From: Hoc, PMT12
Sent: Saturday, April 16, 2011 9:45 PM
To: PMT10 Hoc
Subject: FW: IAEA distributed documents
Attachments: NISA_News_Release_97_-_English_Extract.pdf; NISA_Press_Release_No87-Monitoring.pdf; NISA_Press_Release_No87-Conditions.pdf; NISA_Press_Release_No87-Params.pdf; NISA_Press_Release_No87.pdf; NISA_News_Release_-_Nuclide_Analysis_(Eng;.pdf; NISA_Press_Release_No86-Monitoring.pdf; NISA_Press_Release_No86-Params.pdf; NISA_Press_Release_No86-Conditions.pdf; NISA_Press_Release_No86.pdf; NISA_News_Release_96_(Eng)-Extract.pdf; NISA_News_Release_96_(JPN)-Zeolite_filter 1.pdf; NISA_News_Release_96_(JPN)-Zeolite_filter.pdf

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From: OST01 HOC
Sent: Saturday, April 16, 2011 4:27 PM
To: Moore, Scott; LIA08 Hoc; RST01 Hoc; Hoc, PMT12
Cc: Weber, Michael; Castleman, Patrick; Orders, William; Franovich, Mike; Hipschman, Thomas; Snodderly, Michael
Subject: IAEA distributed documents

Attachments are ~~OUO~~

QQQ|317

Fukushima Dai-ichi Nuclear Power Station Major Parameters of the Plant (As of 13:00, April 11th)

Unit No.	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Situation of water injection	Injecting fresh water via the Water Supply Line. Flow rate of injected water : 6 m^3/h (As of 17:30, April 3rd) temporary measuring instrument	Injecting fresh water via the Fire Extinguish Line. Flow rate of injected water : 7 m^3/h (As of 19:00, April 7th) temporary measuring instrument	Injecting fresh water via the Fire Extinguish Line. Flow rate of injected water: 7 m^3/h (As of 17:32, April 3rd) temporary measuring instrument	Under shutdown	Under shutdown	Under shutdown
Reactor water level	Fuel range A : -1,600mm Fuel range B : -1,650mm (As of 12:00, April 11th)	Fuel range A : -1,500mm (As of 12:00, April 11th)	Fuel range A:-1,900mm Fuel range B:-2,250mm (As of 12:00, April 11th)	#2	Shutdown range measurement 1,909mm (As of 13:00, April 11th)	Shutdown range measurement 2,489mm (As of 13:00, April 11th)
Reactor pressure	0.416MPa g(A) 0.873MPa g(B) #3 (As of 12:00, April 11th)	-0.020MPa g (A) -0.023MPa g (D) (As of 12:00,April 11th)	-0.017MPa g (A) -0.083MPa g (C) (As of 12:00, April 11th)	#2	0.006MPa g (As of 13:00, April 11th)	0.018MPa g (As of 13:00, April 11th)
Reactor water temperature	(Impossible collection due to low system flow rate)			#2	42.6℃ (As of 13:00, April 11th)	33.4℃ (As of 13:00, April 11th)
Reactor Pressure Vessel (RPV) temperature	Feedwater nozzle temperature: 220.8℃ #3 Temperature at the bottom head of RPV: 119.9℃ (As of 12:00, April 11th)	Feedwater nozzle temperature: 154.8℃ Temperature at the bottom head of RPV: #1 (As of 12:00, April 11th)	Feedwater nozzle temperature: 97.0℃ #3 Temperature at the bottom head of RPV: 111.0℃ (As of 12:00, April 11th)	Unit 4 No heating element (fuel) inside the reactor Unit 5,6 Monitoring by the reactor water temperature		
D/W*1 Pressure, S/C*2 Pressure	D/W: 0.195MPa abs S/C: 0.165MPa abs (As of 12:00, April 11th)	D/W: 0.095MPa abs S/C: #1 (As of 12:00, April 11th)	D/W: 0.1043MPa abs S/C: 0.1699MPa abs (As of 12:00, April 11th)	#2		
CAMS*3	D/W: #1 S/C: 1.11×10^{1}Sv/h (As of 12:00, April 11th)	D/W: 2.84×10^{1}Sv/h S/C: 7.17×10^{-1}Sv/h (As of 12:00,April 11th)	D/W: 1.77×10^{1}Sv/h S/C: 6.81×10^{-1}Sv/h (As of 12:00, April 11th)	#2		
D/W*1 design operating pressure	0.384MPa g(0.485MPa abs)	0.384MPa g(0.485MPa abs)	0.384MPa g(0.485MPa abs)	#2		
D/W*1 maximum operating pressure	0.427MPa g(0.528MPa abs)	0.427MPa g(0.528MPa abs)	0.427MPa g(0.528MPa abs)			
Spent Fuel Pool water	#1	71.0℃ (As of 12:00, April 11th)	#1	#1	36.3℃ (As of 13:00, April 11th)	23.0℃ (As of 13:00, April 11th)
FPC skimmer level	4,500mm (As of 12:00, April 11th)	5,800mm (As of 12:00, April 11th)	#1	4,750mm (As of 12:00, April 11th)	#2	
Power supply	Receiving external power supply (P/C*4 2C)		Receiving external power supply (P/ C*4 4D)		Receiving external power supply	

Other information		Common pool: about 32 ℃ (As of 6:30, April 11th)	Unit5: Supplemental Fuel Pool Cooling mode (From 9:57 April 11th)	Unit6: SHC*5 mode (From 10:13 April 11th)

Pressure conversion	Gauge pressure (MPa g) = Absolute pressure (MPa abs) – Atmospheric pressure (Normal atmospheric pressure 0.1013MPa) Absolute pressure (MPa abs) = Gauge pressure (MPa g) + Atmospheric pressure (Normal atmospheric pressure 0.1013MPa)

*1 D/W : Dry Well
*2 S/C : Suppression Chamber
*3 CAMS : Containment Atmospheric Monitoring System
*4 P/C : Power Center
*5 SHC : Shutdown Cooling

#1 : Measuring instrument malfunction
#2 : Except from data collection
#3 : Under investigation of the change of the situation

News Release

経済産業省 Ministry of Economy, Trade and Industry

April 11, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 87th Release)
(As of 15:00 April 11th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)

- Fukushima Dai-ichi NPS

  - Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 15:59 till 16:28 April 10th)
  - The silt fences to prevent the spread of the contaminated water were completed to be doubly installed at the appropriate part of the seawall on the south side of the NPS.

2. Action taken by NISA

In accordance with Article 67, paragraph 1 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the necessity, the evaluation of safety and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(Attached sheet)

1. The state of operation at NPS (Number of automatic shutdown units: 10)

- Fukushima Dai-ichi NPS, TEPCO
  (Okuma Town and FutabaTown, Futaba County, Fukushima Prefecture)

(1) The state of operation

Unit 1 (460MWe):	automatic shutdown
Unit 2 (784MWe):	automatic shutdown
Unit 3 (784MWe):	automatic shutdown
Unit 4 (784MWe):	in periodic inspection outage
Unit 5 (784MWe):	in periodic inspection outage, cold shutdown at 14:30 March 20th
Unit 6 (1,100MWe):	in periodic inspection outage, cold shutdown at 19:27 March 20th

(2) Major Plant Parameters (As of 13:00 April 11th)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure*1 [MPa]	0.517(A) 0.974(B)	0.081(A) 0.078(D)	0.084(A) 0.018(C)	–	0.107	0.119
CV Pressure (D/W) [kPa]	195	95	104.3	–	–	–
Reactor Water Level*2 [mm]	-1,600(A) -1,650(B)	-1,500(A) Not available(B)	-1,900(A) -2,250(B)	–	1,909	2,489
Suppression Pool Water Temperature (S/C) [℃]	–	–	–	–	–	–
Suppression Pool Pressure (S/C) [kPa]	165	Indicator Failure	164.9	–	–	–
Spent Fuel Pool Water Temperature [℃]	Indicator Failure	71.0	Indicator Failure	Indicator Failure	36.3	23.0
Time of Measurement	12:00 April 11th	12:00 April 11th	12:00 April 11th	April 11th	13:00 April 11th	13:00 April 11th

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent ※ (10:17 March 12th)
- Seawater injection to the Reactor Pressure Vessel (RPV) via the Fire Extinguish Line was started. (20:20 March 12th)
  →Temporary interruption of the injection (01:10 March 14th)
- The sound of explosion in Unit 1 occurred. (15:36 March 12th)
- The amount of injected water to the Reactor Core was increased by utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$). (02:33 March 23rd) Later, it was switched to the Feedwater Line only (around $11m^3/h$). (09:00 March 23rd)
- Lighting in the Central Operation Room was recovered. (11:30 March 24th)
- Fresh water injection to RPV was started. (15:37 March 25)
- As the result of concentration measurement in the stagnant water on the basement floor of the turbine building, $2.1 \times 10^5 Bq/cm^3$ of ^{131}I (Iodine) and $1.8 \times 10^6 Bq/cm^3$ of ^{137}Cs (Caesium) were detected as major radioactive nuclides.
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (08:32 March 29th.)
- The Stagnant water on the basement floor of the turbine building was started to be transferred to the Condenser around 17:00 March 24. As the Condenser was confirmed to be almost filled with water, pumping out of the water to the Condenser was stopped. (07:30 March 29th) In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank started to be transferred to the Surge Tank of Suppression Pool Water (A) (12:00 March 31th), after switching the place where the water was to be transferred to the Surge Tank of Suppression Pool Water (B) (15:25 March 31th), the transfer was

resumed and finished. (15:26 April 2nd)

- Water spray of around 90t (fresh water) over the Spent Fuel Pool using Concrete Pump Truck was carried out. (From 13:03 till 16:04 March 31st) A test water spray using Concrete Pump Truck was carried out in order to confirm the appropriate position for water spray. (From 17:16 till 17:19 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (10:42 to 11:52 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (13:55 April 3rd)
- Aiming at reducing the possibility of hydrogen combustion in the Primary Containment Vessel (PCV), the operations for the injection of nitrogen to PCV were started. (22:30 April 6th)
- The start of nitrogen injection to PCV was confirmed. (01:31 April 7th)
- The nitrogen injection to PCV was switched to the generator of high purity nitrogen. (04:10 April 9th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (09:30 April 10th)
- White smoke was confirmed to generate continuously. (As of 06:30 April 11th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 11th)

※ From now on, "Started to vent" is used instead of "Operation of Vent" to unify the expression in other documents.

<Unit 2>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)

- Started to vent ※ (11:00 March 13th)
- The Blow-out Panel of reactor building was opened due to the explosion in the reactor building of Unit 3. (After 11:00 March 14th)
- Reactor water level tended to decrease. (13:18 March 14th) TEPCO reported to NISA the event (Loss of reactor cooling functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:49 March 14th)
- Seawater injection to RPV via the Fire Extinguish line was started. (16:34 March 14th)
- Water level in RPV tended to decrease. (22:50 March 14th)
- Started to vent ※(0:02 March 15th)
- A sound of explosion was made in Unit 2. As the pressure in Suppression Pool (Suppression Chamber) decreased (06:10 March 15th), there was a possibility that an incident occurred in the Chamber. (About 06:20 March 15th)
- Electric power receiving at the emergency power source transformer from the external transmission line was completed. The work for laying the electric cable from the facility to the load side was carried out. (13:30 March 19th)
- Seawater injection of 40t to the Spent Fuel Pool was started. (From 15:05 till 17:20 March 20th)
- Power Center received electricity (15:46 March 20th)
- White smoke generated. (18:22 March 21st)
- White smoke was died down and almost invisible. (As of 07:11 March 22nd)
- Seawater injection of 18t to the Spent Fuel Pool was carried out. (From 16:07 till 17:01 March 22nd)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:30 till 12:19 March 25th)
- Fresh water injection to RPV was started. (10:10 March 26th)
- Lighting of Central Operation Room was recovered (16:46 March26th)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump.(18:31 March 27th)

- Regarding the result of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, TEPCO reported to NISA that as the result of analysis and evaluation through re-sampling, judging the measured value of ^{134}I (Iodine) was wrong, the concentrations of gamma nuclides including ^{134}I (Iodine) were less than the detection limit. (00:07 March 28).
- Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump. (From 16:30 till 18:25 March 29th)
- As the malfunction of the temporary motor-driven pump, which had been injecting to the Spent Fuel Pool since 09:25 March 30th, was confirmed at 09:45 March 30th, the injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. Fresh water injection was resumed. (From 19:05 till 23:50 March 30th)
- Fresh water injection of around 70t to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 14:56 till 17:05 April 1st)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank was transferred to the Surge Tank of Suppression Pool Water. (From 16:45 March 29th till 11:50 April 1st)
- The water, of which the dose rate was at the level of more than 1,000 mSv/h, was confirmed to be collected in the pit (a vertical portion of an underground structure) for laying electric cables, located near the Intake Channel. In addition, the outflow from the crack with a length of around 20 cm in the concrete portion of the lateral surface of the pit into the sea was confirmed. (Around 09:30 April 2nd) In order to stop the outflow, concrete was poured into the pit. (16:25, 19:02 April 2nd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (17:10 April 2nd)
- The cameras for monitoring the water levels in the vertical part of the trench outside of the turbine building and on the basement floor of the

turbine building were installed. (April 2nd)

- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:22 till 12:06 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- As the measure to prevent the outflow of the water accumulated in the Pits for Conduit in the area around the Inlet Bar Screen, the upper part of the Power Cable Trench for power source at Intake Channel was crushed and 20 bags of sawdust (3 kg/bag), 80 bags of high polymer absorbent (100 g/bag) and 3 bags of cutting-processed newspaper (Large garbage bag) were put inside. (From 13:47 till 14:30 April 3rd)
- Approximately 13kg of tracer (milk white bath agent) was put in from the Pit for the Duct for Seawater Pipe. (From 07:08 till 07:11 April 4th)
- Fresh water injection (Around 70t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 11:05 till 13:37 April 4th)
- The tracer solution was put in from the two holes dug around the Pit for the Conduit near the Inlet Bar Screen of Unit 2 and was confirmed to be flowed out from the crack to the sea. (14:15 April 5th) The coagulant (soluble glass) started to be injected from the holes around the Pit in order to prevent the outflowing of the water. (15:07 April 5th) The outflow of the water was confirmed to stop. (Around 05:38 April 6th) In addition, it was confirmed that the water level in the turbine building did not rise. Furthermore, the measurements to stop water by means of rubber board and jig (prop) were implemented at the outflowing point. (Finished at 13: 15 April 6th)
- One more pump for the transfer of the water in the Condenser to the Condensate Storage Tank was installed. (Two pumps in total: 30 m^3/h) (Around 15:40 April 5th)
- Fresh water injection (Around 36t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 13:39 till 14:34 April 7th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (13:10 April 9th)

- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:37 till 12:38 April 10th)
- White smoke was confirmed to generate continuously. (As of 06:30 April 11th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 11th)

<Unit 3>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (05:10 March 13th)
- Started to vent ※ (08:41 March 13th)
- Fresh water started to be injected to RPV via the Fire Extinguish Line. (11:55 March 13th)
- Seawater started to be injected to RPV via the Fire Extinguish Line. (13:12 March 13th)
- Seawater injection for Units 1 and 3 was suspended due to the lack of seawater in pit. (01:10 March 14th)
- Seawater injection to RPV for Unit 3 was resumed. (03:20 March 14th)
- Started to vent ※ (05:20 March 14th)
- PCV rose unusually. (07:44 March 14th) TEPCO reported to NISA on the event falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (7:52 March 14th)
- The explosion like Unit 1 occurred around the reactor building (11:01 March 14th)
- The white smoke like steam generated. (08:30 March 16th)
- Because of the possibility that PCV was damaged, the workers evacuated from the main control room (common control room). (10:45 March 16th) Thereafter the operators returned to the room and resumed the operation of water injection. (11:30 March 16th)
- Seawater was discharged 4 times to Unit 3 by the helicopters of the Self-Defence Force. (9:48, 9:52, 9:58 and 10:01 March 17th)
- The riot police arrived at the site for the water spray from the grand. (16:10 March 17th)

- The Self-Defence Force started the water spray using a fire engine. (19:35 March 17th)
- The water spray from the ground was carried out by the riot police. (From 19:05 till 19:13 March 17th)
- The water spray from the ground was carried out by the Self-Defense Force using 5 fire engines. (19:35, 19:45, 19:53, 20:00 and 20:07 March 17th)
- The water spray from the ground using 6 fire engines (6 tons of water spray per engine) was carried out by the Self-Defence Force. (From before 14:00 till 14:38 March 18th)
- The water spray from the ground using a fire engine provided by the US Military was carried out. (Finished at 14:45 March 18th)
- Hyper Rescue Unit of Tokyo Fire Department carried out the water spray. (Finished at 03:40 March 20th)
- The pressure in PCV rose (320 kPa at 11:00 March 20th). Preparation to lower the pressure was carried out. Judging from the situation, immediate pressure relief was not required. Monitoring the pressure continues. (120 kPa at 12:15 March 21st)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool of Unit 3 by Hyper Rescue Unit of Tokyo Fire Department was carried out (From 21:30 March 20th till 03:58 March 21st).
- Grayish smoke generated. (Around 15:55 March 21st)
- The smoke was confirmed to be died down. (17:55 March 21st)
- Grayish smoke changed to be whitish and seems to be ceasing. (As of 07:11 March 22nd)
- Water spray (Around 180t) by Tokyo Fire Department and Osaka City Fire Bureau was carried out. (From 15:10 till 16:00 March 22nd)
- Lighting was recovered in the Central Operation Room. (22:43 March 22nd)
- Seawater injection of 35t to the Spent Fuel Pool via the Fuel Pool Cooling Line was carried out. (From 11:03 till 13:20 March 23rd) Around 120t of seawater was injected. (From around 5:35 till around 16:05 March 24th)
- Slightly blackish smoke generated from the reactor building. (Around

16:20 March 23rd) Around 23:30 March 23rd and around 4:50 March 24th, it was reported that the smoke seemed to cease.

- As the results of the survey of the stagnant water, into which workers who were laying electric cable on the ground floor and the basement floor of the turbine building walked, the dose rate on the water surface was around 400mSv/h, and as the result of gamma-ray analysis of the sampling water, the totaled concentration of each nuclide of the sampling water was around 3.9×10^6 Bq/cm^3.
- Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department was carried out. (From 13:28 till 16:00 March 25th)
- Fresh water injection to RPV was started. (18:02 March 25th)
- Water spray of around 100t using Concrete Pump Truck (50t/h) was carried out. (From 12:34 till 14:36 March 27th)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water. (From 17:40 March 28th till around 8:40 March 31st)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (20:30 March 28th)
- Fresh water spray of around 100t using Concrete Pump Truck (50t/h) was carried out. (From 14:17 till 18:18 March 29th)
- Fresh water spray of around 105t using Concrete Pump Truck (50t/h) was carried out. (From 16:30 till 19:33 March 31st)
- Fresh water spray of around 75t using Concrete Pump Truck (50t/h) was carried out. (From 09:52 till 12:54 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- The camera for monitoring the water level in the vertical part of the trench outside of the turbine building was installed. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:03 till 12:16 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:18 April 3rd)

- Fresh water spray of around 70t using Concrete Pump Truck (50t/h) was carried out. (From 17:03 till 19:19 April 4th)
- Fresh water spray of around 70t using Concrete Pump Truck (50t/h) was carried out. (From 06:53 till 08:53 April 7th)
- Fresh water spray of around 75t using Concrete Pump Truck (50t/h) was carried out. (From 17:06 till 20:00 April 8th)
- Fresh water spray of around 80t using Concrete Pump Truck (50t/h) was carried out. (From 17:15 till 19:15 April 10th)
- White smoke was confirmed to generate continuously (As of 06:30 April 11th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 11th)

<Unit 4>

- Because of the replacement work of the Shroud of RPV, no fuel was inside the RPV.
- The temperature of water in the Spent Fuel Pool had increased. (84 ℃ at 04:08 March 14th)
- It was confirmed that a part of wall in the operation area was damaged. (06:14 March 15th)
- The fire occurred. (09:38 March 15th) TEPCO reported that the fire was extinguished spontaneously. (Around 11:00 March 15th)
- The fire occurred. (05:45 March 16th) TEPCO reported that no fire could be confirmed on the ground.(Around 06:15 March 16th)
- The Self-Defence Force started water spray over the Spent Fuel Pool.(09:43 March 20th)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool by Self-Defense Force was started. (From around 18:30 till 19:46 March 20th).
- Water spray over the Spent Fuel Pool by Self-Defence Force using 13 fire engines was started (From 06:37 till 08:41 March 21st).
- Works for laying electric cable to the Power Center was completed. (Around 15:00 March 21st)
- Power Center received electricity. (10:35 March 22nd)
- Water spray of around 150t using Concrete Pump Truck (50t/h) was

carried out. (From 17:17 till 20:32 March 22nd)

- Water spray of around 130t using Concrete Pump Truck (50t/h) was carried out. (From 10:00 till 13:02 March 23rd)
- Water spray of around 150t using Concrete Pump Truck (50t/h) was carried out. (From 14:36 till 17:30 March 24th)
- Water spray of around 150t using Concrete Pump Truck (50t/h) was carried out. (From 19:05 till 22:07 March 25th)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 06:05 till 10:20 March 25th)
- Water spray of around 125t using Concrete Pump Truck (50t/h) was carried out. (From 16:55 till 19:25 March 27th)
- Lighting of Central Operation Room was recovered. (11:50 March 29th)
- Fresh water spray of around 140t using Concrete Pump Truck (50t/h) was carried out. (From 14:04 till 18:33 March 30th)
- Fresh water spray of around 180t using Concrete Pump Truck (50t/h) was carried out. (From 08:28 till 14:14 April 1st)
- Lighting in the turbine building was partially turned on. (April 2nd)
- From 2 April, the stagnant water in the Main Building of Radioactive Waste Treatment Facilities was being transferred to the turbine building of Unit 4. As the water level in the vertical portion of the trench for Unit 3 rose from 3 April, by way of precaution, the transfer was suspended notwithstanding that the path of the water was not clear. (09:22 April 4th)
- Fresh water spray of around 180t using Concrete Pump Truck (50t/h) was carried out. (From 17:14 till 22:16 April 3rd)
- Fresh water spray of around 20t using Concrete Pump Truck (50t/h) was carried out. (From 17:35 till 18:22 April 5th)
- Fresh water spray of around 38t using Concrete Pump Truck (50t/h) was carried out. (From 18:23 till 19:40 April 7th)
- Fresh water spray of around 90t using Concrete Pump Truck (50t/h) was carried out. (From 17:07 till 19:24 April 9th)
- White smoke was confirmed to generate continuously. (As of 06:30 April 11th)

<Units 5 and 6>

- The first unit of Emergency Diesel Generator (D/G) (B) for Unit 6 is

operating and supplying electricity. Water injection to RPV and the Spent Fuel Pool through the system of Make up Water Condensate (MUWC) is being carried out.

- The second unit of Emergency Diesel Generator (D/G) (A) for Unit 6 started up. (04:22 March 19th)
- The pumps for Residual Heat Removal (RHR) (C) for Unit 5 (05:00 March 19th) and RHR (B) for Unit 6 (22:14 March 19th) started up and recovered heat removal function. It cools Spent Fuel Pool with priority. (Power supply : Emergency Diesel Generator for Unit 6) (05:00 March 19th)
- Unit 5 under cold shut down (14:30 March 20th)
- Unit 6 under cold shut down (19:27 March 20th)
- Receiving electricity reached to the transformer of starter. (19:52 March 20th)
- Power supply to Unit 5 was switched from the Emergency Diesel Generator to external power supply. (11:36 March 21st)
- Power supply to Unit 6 was switched from the Emergency Diesel Generator to external power supply. (19:17 March 22nd)
- The temporary pump for RHR Seawater System (RHRS) of Unit 5 was automatically stopped when the power supply was switched from the temporary to the permanent. (17:24 March 23rd)
- Repair of the temporary pump for RHRS of Unit 5 was completed (16:14 March 24th) and cooling was started again. (16:35 March 24th)
- Power supply for the temporary pump for RHRS of Unit 6 was switched from the temporary to the permanent. (15:38 and 15:42 March 25th)
- The groundwater with low-level radioactivity in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was started to be discharged through the Water Discharge Canal to the sea. (21:00 April 4th)
- The groundwater with low-level radioactivity in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was discharged through the Water Discharge Canal to the sea. (Unit5 from 21:00 April 4th till 12:14 April 8th (Around 950t), Unit6 from 21:00 April 4th till 18:52 April 9th (Around 373t))

<Common Spent Fuel Pool>

- It was confirmed that the water level of Spent Fuel Pool was maintained almost full at after 06:00 March 18th.

- Water spray over the Common Spent Fuel Pool was started. (From 10:37 till 15:30 March 21st)
- The power was started to be supplied (15:37 March 24th) and cooling was also started.(18:05 March 24th)
- As of 06:30 April 11th, water temperature of the pool was around 32℃.

<Other>

- As the result of nuclide analysis at around the Southern Water Discharge Canal, 7.4×10^{1}Bq/cm^{3} of ^{131}I (Iodine) (1,850.5 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected. (14:30 March 26th)
  (As the result of measurement on 29 March, it was detected as 3,355.0 times higher than the limit in water (13:55 March 29th). On the other hand, as the result of the analysis at the northern side of the Water Discharge Canal of the NPS, 4.6×10^{1}Bq/cm^{3} of ^{131}I (Iodine) (1,262.5 times higher than the limit in water) was detected. (14:10 March 29th)
- The water was confirmed to be collected in the vertical parts of the trenches (an underground structure for laying pipes, shaped like a tunnel) outside of the turbine building of Units 1 to 3. The dose rates on the water surface were 0.4 mSv/h of the Unit 1's trench and 1,000 mSv/h of the Unit 2's trench. The rate of the Unit 3's trench could not measure because of the rubble. (Around 15:30 March 27th) The collected water in the vertical part of the trench outside of the turbine building of Unit 1 was transferred to the storage tank in the Main Building of Radioactive Waste Treatment Facilities by the temporary pump. Thereafter the water level from the top of the vertical part went down from approximately -0.14m to approximately -1.14m. (From 09:20 till 11:25 March 31st)
- In the samples of soil collected on 21 and 22 March on the site (at 5 points) of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (23:45 March 28th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was

not at the level of having harmful influence on human body.

- When removing the flange of pipes of Residual Heat Removal Seawater System outside the building of Unit 3, three subcontractor's employees were wetted by the water remaining in the pipe. However, as the result of wiping the water off, no radioactive materials were attached to their bodies. (12:03 March 29th)
- On March 28th, the stagnant water was confirmed in the Main Building of Radioactive Waste Treatment Facilities. As the result of analysis of radioactivity, the total amount of the radioactivity 1.2×10^1 Bq/cm^3 in the controlled area and that of 2.2×10^1 Bq/cm^3 in the non-controlled area were detected in March 29th.
- As the result of nuclide analysis at around the Southern Water Discharge Canal, 1.8×10^2 Bq/cm^3 of ^{131}I (Iodine) (4,385.0 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected (13:55 March 30th).
- The barge (the first ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (15:42 March 31st) The transfer of fresh water from the barge (the first ship) to the Filtrate Tank was started. (15:58 April 1st) Thereafter it was suspended due to the malfunction of the hose (16:25 April 1st), but was resumed on April 2nd. (From 10:20 till 16:40 April 2nd)
- The permanent monitoring posts (No.1 to 8) installed near the Site Boundary were recovered. (March 31st) They are measuring once a day.
- The spraying for test scattering of antiscattering agent was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (From 15:00 till 16:05 April 1st)
- The barge (the second ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (9:10 April 2nd)
- The freshwater was transferred from the barge (the second ship) of the US armed force to the barge (the first ship). (From 09:52 till 11:15 April 3rd)
- The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged

from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps in total was carried out (19:07 April 4th) and stopped discharging to the sea using submersible pumps at 17:40 April 10th. Confirmation of the remaining water is being carried out. (Total amount of discharged water is around 9,070t.)

- In the samples of soil (7 samples in total) collected on 25 March (at 4 points) and 28 March (at 3 points) on the site of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (18:30 April 6th announced by TEPCO). The concentration of the detected plutonium was, in the same as the last one (Announced on 28 March), at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- In order to prevent the outflow of the contaminated water from the exclusive port, the work for stopping water by means of large-sized sandbags was implemented around the seawall on the south side of the NPS. (From 15:00 till 16:30 April 5th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 600 m^2 on the mountain-side of the Common Pool. (April 5th, 6th)
- The stagnant water with low-level radioactivity in the Building of Miscellaneous Solid Waste Volume Reduction Processing was discharged from the southern side of the Water Discharge Canal to the sea using 5 pumps.(From 17:20 April 6th till 18:20 April 7th)
- In order to prepare to transfer the stagnant water in the turbine buildings to the Radioactive Waste Treatment Facilities, drilling the outer walls of the turbine buildings of Units 2 to 4 was carried out. (April 7th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 680 m^2 on the mountain-side of the Common Pool. (April 8th)
- The pumping out of the water in the Radioactive Waste Treatment Facilities, which was suspended by the earthquake off the coast of Miyagi

Prefecture occurred at 11:32 April 7th, was resumed. (14:30 April 8th)

- The test implementation of spraying antiscattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (April 10th)
- Removal of the rubble using remote-control heavy machineries was carried out. (April 10th)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 15:59 till 16:28 April 10th)
- The silt fences to prevent the spread of the contaminated water were completed to be doubly installed at the appropriate part of the seawall on the south side of the NPS.

● Fukushima Dai-ni NPS (TEPCO)
(Naraha Town / Tomioka Town, Futaba County, Fukushima Prefecture.)

(1) The state of operation

Unit1 (1,100MWe):	automatic shutdown, cold shut down at 17:00, March 14th
Unit2 (1,100MWe):	automatic shutdown, cold shut down at 18:00, March 14th
Unit3 (1,100MWe):	automatic shutdown, cold shut down at 12:15, March 12th
Unit4 (1,100MWe):	automatic shutdown, cold shut down at 07:15, March 15th

(2) Major plant parameters (As of 12:00 April 11th)

	Unit	Unit 1	Unit 2	Unit 3	Unit 4
Reactor Pressure*1	MPa	0.15	0.13	0.10	0.17
Reactor water temperature	℃	25.4	25.1	33.7	29.5
Reactor water level*2	mm	9,346	10,346	7,800	8,785
Suppression pool water temperature	℃	24	24	26	30
Suppression pool pressure	kPa (abs)	105	105	111	110
Remarks		cold shutdown	cold shutdown	cold shutdown	cold shutdown

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- Around 17:56 March 30th, smoke was rising from the power distribution panel on the first floor of the turbine building of Unit 1. However, when the power supply was turned off, the smoke stopped to generate. It was judged by the fire station at 19:15 that this event was caused by the malfunction of the power distribution panel and was not a fire.
- The Residual Heat Removal System (B) to cool the reactor of Unit 1 became to be able to receive power from the emergency power supply as well as the external power supply. This resulted in securing the backup power supplies (emergency power supplies) of Residual Heat Removal System (B) for all Units. (14:30 March 30th)

(4) Report concerning other incidents

- TEPCO reported to NISA the event in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (18:08 March 11th)
- TEPCO reported to NISA the events in accordance with the Article 10 regarding Units 1, 2 and 4. (18:33 March 11th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (5:22 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 2. (5:32 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 4 of Fukushima Dai-ni NPS. (6:07 March 12th)

- Onagawa NPS (Tohoku Electric Power Co. Inc.)
  (Onagawa Town, Oga County and Ishinomaki City, Miyagi Prefecture)

(1) The state of operation

Unit 1 (524MWe): automatic shutdown, cold shut down at 0:58, March 12th

Unit 2 (825MWe): automatic shutdown, cold shut down at earthquake

Unit 3 (825MWe): automatic shutdown, cold shut down at 1:17, March 12th

(2) Readings of monitoring post, etc.

MP2 (Monitoring at the Northern End of Site Boundary)

Approx. 0.36 μ SV/h (16:00 April 9th) (Approx. 0.37 μ SV/h (16:00 April 7th))

(3) Report concerning other incidents

- Fire Smoke on the first basement of the Turbine Building was confirmed to be extinguished. (22:55 on March 11th)
- Tohoku Electric Power Co. reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:09 March 13th)

2. Action taken by NISA

(March 11th)

14:46 Set up of the NISA Emergency Preparedness Headquarters (Tokyo) immediately after the earthquake

15:42 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

16:36 TEPCO recognized the event (Inability of water injection of the Emergency Core Cooling System) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Units 1 and 2 of Fukushima Dai-ichi NPS. (Reported to NISA at 16:45)

18:08 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

18:33 Regarding Units 1, 2 and 4 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of Act on Special Measures Concerning Nuclear Emergency Preparedness.

19:03 The Government declared the state of nuclear emergency. (Establishment of the Government Nuclear Emergency Response Headquarters and the Local Nuclear Emergency Response Headquarters)

20:50 Fukushima Prefecture's Emergency Response Headquarters issued a direction for the residents within 2 km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate. (The population of this area is 1,864.)

21:23 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayor of Okuma Town and the Mayor of Futaba Town were issued regarding the event occurred at Fukushima Dai-ichi NPS, TEPCO, in accordance with the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate
- Direction for the residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS to stay in-house

24:00 Vice Minister of Economy, Trade and Industry, Ikeda arrived at the Local Nuclear Emergency Response Headquarters

(March12th)

0:49 Regarding Units 1 TEPCO Fukushima Dai-ichi NPS, TEPCO recognized the event (Unusual rise of the pressure in PCV) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 01:20)

05:22 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 06:27)

05:32 Regarding Unit 2 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article

15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

05:44 Residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS shall evacuate by the Prime Minister Directive.

06:07 Regarding of Unit 4 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

06:50 In accordance with the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to control the internal pressure of PCV of Units 1 and 2 of Fukushima Dai-ichi NPS.

07:45 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayors of Hirono Town, Naraha Town , Tomioka Town and Okuma Town were issued regarding the event occurred at Fukushima Dai-ni NPS, TEPCO, pursuant to the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Fukushima Dai-ni NPS to evacuate
- Direction for the residents within 10km radius from Fukushima Dai-ni NPS to stay in-house

17:00 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

17:39 The Prime Minister directed evacuation of the residents within the 10 km radius from Fukushima Dai-ni NPS.

18:25 The Prime Minister directed evacuation of the residents within the 20km radius from Fukushima Dai-ichi NPS.

19:55 Directives from the Prime Minister was issued regarding seawater injection to Unit 1 of Fukushima Dai-ichi NPS.

20:05 Considering the Directives from the Prime Minister and pursuant to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to inject seawater to Unit 1 of Fukushima Dai-ichi NPS and so on.

20:20 At Unit 1 of Fukushima Dai-ichi NPS, seawater injection was started.

(March 13th)

05:38 TEPCO reported to NISA the event (Total loss of coolant injection function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS. Recovering efforts by TEPCO of the power source and coolant injection function and the work on venting were under way.

09:01 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

09:08 Pressure suppression and fresh water injection was started for Unit 3 of Fukushima Dai-ichi NPS.

09:20 The Pressure Vent Valve of Unit 3 of Fukushima Dai-ichi NPS was opened.

09:30 Directive was issued for the Governor of Fukushima Prefecture, the Mayors of Okuma Town, Futaba Town, Tomioka Town and Namie Town in accordance with the Act on Special Measures Concerning Nuclear Emergency Preparedness on the contents of radioactivity decontamination screening.

13:09 Tohoku Electric Power Co. reported to NISA that Onagawa NPS reached a situation specified in the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

13:12 Fresh water injection was switched to seawater injection for Unit 3 of Fukushima Dai-ichi NPS.

14:36 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 14th)

01:10 Seawater injection for Units 1 and 3 of Fukushima Dai-ichi NPS were temporarily interrupted due to the lack of seawater in pit.

03:20 Seawater injection for Unit 3 of Fukushima Dai-ichi NPS was resumed.

04:40 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

05:38 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:52 TEPCO reported to NISA the event (Unusual rise of the pressure in PCV) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS.

13:25 Regarding Unit 2 of Fukushima Dai-ichi NPS, TEPCO recognised the event (Loss of reactor cooling function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

22:13 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ni NPS.

22:35 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 15th)

00:00: The acceptance of experts from International Atomic Energy Agency (IAEA) was decided. NISA agreed to accept the offer of dispatching of the expert on NPS damage from IAEA considering the intention by Mr. Amano, Director General of IAEA. Therefore, the schedule of expert acceptance will be planned from now on according to the situation.

00:00: NISA also decided the acceptance of experts dispatched from U.S. Nuclear Regulatory Commission (NRC).

07:21 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:24 Incorporated Administration Agency, Japan Atomic Energy Agency (JAEA) reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre.

07:44 JAEA reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Science Research Institute.

08:54 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

10:30 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the directions as follows.

For Unit 4: To extinguish fire and to prevent the occurrence of re-criticality

For Unit 2: To inject water to reactor vessel promptly and to vent Drywell.

10:59 Considering the possibility of lingering situation, it was decided that the function of the Local Nuclear Emergency Response Headquarters was moved to the Fukushima Prefectural Office.

11:00 The Prime Minister directed the in-house stay area.

In-house stay was additionally directed to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS considering in-reactor situation.

16:30 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

22:00 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the following direction.

For Unit 4: To implement the water injection to the Spent Fuel Pool.

23:46 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 18th)

13:00 Ministry of Education, Culture, Sports, Science and Technology decided to reinforce the nation-wide monitoring survey in the emergency of Fukushima Dai-ichi and Dai-ni NPS.

15:55 TEPCO reported to NISA on the accidents and failure at Units 1, 2, 3 and 4 of Fukushima Dai-ichi NPS (Leakage of the radioactive materials inside of the reactor buildings to non-controlled area of radiation) pursuant to the Article 62-3 of the Nuclear Regulation Act.

16:48 Japan Atomic Power Co. reported to NISA accidents and failures in Tokai NPS (Failure of the seawater pump motor of the Emergency Diesel Generator 2C) pursuant to the Article 62-3 of the Nuclear Regulation Act.

(March 19th)

07:44 The second unit of Emergency Diesel Generator (A) for Unit 6 started up.

TEPCO reported to NISA that the pump for RHR (C) for Unit 5 started up and started to cooling Spent Fuel Storage Pool. (Power supply: Emergency Diesel Generator for Unit 6)

08:58 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 20th)

23:30 Directive from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisoma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village) was issued regarding the change of the reference value for the screening level for decontamination of radioactivity.

(March 21st)

07:45 Directive titled as "Administration of the stable Iodine" was issued from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village), which directs the above-mentioned governor and the heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

16:45 Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" was issued from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village), which directs the above-mentioned governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

17:50 Directive from the Director-general of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Gunma was issued, which direct the above-mentioned governors to issue a request to relevant businesses and people to suspend shipment of spinach, *Kakina* (a green vegetable) and raw milk for the time being.

(March 22nd)

16:00 NISA received the response (Advice) from Nuclear Safety Commission Emergency Technical Advisory Body to the request for advice made by NISA, regarding the report from TEPCO titled as "The Results of Analysis of Seawater" dated March 22nd.

(March 25th)

NISA directed orally to the TEPCO regarding the exposure of workers at the turbine building of Unit 3 of Fukushima Dai-ichi

Nuclear Power Station occurred on March 24th, to review immediately and to improve its radiation control measures from the viewpoint of preventing a recurrence.

(March 28th)

Regarding the mistake in the evaluation of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, NISA directed TEPCO orally to prevent the recurrence of such a mistake.

13:50 Receiving the suggestion by the special meeting of Nuclear Safety Commission (NSC) (Stagnant water on the underground floor of the turbine building at Fukushima Dai-ichi Plant Unit 2), NISA directed TEPCO orally to add the sea water monitoring points and carry out the groundwater monitoring.

Regarding the delay in the reporting of the water confirmed outside of the turbine buildings, NISA directed TEPCO to accomplish the communication in the company on significant information in a timely manner and to report it in a timely and appropriate manner.

(March 29th)

11:16 The report was received, regarding the accident and trouble etc. in Onagawa NPS of Tohoku Electric Power Co. Inc. (the trouble of pump of component cooling water system etc. in Unit 2 and the fall of heavy oil tank for auxiliary boiler of Unit 1 by tsunami), pursuant to the Article 62-3 of the Nuclear Regulation Act and the Article 3 of the Ministerial Ordinance for the Reports related to Electricity.

In order to strengthen the system to assist the nuclear accident sufferers, the "Team to Assist the Lives of the Nuclear Accident Sufferers" headed by the Minister of Economy, Trade and Industry was established and the visits, etc. by the team to relevant cities, towns and villages were carried out.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.1 for the residents within the area from 20 km to 30 km radius.

(March 30th)

Directions as to the implementation of the emergency safety measures for the other power stations considering the accident of Fukushima Dai-ichi and Dai-ni NPSs in 2011 was issued and handed to each electric power company and the relevant organization.

(March 31st)

Regarding the break-in of the propaganda vehicle to Fukushima Dai-ni NPS on 31 March, NISA directed TEPCO orally to take the carefully thought-out measures regarding physical protection, etc.

NISA alerted TEPCO to taking the carefully though-out measures regarding radiation control for workers.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.2 for the residents within the area from 20 km to 30 km radius.

(April 1st)

NISA strictly alerted TEPCO to taking appropriate measures concerning the following three matters regarding the mistake in the result of nuclide analysis.

- Regarding the past evaluation results on nuclide analysis, all the nuclides erroneously evaluated should be identified and the re-evaluation on them should be promptly carried out.
- The causes for the erroneous evaluation should be investigated and the thorough measures for preventing the recurrence should be taken.
- Immediate notification should be done in the stage when any erroneous evaluation results, etc. are identified.

(April 2nd)

Regarding the outflow of the liquid including radioactive materials from the area around the Intake Channel of Unit 2 of Fukushima Dai-ichi NPS, NISA directed TEPCO orally to carry out nuclide analysis of the liquid sampled, to confirm whether there are other outflows from the same parts of the facilities as the one, from which the outflow was confirmed around the Unit 2, and to strengthen monitoring through sampling water at more points around the facilities concerned.

(April 4th)

On the imperative execution of the discharge to the sea as an emergency measure, NISA requested the technical advice of NSC and directed TEPCO to survey and confirm the impact of the spread of radioactive materials caused by the discharge, by ensuring continuity of the sea monitoring currently underway and enhancing it (Increase of the frequency of measuring as well as the number of monitoring points), disclose required information, as well as to enhance the strategy to minimize the discharge amount.

(April 5th)

Directions as to the implementation of advance notification and contact to the local governments with regard to taking measures related to discharge of radioactive materials from Fukushima Dai-ichi NPS, which have a possible impact on the environment, was issued.

(April 6th)

On the implementation of the nitrogen injection to PCV of Unit 1, NISA directed TEPCO on the following three points. (12:40 April 6th) ① Properly control the plant parameters, and take measures appropriately to ensure safety in response to changes in the parameters. ②Establish and implement an organizational structure and so on that will ensure the safety of the workers who will engage in the operation. ③As the possibility of leakage of the air in PCV to the outside due to the nitrogen injection cannot be ruled out, through the judicious and further enhanced monitoring, TEPCO shall survey and confirm the impact of the release and spreading of radioactive materials due to the nitrogen injection, and strive to disclose information.

(April 7th)

The Local Nuclear Emergency Response Headquarters issued the News Letter No.3 for the residents within the area from 20km to 30km radius. (April 7th)

(April 9th)

Due to the earthquake off the coast of Miyagi Prefecture occurred around 23:32 April 7th, all the Emergency Diesel Generators for Unit 1 of the Higashidori NPS of Tohoku Electric Power Co., Inc. were not workable. Considering this event, NISA issued the letters of direction titled "Regarding the Treatment of Emergency Power Generating Facilities in Terms of Safety Regulations (Directions)" to each Electricity Utility and other organizations concerned.

In accordance with the Paragraph 1, the Article 67 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the evaluation of necessity and safety, and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 10th)

In accordance with Article 67, paragraph 1 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the necessity, the evaluation of safety and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

< Possibility on radiation exposure (As of 15:00 April 11th) >

1. Exposure of residents

(1) Including the about 60 evacuees from Futaba Public Welfare Hospital to Nihonmatsu City Fukushima Gender Equality Centre, as the result of measurement of 133 persons at the Centre, 23 persons counted more than 13,000 cpm were decontaminated.

(2) The 35 residents transferred from Futaba Public Welfare Hospital to Kawamata Town Saiseikai Kawamata Hospital by private bus arranged by Fukushima Prefecture were judged to be not contaminated by the Prefectural Response Centre.

(3) As for the about 100 residents in Futaba Town evacuated by bus, the results of measurement for 9 of the 100 residents were as follows. The evacuees, moving outside the Prefecture (Miyagi Prefecture), were divided into two groups, which joined later to Nihonmatsu City Fukushima Gender Equality Centre.

No. of Counts	No. of Persons
18,000 cpm	1
30,000-36,000 cpm	1
40,000 cpm	1
little less than 40,000 cpm*	1
very small counts	5

*(These results were measured without shoes, though the first measurement exceeded 100,000 cpm.)

(4) The screening was started at the Off site Centre in Okuma Town from March 12th to 15th. 162 people received examination until now. At the beginning, the reference value was set at 6,000 cpm. 110 people were at the level below 6,000 cpm and 41 people were at the level of 6,000 cpm or more. When the reference value was increased to 13,000 cpm afterward, 8 people were at the level below 13,000 cpm and 3 people are at the level of 13,000 cpm or more.

The 5 out of 162 people examined were transported to hospital after being decontaminated.

(5) The Fukushima Prefecture carried out the evacuation of patients and personnel of the hospitals located within 10km area. The screening of all the members showed that 3 persons have the high counting rate. These members were transported to the secondary medical institute of exposure. As a result of the screening on 60 fire fighting personnel involved in the transportation activities, the radioactivity higher than

twice of the back ground was detected on 3 members. Therefore, all the 60 members were decontaminated.

(6) Fukushima Prefecture has started the screening from 13 March. It is carried out by rotating the evacuation sites and at the 13 places (set up permanently) such as health offices. Up until April 9th, the screening was done to 140,338 people. Among them, 102 people were above the 100,000 cpm, but when measured these people again without clothes, etc., the counts decreased to 100,000 cpm and below, and there was no case which affects health.

2. Exposure of workers

As for the workers conducting operations in Fukushima Dai-ichi NPS, the total number of people who were at the level of exposure more than 100 mSv becomes 21.

For two out of the three workers who were confirmed to be at the level of exposure more than 170 mSv on March 24, the attachment of radioactive material on the skin of both legs was confirmed. As the two workers were judged to have a possibility of beta ray burn, they were transferred to the Fukushima Medical University Hospital, and after that, on March 25th, all of the three workers arrived at the National Institute of Radiological Sciences in the Chiba Prefecture. As the result of examination, the level of exposure of their legs was estimated to be from 2 to 3 Sv. The level of exposure of both legs and internal did not require medical treatment, but they decided to monitor the progress of all three workers in the hospital. All the three workers have been discharged from the hospital around the noon on 28 March.

At around 11:35 April 1st, a worker fell into the sea when he went on board the barge of the US Armed forces in order to adjust the hose. He was rescued immediately by other workers around without any injury and external contamination. In order to make double sure, the existence of internal radionuclide contaminant is being confirmed by a whole-body counter.

3. Others

(1) 4 members of Self-Defence Force who worked in Fukushima Dai-ichi NPS were injured by explosion. One member was transferred to National Institute of Radiological Sciences. After the examination, judged that there were wounds but no risk for health from the exposure, the one was released from the hospital on March 17th. No other exposure of the Self-Defence Force member was confirmed at the Ministry of Defence.

(2) As for policeman, the decontaminations of two policemen were confirmed by the National Police Agency. Nothing unusual was reported.

(3) On March 24th, examinations of thyroid gland for 66 children aged from 1 to 15 years old were carried out at the Kawamata Town public health Center. The result was at not at the level of having harmful influence.

(4) From March 26th to 27th, examinations of thyroid gland for 137 children aged from 0 to 15 years old were carried out at the Iwaki City Public Health Center. The result was not at the level of having harmful influence.

(5) From March 28th to 30th, examinations of thyroid gland for 946 children aged from 0 to 15 years old were carried out at the Kawamata Town Community Center and the Iidate Village Office. The result was not at the level of having harmful influence.

<Directive of screening levels for decontamination of radioactivity>

(1) On March 20th, the Local Nuclear Emergency Response Headquarters issued the directive to change the reference value for the screening level for decontamination of radioactivity as the following to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village).

Old: 40 Bq/cm^2 measured by a gamma-ray survey meter or 6,000 cpm

New: 1 μ Sv/hour (dose rate at 10cm distance) or 100,000cpm equivalent

<Directives of administrating stable Iodine during evacuation>

(1) On March 16th, the Local Nuclear Emergency Response Headquarters issued "Directive to administer the stable Iodine during evacuation from the evacuation area (20 km radius)" to the Prefectural Governor and the

heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village).

(2) On March 21st, the Local Nuclear Emergency Response Headquarters issued Directive titled as "Administration of the stable Iodine" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village), which directs the above-mentioned governor and heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

<Situation of the injured (As of 08:00 April 11th)>

1. Injury in Unit 1 of Fukushima Dai-ichi NPS due to earthquake on 11 March
   - Two employees (slightly, have already gone back working)
   - Two subcontract employees (one fracture in both legs, be in hospital)
   - Two died (After the earthquake, two TEPCO's employees missed and had been searched continuously. In the afternoon of March 30th, the two employees were found on the basement floor of the turbine building of Unit 4 and were confirmed dead by April 2nd.)

2. Injury due to the explosion of Unit 1 of Fukushima Dai-ichi NPS on 12 March
   - Four employees (two TEPCO's employees and two subcontractor's employees) were injured at the explosion and smoke of Unit 1 around the turbine building (non-controlled area of radiation) and were examined by Kawauchi Clinic. Two TEPCO's employees return to work again and two subcontractors' employees are under home treatment.

3. Injury due to the explosion of Unit 3 of Fukushima Dai-ichi NPS on 14 March.
   - Four TEPCO's employees (They have already return to work.)
   - Three subcontractor's employees (They have already return to work.)

- Four members of Self-Defence Force (one of them was transported to National Institute of Radiological Sciences considering internal possible exposure. The examination resulted in no internal exposure. The member was discharged from the institute on March 17th.)

4. Other injuries
   - On the earthquake on 11 March, one subcontractor's employees (a crane operator) died in Fukushima Dai-ni NPS. (It seems that the tower crane broke and the operator room was crushed and the person was hit on the head.)
   - One emergency patient on 12 March. (Cerebral infarction, transported by the ambulance, be in hospital)
   - Ambulance was requested for one employee complaining the pain at left chest outside of control area on March 12. (Conscious, under home treatment)
   - Two employees complaining discomfort wearing full-face mask in the main control room were transported to Fukushima Dai-ni NPS for a consultation with an industrial doctor on 13 March. (One employee has already returned to work and the other is under home treatment.)
   - Two subcontractor's employees were injured during working at temporary control panel of power source in the Common Spent Fuel Pool, transported to where were industrial medical doctors the Fukushima Dai-ni NPS on 22 and 23 March. (One employee has already returned to work and the other is under home treatment.)
   - On the afternoon of 7 April, a worker who was making sandbags at the soil disposal yard (spoil bank) on the north side of Fukushima Dai-ichi NPS got sick and was transported to J-Village for the body survey of contamination of radioactive materials. Being confirmed to be free from contamination, the worker was taken to the Iwaki City Kyouritsu Hospital by ambulance. On 8 April, the worker was diagnosed as dehydration and transient unconsciousness.
   - At 09:19 April 9th, one subcontractor's employee was transported to a hospital as the worker wearing full-face mask felt discomfort during the work for cable processing in the Building of Water Processing, stepped on the manhole outside the building, which lid was shifted, and injured. As a result of medical examination, the worker was diagnosed as a right

knee contusion and suspect of right knee medial collateral ligament injury. Furthermore, as a result of the body survey, it was confirmed that the worker was free from contamination of radioactive materials.

- Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body

<Situation of resident evacuation (As of 08:00 April 11th)>

At 11:00 March 15th, the Prime Minister directed in-house stay to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS. The directive was conveyed to Fukushima Prefecture and related municipalities.

Regarding the evacuation as far as 20-km from Fukushima Dai-ichi NPS and 10-km from Fukushima Dai-ni NPS, necessary measures have already been taken.

- The in-house stay in the area from 20 km to 30 km from Fukushima Dai-ichi NPS is made fully known to the residents concerned.
- Cooperating with Fukushima Prefecture, livelihood support to the residents in the in-house stay area are implemented.
- On March 28th, Chief Cabinet Secretary mentioned the continuation of the limited-access within the area of 20 km from Fukushima Dai-ichi NPS. On the same day, the Local Nuclear Emergency Response Headquarters notified the related municipalities of forbidding entry to the evacuation area within the 20 km zone.

<Directives regarding foods and drinks>

Directive from the Director-General of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Chiba was issued, which directed above-mentioned governors to suspend shipment and so on of the following products for the time being.

The Government Nuclear Emergency Response Headquarters organized the thoughts of imposing and lifting restrictions on shipment as follows, considering the NSC's advice.

- The area where restrictions on shipment to be imposed or lifted could be decided in units of the area where a prefecture is divided into, such as cities, towns, villages and so on, considering the spread of the contamination affected area and the actual situation of produce collection, etc.
- The restriction on shipment of the item, of which the result of the sample test exceeded the provisional regulation limits, shall be decided by judging in a comprehensive manner considering the regional spread of the contamination impact.
- Lifting the restrictions on shipment shall be implemented when a series of three results of nearly weekly tests for the item or the area falls below the provisional regulation limits, considering the situation of the Fukushima Dai-ichi NPS.
- However, the tests shall be carried out nearly weekly after the lifting, while the release of the radioactive materials from the NPS continues.

(1) Items under the suspension of shipment and restriction of intake (As of 08:00 April 11th)

Prefectures	Suspension of shipment	Restriction of intake
Fukushima Prefecture	Non-head type leafy vegetables, head type leafy vegetables , flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna**, Rape, *Chijirena*, *Santouna**, *Kousaitai**, *Kakina**, *etc.*), Turnip, Raw milk (Except Kitakata-City, Bandai-Town, Inawashiro-Town,	Non-head type leafy vegetables, head type leafy vegetables, flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna*, Rape, *Chijirena*, *Santouna**, *Kousaitai**, *Kakina**, *etc.*)

	Mishima-Town, Aizumisato-Town, Shimogo-Town and Minamiaizu-Town)	
Ibaraki Pref.	Spinach, *Kakina**, Parsley	
Tochigi Pref.	Spinach, *Kakina**	
Chiba Pref.	- Spinach from Katori City and Tako Town - Spinach, Qing-geng-cai, Garland chrysanthemum, Sanchu Asian lettuce, Celery and Parsley from Asahi City	

*a green vegetable

(2) Request for restriction of drinking for tap-water (As of 08:00 April 11th)

Scope under restriction	Water service (Local governments requested for restriction)
All residents	None
Babies ・Water services that continue to respond to the directive	<Fukushima Prefecture> Iitate small water service (Iitate Village, Fukushima Prefecture)
・Tap-water supply service that continues to respond to the directive	Non

<Directive regarding the ventilation when using heating equipments in the aria of indoor evacuation >

On March 21st, Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural

Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village) was issued, which directs those governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

< Fire Bureaus' Activities>

- From 11:00 till around 14:00 on March 22nd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the set up of large decontamination system.
- From 8:30 till 9:30, from 13:30 till 14:30 on March 23rd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the operation of large decontamination system.

(Contact Person)
Mr. Toshihiro Bannai
Director, International Affairs Office, NISA/METI
Phone:+81-(0)3-3501-1087

放射性物質を含む液体の拡散防止対策（ゼオライト）

1．目　的

放射性物質を含む液体の拡散防止対策として、1～4号機スクリーン室前面に放射性物質を吸着する材料（ゼオライト）を投入する。

2．作業内容

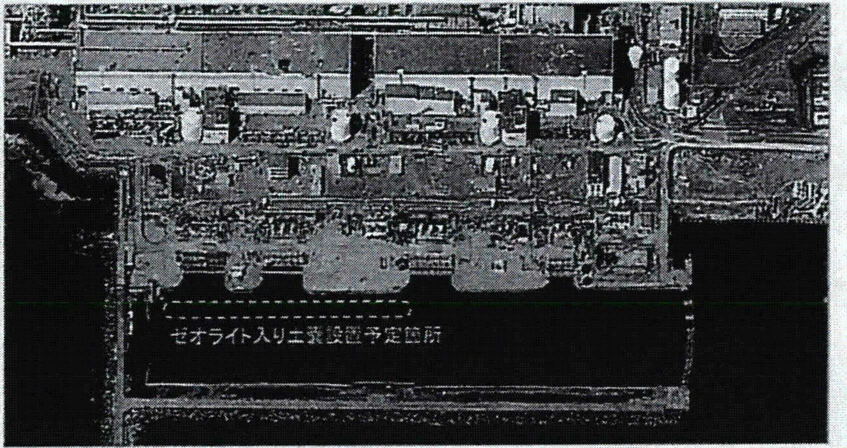
放射性物質吸着材料（ゼオライト）を大型土嚢に入れ、1～4号機スクリーン室前面に投入する。

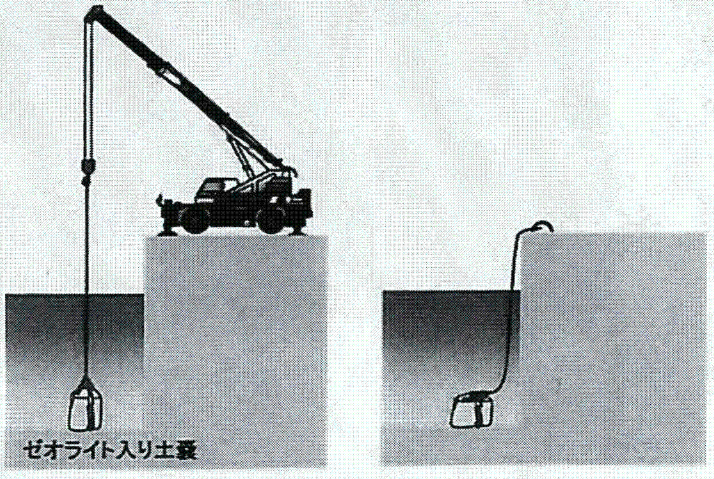
投入した大型土嚢を定期的に引き上げ、表面線量を測定することなどにより放射性物質吸着効果について確認する。

3．スケジュール

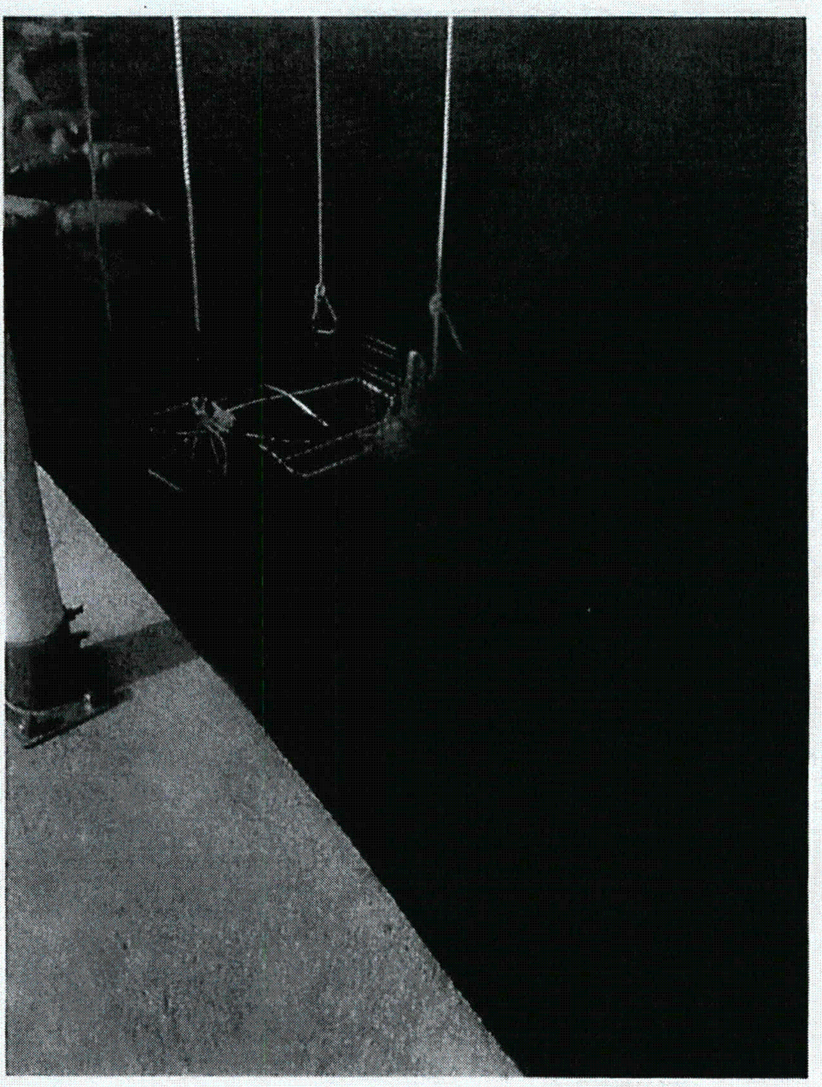
放射性物質吸着材料（ゼオライト）の投入については、材料の手配、作業準備が整い次第実施。

4月15日、大型土嚢3袋を投入。





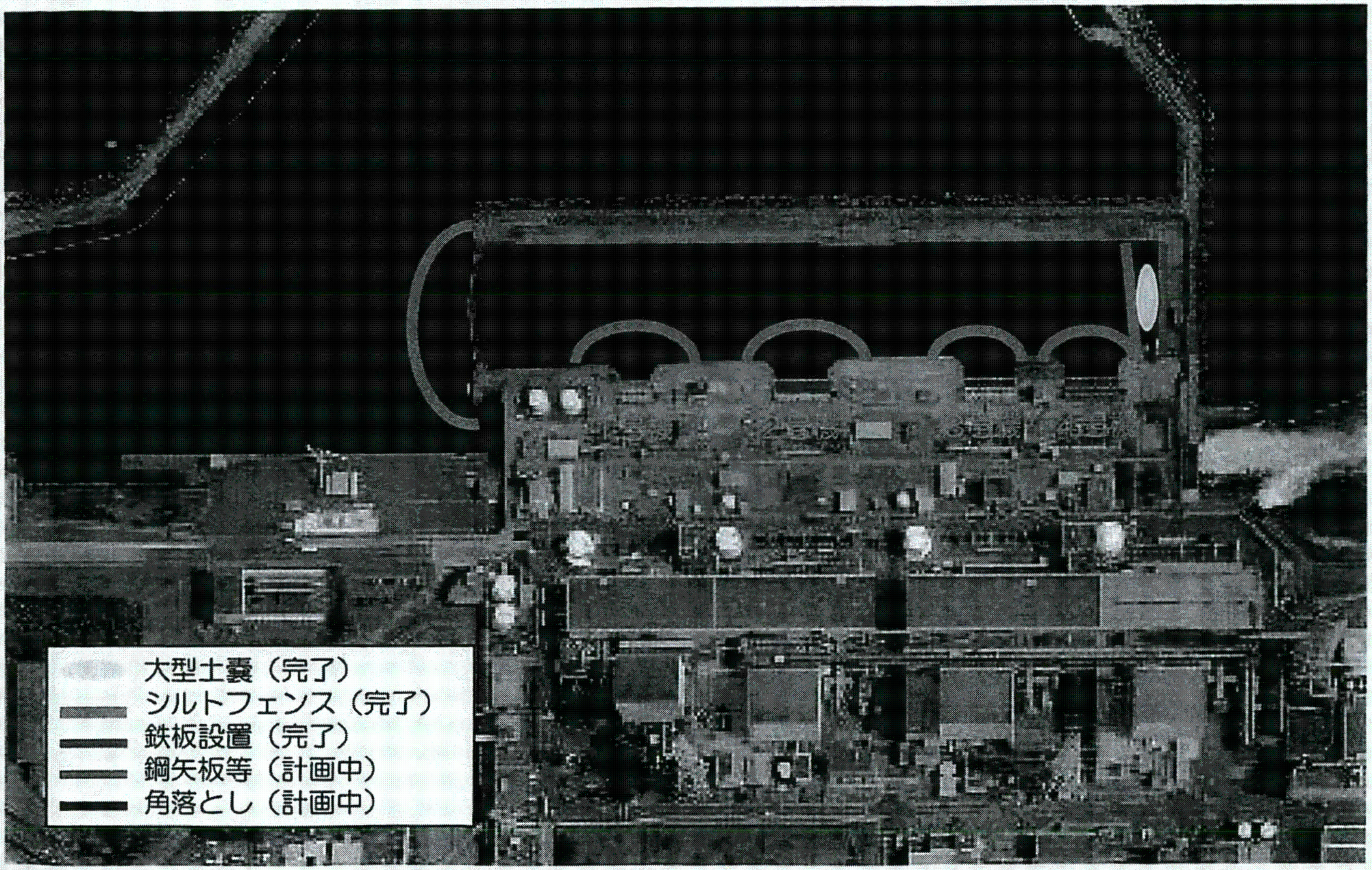
作業・設置状況イメージ図



福島第一原子力発電所　ゼオライト入り土嚢

撮　影：東京電力株式会社
撮影日：平成２３年4月１4日１５時撮影
場　所：２号機スクリーン南側

放射性物質を含む液体の拡散防止対策



放射性物質を含む液体の拡散防止対策（ゼオライト）

1．目　的

放射性物質を含む液体の拡散防止対策として、1～4号機スクリーン室前面に放射性物質を吸着する材料（ゼオライト）を投入する。

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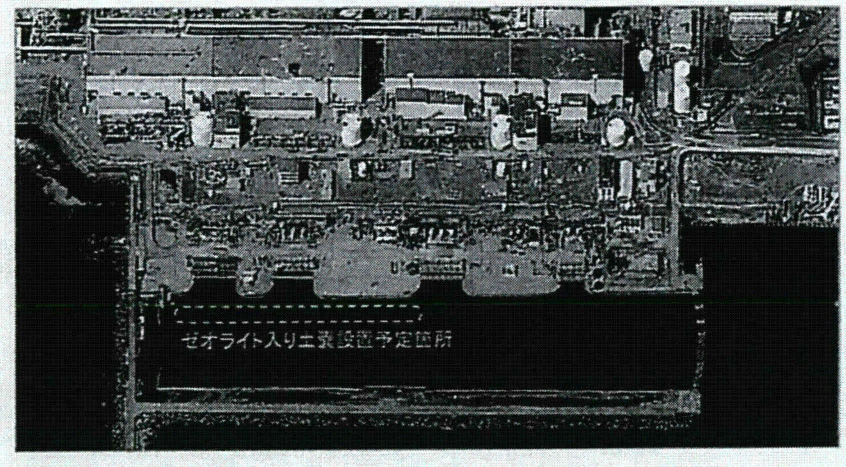
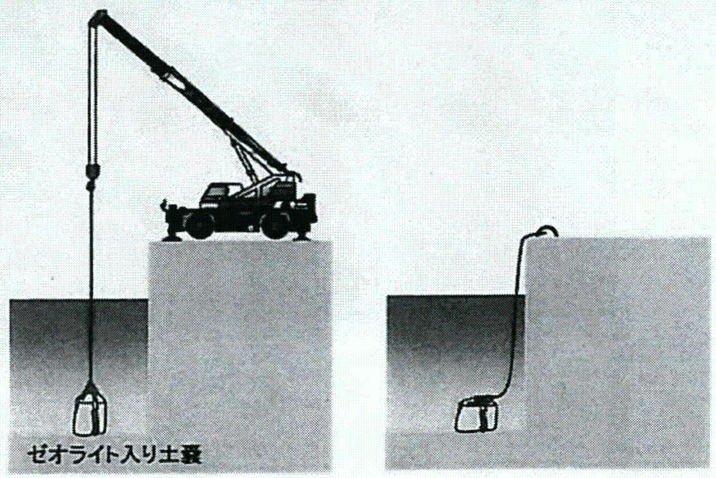
放射性物質吸着材料（ゼオライト）を大型土嚢に入れ、1～4号機スクリーン室前面に投入する。
投入した大型土嚢を定期的に引き上げ、表面線量を測定することなどにより放射性物質吸着効果について確認する。

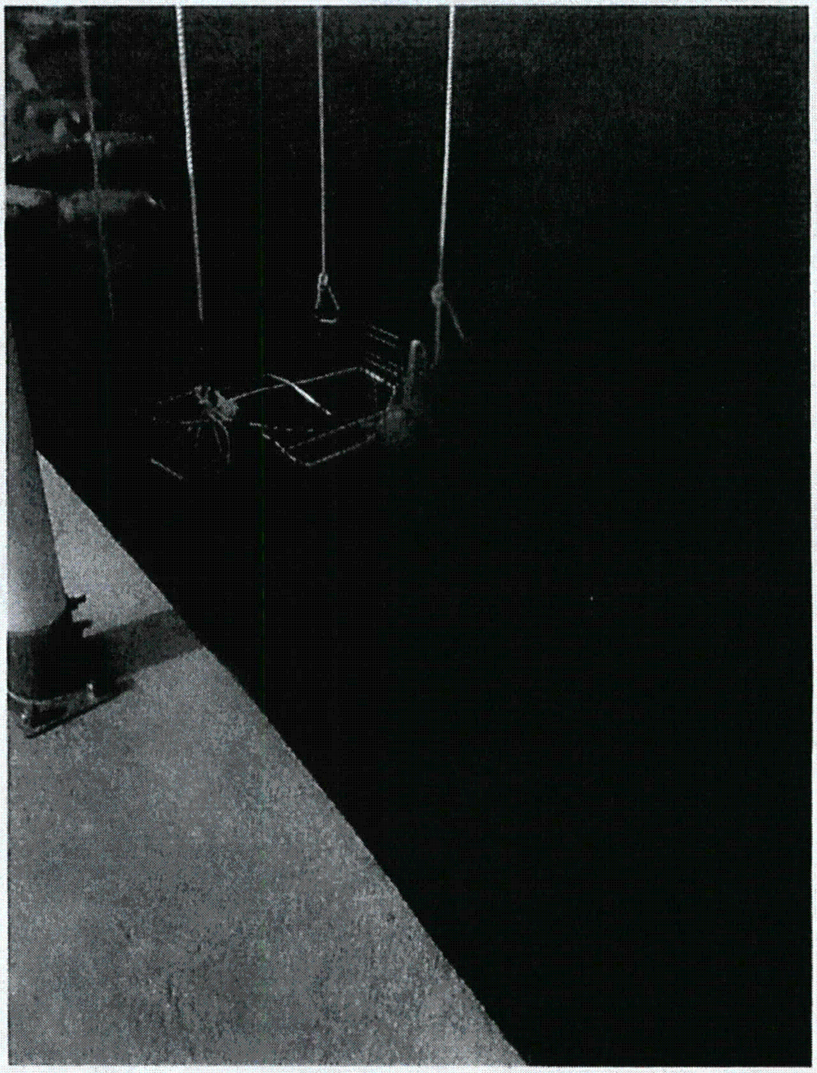
3．スケジュール

放射性物質吸着材料（ゼオライト）の投入については、材料の手配、作業準備が整い次第実施。
4月15日、大型土嚢3袋を投入。





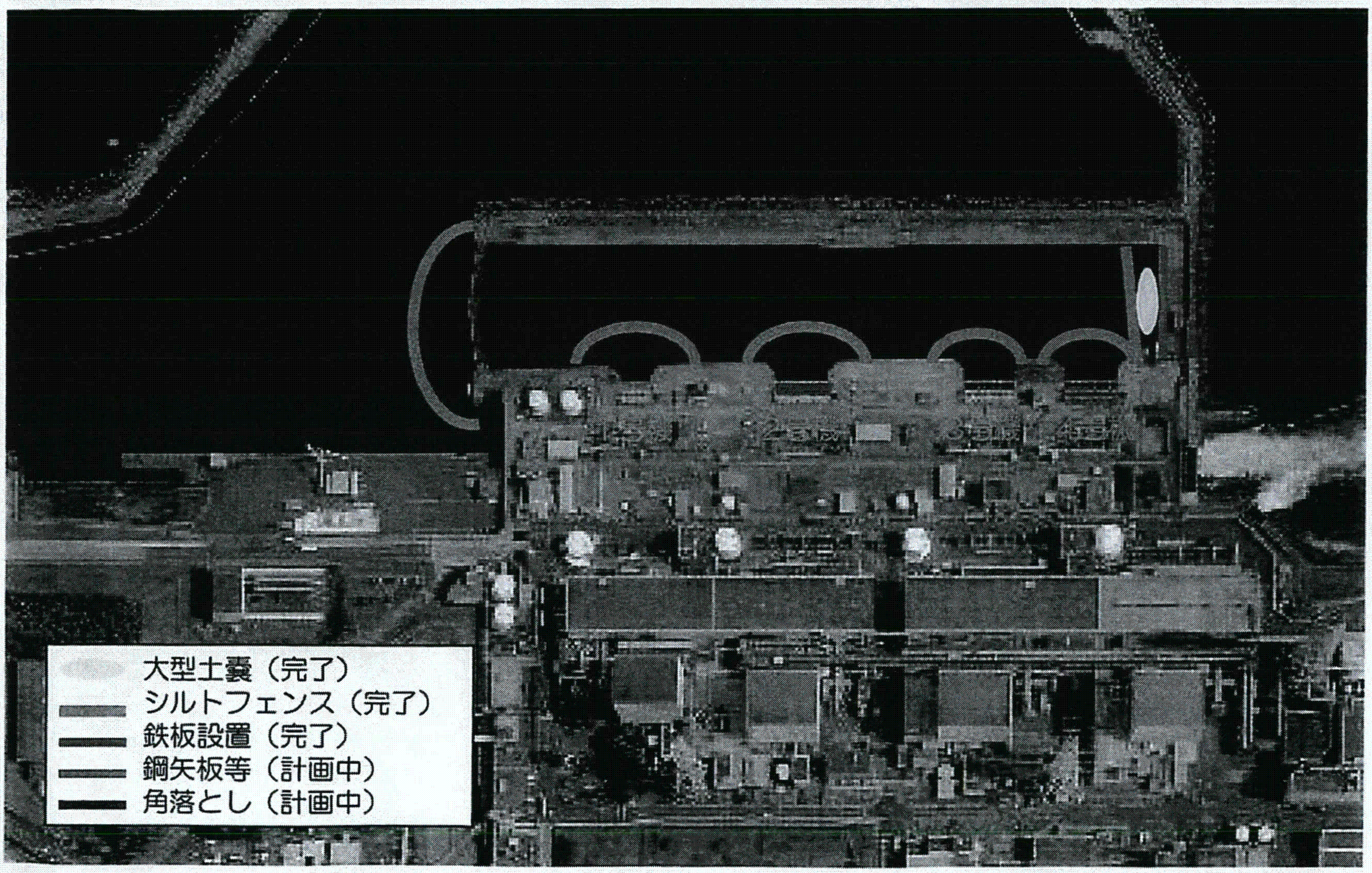
作業・設置状況イメージ図



福島第一原子力発電所　ゼオライト入り土嚢

撮　影：東京電力株式会社
撮影日：平成２３年4月１４日１５時撮影
場　所：２号機スクリーン南側

放射性物質を含む液体の拡散防止対策



News Release

Extract

経済産業省
Ministry of Economy, Trade and Industry

April 16, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 97th Release)
(As of 15:00 April 16th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)

- Fukushima Dai-ichi NPS

  - From 11:00, 16 April, the test implementation of spraying antiscattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,800 m^2 on the mountain-side of the Common Pool. It was finished at 13:00 on the same day.

April 11, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 86th Release)
(As of 08:00 April 11th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)

- Fukushima Dai-ichi NPS

  - Fresh water spray of around 80t for Unit 3 using Concrete Pump Truck (50t/h) was carried out. (From 17:15 till 19:15 April 10th)

  - The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps in total was carried out (19:07 April 4th) and stopped at 17:40 April 10th. Confirmation of the remaining water is being carried out. (Total amount of discharged water is around 9,070t.)

  - Removal of the rubble using remote-control heavy machineries was carried out. (April 10th)

  - Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body.

(Attached sheet)

1. The state of operation at NPS (Number of automatic shutdown units: 10)

- Fukushima Dai-ichi NPS, TEPCO
  (Okuma Town and FutabaTown, Futaba County, Fukushima Prefecture)

(1) The state of operation

Unit 1 (460MWe):	automatic shutdown
Unit 2 (784MWe):	automatic shutdown
Unit 3 (784MWe):	automatic shutdown
Unit 4 (784MWe):	in periodic inspection outage
Unit 5 (784MWe):	in periodic inspection outage, cold shutdown at 14:30 March 20th
Unit 6 (1,100MWe):	in periodic inspection outage, cold shutdown at 19:27 March 20th

(2) Major Plant Parameters (As of 02:00 April 11th)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure*1 [MPa]	0.514(A)*3 0.974(B)*3	0.076(A) 0.074(D)	0.084(A) 0.018(C)	–	0.108	0.117
CV Pressure (D/W) [kPa]	195	90	105.0	–	–	–
Reactor Water Level*2 [mm]	-1,650(A)*3 -1,650(B)*3	-1,500(A) Not available(B)	-1,900(A) -2,250(B)	–	1,974	2,523
Suppression Pool Water Temperature (S/C) [℃]	–	–	–	–	–	–
Suppression Pool Pressure (S/C) [kPa]	165	Indicator Failure	170.3	–	–	–
Spent Fuel Pool Water Temperature [℃]	Indicator Failure	71.0	Indicator Failure	Indicator Failure	34.2	26.5
Time of Measurement	02:00 April 11th	02:00 April 11th	00:00 April 11th	April 11th	02:00 April 11th	02:00 April 11th

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel
*3: As of 00:00 April 11th

(3) Situation of Each Unit

<Unit 1>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent ※ (10:17 March 12th)
- Seawater injection to the Reactor Pressure Vessel (RPV) via the Fire Extinguish Line was started. (20:20 March 12th)
  →Temporary interruption of the injection (01:10 March 14th)
- The sound of explosion in Unit 1 occurred. (15:36 March 12th)
- The amount of injected water to the Reactor Core was increased by utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$). (02:33 March 23rd) Later, it was switched to the Feedwater Line only (around $11m^3/h$). (09:00 March 23rd)
- Lighting in the Central Operation Room was recovered. (11:30 March 24th)
- Fresh water injection to RPV was started. (15:37 March 25)
- As the result of concentration measurement in the stagnant water on the basement floor of the turbine building, $2.1\times10^5 Bq/cm^3$ of ^{131}I (Iodine) and $1.8\times10^6 Bq/cm^3$ of ^{137}Cs (Caesium) were detected as major radioactive nuclides.
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (08:32 March 29th.)
- The Stagnant water on the basement floor of the turbine building was started to be transferred to the Condenser around 17:00 March 24. As the Condenser was confirmed to be almost filled with water, pumping out of the water to the Condenser was stopped. (07:30 March 29th) In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank started to be transferred to the Surge Tank of Suppression Pool Water (A) (12:00 March 31th), after switching the place where the water was to be transferred to the Surge Tank of

Suppression Pool Water (B) (15:25 March 31th), the transfer was resumed and finished. (15:26 April 2nd)

- Water spray of around 90t (fresh water) over the Spent Fuel Pool using Concrete Pump Truck was carried out. (From 13:03 till 16:04 March 31st) A test water spray using Concrete Pump Truck was carried out in order to confirm the appropriate position for water spray. (From 17:16 till 17:19 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (10:42 to 11:52 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (13:55 April 3rd)
- Aiming at reducing the possibility of hydrogen combustion in the Primary Containment Vessel (PCV), the operations for the injection of nitrogen to PCV were started. (22:30 April 6th)
- The start of nitrogen injection to PCV was confirmed. (01:31 April 7th)
- The nitrogen injection to PCV was switched to the generator of high purity nitrogen. (04:10 April 9th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (09:30 April 10th)
- White smoke was confirmed to generate continuously. (As of <u>06:30</u> April <u>11th</u>)
- Fresh water injection to RPV is being carried out. (As of <u>08:00</u> April <u>11th</u>)

※ From now on, "Started to vent" is used instead of "Operation of Vent" to unify the expression in other documents.

<Unit 2>

- TEPCO reported to NISA the event (Inability of water injection of the

Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)

- Started to vent ※ (11:00 March 13th)
- The Blow-out Panel of reactor building was opened due to the explosion in the reactor building of Unit 3. (After 11:00 March 14th)
- Reactor water level tended to decrease. (13:18 March 14th) TEPCO reported to NISA the event (Loss of reactor cooling functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:49 March 14th)
- Seawater injection to RPV via the Fire Extinguish line was started. (16:34 March 14th)
- Water level in RPV tended to decrease. (22:50 March 14th)
- Started to vent ※(0:02 March 15th)
- A sound of explosion was made in Unit 2. As the pressure in Suppression Pool (Suppression Chamber) decreased (06:10 March 15th), there was a possibility that an incident occurred in the Chamber. (About 06:20 March 15th)
- Electric power receiving at the emergency power source transformer from the external transmission line was completed. The work for laying the electric cable from the facility to the load side was carried out. (13:30 March 19th)
- Seawater injection of 40t to the Spent Fuel Pool was started. (From 15:05 till 17:20 March 20th)
- Power Center received electricity (15:46 March 20th)
- White smoke generated. (18:22 March 21st)
- White smoke was died down and almost invisible. (As of 07:11 March 22nd)
- Seawater injection of 18t to the Spent Fuel Pool was carried out. (From 16:07 till 17:01 March 22nd)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:30 till 12:19 March 25th)
- Fresh water injection to RPV was started. (10:10 March 26th)
- Lighting of Central Operation Room was recovered (16:46 March26th)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump.(18:31 March

27th)

- Regarding the result of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, TEPCO reported to NISA that as the result of analysis and evaluation through re-sampling, judging the measured value of ^{134}I (Iodine) was wrong, the concentrations of gamma nuclides including ^{134}I (Iodine) were less than the detection limit. (00:07 March 28).
- Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump. (From 16:30 till 18:25 March 29th)
- As the malfunction of the temporary motor-driven pump, which had been injecting to the Spent Fuel Pool since 09:25 March 30th, was confirmed at 09:45 March 30th, the injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. Fresh water injection was resumed. (From 19:05 till 23:50 March 30th)
- Fresh water injection of around 70t to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 14:56 till 17:05 April 1st)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank was transferred to the Surge Tank of Suppression Pool Water. (From 16:45 March 29th till 11:50 April 1st)
- The water, of which the dose rate was at the level of more than 1,000 mSv/h, was confirmed to be collected in the pit (a vertical portion of an underground structure) for laying electric cables, located near the Intake Channel. In addition, the outflow from the crack with a length of around 20 cm in the concrete portion of the lateral surface of the pit into the sea was confirmed. (Around 09:30 April 2nd) In order to stop the outflow, concrete was poured into the pit. (16:25, 19:02 April 2nd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (17:10 April 2nd)
- The cameras for monitoring the water levels in the vertical part of the

trench outside of the turbine building and on the basement floor of the turbine building were installed. (April 2nd)

- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:22 till 12:06 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- As the measure to prevent the outflow of the water accumulated in the Pits for Conduit in the area around the Inlet Bar Screen, the upper part of the Power Cable Trench for power source at Intake Channel was crushed and 20 bags of sawdust (3 kg/bag), 80 bags of high polymer absorbent (100 g/bag) and 3 bags of cutting-processed newspaper (Large garbage bag) were put inside. (From 13:47 till 14:30 April 3rd)
- Approximately 13kg of tracer (milk white bath agent) was put in from the Pit for the Duct for Seawater Pipe. (From 07:08 till 07:11 April 4th)
- Fresh water injection (Around 70t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 11:05 till 13:37 April 4th)
- The tracer solution was put in from the two holes dug around the Pit for the Conduit near the Inlet Bar Screen of Unit 2 and was confirmed to be flowed out from the crack to the sea. (14:15 April 5th) The coagulant (soluble glass) started to be injected from the holes around the Pit in order to prevent the outflowing of the water. (15:07 April 5th) The outflow of the water was confirmed to stop. (Around 05:38 April 6th) In addition, it was confirmed that the water level in the turbine building did not rise. Furthermore, the measurements to stop water by means of rubber board and jig (prop) were implemented at the outflowing point. (Finished at 13: 15 April 6th)
- One more pump for the transfer of the water in the Condenser to the Condensate Storage Tank was installed. (Two pumps in total: 30 m^3/h) (Around 15:40 April 5th)
- Fresh water injection (Around 36t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 13:39 till 14:34 April 7th)
- The transfer of the water in the Condenser to the Condensate Storage

Tank was completed. (13:10 April 9th)

- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:37 till 12:38 April 10th)
- White smoke was confirmed to generate continuously. (As of 06:30 April 11th)
- Fresh water injection to RPV is being carried out. (As of 08:00 April 11th)

<Unit 3>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (05:10 March 13th)
- Started to vent ※ (08:41 March 13th)
- Fresh water started to be injected to RPV via the Fire Extinguish Line. (11:55 March 13th)
- Seawater started to be injected to RPV via the Fire Extinguish Line. (13:12 March 13th)
- Seawater injection for Units 1 and 3 was suspended due to the lack of seawater in pit. (01:10 March 14th)
- Seawater injection to RPV for Unit 3 was resumed. (03:20 March 14th)
- Started to vent ※ (05:20 March 14th)
- PCV rose unusually. (07:44 March 14th) TEPCO reported to NISA on the event falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (7:52 March 14th)
- The explosion like Unit 1 occurred around the reactor building (11:01 March 14th)
- The white smoke like steam generated. (08:30 March 16th)
- Because of the possibility that PCV was damaged, the workers evacuated from the main control room (common control room). (10:45 March 16th) Thereafter the operators returned to the room and resumed the operation of water injection. (11:30 March 16th)
- Seawater was discharged 4 times to Unit 3 by the helicopters of the Self-Defence Force. (9:48, 9:52, 9:58 and 10:01 March 17th)
- The riot police arrived at the site for the water spray from the grand.

(16:10 March 17th)

- The Self-Defence Force started the water spray using a fire engine. (19:35 March 17th)
- The water spray from the ground was carried out by the riot police. (From 19:05 till 19:13 March 17th)
- The water spray from the ground was carried out by the Self-Defense Force using 5 fire engines. (19:35, 19:45, 19:53, 20:00 and 20:07 March 17th)
- The water spray from the ground using 6 fire engines (6 tons of water spray per engine) was carried out by the Self-Defence Force. (From before 14:00 till 14:38 March 18th)
- The water spray from the ground using a fire engine provided by the US Military was carried out. (Finished at 14:45 March 18th)
- Hyper Rescue Unit of Tokyo Fire Department carried out the water spray. (Finished at 03:40 March 20th)
- The pressure in PCV rose (320 kPa at 11:00 March 20th). Preparation to lower the pressure was carried out. Judging from the situation, immediate pressure relief was not required. Monitoring the pressure continues. (120 kPa at 12:15 March 21st)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool of Unit 3 by Hyper Rescue Unit of Tokyo Fire Department was carried out (From 21:30 March 20th till 03:58 March 21st).
- Grayish smoke generated. (Around 15:55 March 21st)
- The smoke was confirmed to be died down. (17:55 March 21st)
- Grayish smoke changed to be whitish and seems to be ceasing. (As of 07:11 March 22nd)
- Water spray (Around 180t) by Tokyo Fire Department and Osaka City Fire Bureau was carried out. (From 15:10 till 16:00 March 22nd)
- Lighting was recovered in the Central Operation Room. (22:43 March 22nd)
- Seawater injection of 35t to the Spent Fuel Pool via the Fuel Pool Cooling Line was carried out. (From 11:03 till 13:20 March 23rd) Around 120t of seawater was injected. (From around 5:35 till around 16:05 March 24th)

- Slightly blackish smoke generated from the reactor building. (Around 16:20 March 23rd) Around 23:30 March 23rd and around 4:50 March 24th, it was reported that the smoke seemed to cease.
- As the results of the survey of the stagnant water, into which workers who were laying electric cable on the ground floor and the basement floor of the turbine building walked, the dose rate on the water surface was around 400mSv/h, and as the result of gamma-ray analysis of the sampling water, the totaled concentration of each nuclide of the sampling water was around 3.9×10^{6} Bq/cm^{3}.
- Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department was carried out. (From 13:28 till 16:00 March 25th)
- Fresh water injection to RPV was started. (18:02 March 25th)
- Water spray of around 100t using Concrete Pump Truck (50t/h) was carried out. (From 12:34 till 14:36 March 27th)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water. (From 17:40 March 28th till around 8:40 March 31st)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (20:30 March 28th)
- Fresh water spray of around 100t using Concrete Pump Truck (50t/h) was carried out. (From 14:17 till 18:18 March 29th)
- Fresh water spray of around 105t using Concrete Pump Truck (50t/h) was carried out. (From 16:30 till 19:33 March 31st)
- Fresh water spray of around 75t using Concrete Pump Truck (50t/h) was carried out. (From 09:52 till 12:54 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- The camera for monitoring the water level in the vertical part of the trench outside of the turbine building was installed. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:03 till 12:16 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:18 April 3rd)

- Fresh water spray of around 70t using Concrete Pump Truck (50t/h) was carried out. (From 17:03 till 19:19 April 4th)
- Fresh water spray of around 70t using Concrete Pump Truck (50t/h) was carried out. (From 06:53 till 08:53 April 7th)
- Fresh water spray of around 75t using Concrete Pump Truck (50t/h) was carried out. (From 17:06 till 20:00 April 8th)
- Fresh water spray of around 80t using Concrete Pump Truck (50t/h) was carried out. (From 17:15 till 19:15 April 10th)
- White smoke was confirmed to generate continuously (As of 06:30 April 11th)
- Fresh water injection to RPV is being carried out. (As of 08:00 April 11th)

<Unit 4>

- Because of the replacement work of the Shroud of RPV, no fuel was inside the RPV.
- The temperature of water in the Spent Fuel Pool had increased. (84 ℃ at 04:08 March 14th)
- It was confirmed that a part of wall in the operation area was damaged. (06:14 March 15th)
- The fire occurred. (09:38 March 15th) TEPCO reported that the fire was extinguished spontaneously. (Around 11:00 March 15th)
- The fire occurred. (05:45 March 16th) TEPCO reported that no fire could be confirmed on the ground.(Around 06:15 March 16th)
- The Self-Defence Force started water spray over the Spent Fuel Pool.(09:43 March 20th)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool by Self-Defense Force was started. (From around 18:30 till 19:46 March 20th).
- Water spray over the Spent Fuel Pool by Self-Defence Force using 13 fire engines was started (From 06:37 till 08:41 March 21st).
- Works for laying electric cable to the Power Center was completed. (Around 15:00 March 21st)
- Power Center received electricity. (10:35 March 22nd)
- Water spray of around 150t using Concrete Pump Truck (50t/h) was

carried out. (From 17:17 till 20:32 March 22nd)

- Water spray of around 130t using Concrete Pump Truck (50t/h) was carried out. (From 10:00 till 13:02 March 23rd)
- Water spray of around 150t using Concrete Pump Truck (50t/h) was carried out. (From 14:36 till 17:30 March 24th)
- Water spray of around 150t using Concrete Pump Truck (50t/h) was carried out. (From 19:05 till 22:07 March 25th)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 06:05 till 10:20 March 25th)
- Water spray of around 125t using Concrete Pump Truck (50t/h) was carried out. (From 16:55 till 19:25 March 27th)
- Lighting of Central Operation Room was recovered. (11:50 March 29th)
- Fresh water spray of around 140t using Concrete Pump Truck (50t/h) was carried out. (From 14:04 till 18:33 March 30th)
- Fresh water spray of around 180t using Concrete Pump Truck (50t/h) was carried out. (From 08:28 till 14:14 April 1st)
- Lighting in the turbine building was partially turned on. (April 2nd)
- From 2 April, the stagnant water in the Main Building of Radioactive Waste Treatment Facilities was being transferred to the turbine building of Unit 4. As the water level in the vertical portion of the trench for Unit 3 rose from 3 April, by way of precaution, the transfer was suspended notwithstanding that the path of the water was not clear. (09:22 April 4th)
- Fresh water spray of around 180t using Concrete Pump Truck (50t/h) was carried out. (From 17:14 till 22:16 April 3rd)
- Fresh water spray of around 20t using Concrete Pump Truck (50t/h) was carried out. (From 17:35 till 18:22 April 5th)
- Fresh water spray of around 38t using Concrete Pump Truck (50t/h) was carried out. (From 18:23 till 19:40 April 7th)
- Fresh water spray of around 90t using Concrete Pump Truck (50t/h) was carried out. (From 17:07 till 19:24 April 9th)
- White smoke was confirmed to generate continuously. (As of <u>06:30</u> April <u>11th</u>)

<Units 5 and 6>

- The first unit of Emergency Diesel Generator (D/G) (B) for Unit 6 is

operating and supplying electricity. Water injection to RPV and the Spent Fuel Pool through the system of Make up Water Condensate (MUWC) is being carried out.

- The second unit of Emergency Diesel Generator (D/G) (A) for Unit 6 started up. (04:22 March 19th)
- The pumps for Residual Heat Removal (RHR) (C) for Unit 5 (05:00 March 19th) and RHR (B) for Unit 6 (22:14 March 19th) started up and recovered heat removal function. It cools Spent Fuel Pool with priority. (Power supply : Emergency Diesel Generator for Unit 6) (05:00 March 19th)
- Unit 5 under cold shut down (14:30 March 20th)
- Unit 6 under cold shut down (19:27 March 20th)
- Receiving electricity reached to the transformer of starter. (19:52 March 20th)
- Power supply to Unit 5 was switched from the Emergency Diesel Generator to external power supply. (11:36 March 21st)
- Power supply to Unit 6 was switched from the Emergency Diesel Generator to external power supply. (19:17 March 22nd)
- The temporary pump for RHR Seawater System (RHRS) of Unit 5 was automatically stopped when the power supply was switched from the temporary to the permanent. (17:24 March 23rd)
- Repair of the temporary pump for RHRS of Unit 5 was completed (16:14 March 24th) and cooling was started again. (16:35 March 24th)
- Power supply for the temporary pump for RHRS of Unit 6 was switched from the temporary to the permanent. (15:38 and 15:42 March 25th)
- The groundwater with low-level radioactivity in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was started to be discharged through the Water Discharge Canal to the sea. (21:00 April 4th)
- The groundwater with low-level radioactivity in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was discharged through the Water Discharge Canal to the sea. (Unit5 from 21:00 April 4th till 12:14 April 8th (Around 950t), Unit6 from 21:00 April 4th till 18:52 April 9th (Around 373t))

<Common Spent Fuel Pool>

- It was confirmed that the water level of Spent Fuel Pool was maintained almost full at after 06:00 March 18th.

- Water spray over the Common Spent Fuel Pool was started. (From 10:37 till 15:30 March 21st)
- The power was started to be supplied (15:37 March 24th) and cooling was also started.(18:05 March 24th)
- As of 07:40 April 10th, water temperature of the pool was around 31℃.

<Other>

- As the result of nuclide analysis at around the Southern Water Discharge Canal, 7.4×10^1Bq/cm^3 of ^{131}I (Iodine) (1,850.5 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected. (14:30 March 26th)
  (As the result of measurement on 29 March, it was detected as 3,355.0 times higher than the limit in water (13:55 March 29th). On the other hand, as the result of the analysis at the northern side of the Water Discharge Canal of the NPS, 4.6×10^1Bq/cm^3 of ^{131}I (Iodine) (1,262.5 times higher than the limit in water) was detected. (14:10 March 29th)
- The water was confirmed to be collected in the vertical parts of the trenches (an underground structure for laying pipes, shaped like a tunnel) outside of the turbine building of Units 1 to 3. The dose rates on the water surface were 0.4 mSv/h of the Unit 1's trench and 1,000 mSv/h of the Unit 2's trench. The rate of the Unit 3's trench could not measure because of the rubble. (Around 15:30 March 27th) The collected water in the vertical part of the trench outside of the turbine building of Unit 1 was transferred to the storage tank in the Main Building of Radioactive Waste Treatment Facilities by the temporary pump. Thereafter the water level from the top of the vertical part went down from approximately -0.14m to approximately -1.14m. (From 09:20 till 11:25 March 31st)
- In the samples of soil collected on 21 and 22 March on the site (at 5 points) of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (23:45 March 28th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was

not at the level of having harmful influence on human body.

- When removing the flange of pipes of Residual Heat Removal Seawater System outside the building of Unit 3, three subcontractor's employees were wetted by the water remaining in the pipe. However, as the result of wiping the water off, no radioactive materials were attached to their bodies. (12:03 March 29th)
- On March 28th, the stagnant water was confirmed in the Main Building of Radioactive Waste Treatment Facilities. As the result of analysis of radioactivity, the total amount of the radioactivity 1.2×10^1 Bq/cm^3 in the controlled area and that of 2.2×10^1 Bq/cm^3 in the non-controlled area were detected in March 29th.
- As the result of nuclide analysis at around the Southern Water Discharge Canal, 1.8×10^2 Bq/cm^3 of ^{131}I (Iodine) (4,385.0 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected (13:55 March 30th).
- The barge (the first ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (15:42 March 31st) The transfer of fresh water from the barge (the first ship) to the Filtrate Tank was started. (15:58 April 1st) Thereafter it was suspended due to the malfunction of the hose (16:25 April 1st), but was resumed on April 2nd. (From 10:20 till 16:40 April 2nd)
- The permanent monitoring posts (No.1 to 8) installed near the Site Boundary were recovered. (March 31st) They are measuring once a day.
- The spraying for test scattering of antiscattering agent was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (From 15:00 till 16:05 April 1st)
- The barge (the second ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (9:10 April 2nd)
- The freshwater was transferred from the barge (the second ship) of the US armed force to the barge (the first ship). (From 09:52 till 11:15 April 3rd)
- The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged

from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps in total was carried out (19:07 April 4th) and stopped discharging to the sea using submersible pumps at 17:40 April 10th. (Total amount of discharged water is around 9,070t.)

- In the samples of soil (7 samples in total) collected on 25 March (at 4 points) and 28 March (at 3 points) on the site of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (18:30 April 6th announced by TEPCO). The concentration of the detected plutonium was, in the same as the last one (Announced on 28 March), at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- In order to prevent the outflow of the contaminated water from the exclusive port, the work for stopping water by means of large-sized sandbags was implemented around the seawall on the south side of the NPS. (From 15:00 till 16:30 April 5th)
- The test scattering of antiscattering agent to prevents the radioactive materials on the ground surface from being scattered was carried out in the area of about 600 m^2 on the mountain-side of the Common Pool. (April 5th, 6th)
- The stagnant water with low-level radioactivity in the Building of Miscellaneous Solid Waste Volume Reduction Processing was discharged from the southern side of the Water Discharge Canal to the sea using 5 pumps.(From 17:20 April 6th till 18:20 April 7th)
- In order to prepare to transfer the stagnant water in the turbine buildings to the Radioactive Waste Treatment Facilities, drilling the outer walls of the turbine buildings of Units 2 to 4 was carried out. (April 7th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 680 m^2 on the mountain-side of the Common Pool. (April 8th)
- The pumping out of the water in the Radioactive Waste Treatment Facilities, which was suspended by the earthquake off the coast of Miyagi Prefecture occurred at 11:32 April 7th, was resumed. (14:30 April 8th)

However, when the power supply was turned off, the smoke stopped to generate. It was judged by the fire station at 19:15 that this event was caused by the malfunction of the power distribution panel and was not a fire.

- The Residual Heat Removal System (B) to cool the reactor of Unit 1 became to be able to receive power from the emergency power supply as well as the external power supply. This resulted in securing the backup power supplies (emergency power supplies) of Residual Heat Removal System (B) for all Units. (14:30 March 30th)

(4) Report concerning other incidents

- TEPCO reported to NISA the event in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (18:08 March 11th)
- TEPCO reported to NISA the events in accordance with the Article 10 regarding Units 1, 2 and 4. (18:33 March 11th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (5:22 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 2. (5:32 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 4 of Fukushima Dai-ni NPS. (6:07 March 12th)
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● Onagawa NPS (Tohoku Electric Power Co. Inc.)
(Onagawa Town, Oga County and Ishinomaki City, Miyagi Prefecture)

(1) The state of operation

Unit 1 (524MWe):	automatic shutdown, cold shut down at 0:58, March 12th
Unit 2 (825MWe):	automatic shutdown, cold shut down at earthquake

Unit 3 (825MWe): automatic shutdown, cold shut down at 1:17, March 12th

(2) Readings of monitoring post, etc.

MP2 (Monitoring at the Northern End of Site Boundary)

Approx. 0.36 μ SV/h (16:00 April 9th) (Approx. 0.37 μ SV/h (16:00 April 7th))

(3) Report concerning other incidents

- Fire Smoke on the first basement of the Turbine Building was confirmed to be extinguished. (22:55 on March 11th)
- Tohoku Electric Power Co. reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:09 March 13th)

<u>2. Action taken by NISA</u>

(March 11th)

14:46 Set up of the NISA Emergency Preparedness Headquarters (Tokyo) immediately after the earthquake

15:42 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

16:36 TEPCO recognized the event (Inability of water injection of the Emergency Core Cooling System) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Units 1 and 2 of Fukushima Dai-ichi NPS. (Reported to NISA at 16:45)

18:08 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

18:33 Regarding Units 1, 2 and 4 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of Act on Special Measures Concerning Nuclear Emergency Preparedness.

19:03 The Government declared the state of nuclear emergency. (Establishment of the Government Nuclear Emergency Response Headquarters and the Local Nuclear Emergency Response

Headquarters)

20:50 Fukushima Prefecture's Emergency Response Headquarters issued a direction for the residents within 2 km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate. (The population of this area is 1,864.)

21:23 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayor of Okuma Town and the Mayor of Futaba Town were issued regarding the event occurred at Fukushima Dai-ichi NPS, TEPCO, in accordance with the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate
- Direction for the residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS to stay in-house

24:00 Vice Minister of Economy, Trade and Industry, Ikeda arrived at the Local Nuclear Emergency Response Headquarters

(March12th)

0:49 Regarding Units 1 TEPCO Fukushima Dai-ichi NPS, TEPCO recognized the event (Unusual rise of the pressure in PCV) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 01:20)

05:22 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 06:27)

05:32 Regarding Unit 2 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

05:44 Residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS shall evacuate by the Prime Minister Directive.

06:07 Regarding of Unit 4 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article

15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

06:50 In accordance with the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to control the internal pressure of PCV of Units 1 and 2 of Fukushima Dai-ichi NPS.

07:45 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayors of Hirono Town, Naraha Town , Tomioka Town and Okuma Town were issued regarding the event occurred at Fukushima Dai-ni NPS, TEPCO, pursuant to the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Fukushima Dai-ni NPS to evacuate
- Direction for the residents within 10km radius from Fukushima Dai-ni NPS to stay in-house

17:00 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

17:39 The Prime Minister directed evacuation of the residents within the 10 km radius from Fukushima Dai-ni NPS.

18:25 The Prime Minister directed evacuation of the residents within the 20km radius from Fukushima Dai-ichi NPS.

19:55 Directives from the Prime Minister was issued regarding seawater injection to Unit 1 of Fukushima Dai-ichi NPS.

20:05 Considering the Directives from the Prime Minister and pursuant to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to inject seawater to Unit 1 of Fukushima Dai-ichi NPS and so on.

20:20 At Unit 1 of Fukushima Dai-ichi NPS, seawater injection was started.

(March 13th)

05:38 TEPCO reported to NISA the event (Total loss of coolant injection function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS. Recovering efforts by TEPCO of the power source and coolant injection function and the work on venting were under way.

09:01 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

09:08 Pressure suppression and fresh water injection was started for Unit 3 of Fukushima Dai-ichi NPS.

09:20 The Pressure Vent Valve of Unit 3 of Fukushima Dai-ichi NPS was opened.

09:30 Directive was issued for the Governor of Fukushima Prefecture, the Mayors of Okuma Town, Futaba Town, Tomioka Town and Namie Town in accordance with the Act on Special Measures Concerning Nuclear Emergency Preparedness on the contents of radioactivity decontamination screening.

13:09 Tohoku Electric Power Co. reported to NISA that Onagawa NPS reached a situation specified in the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

13:12 Fresh water injection was switched to seawater injection for Unit 3 of Fukushima Dai-ichi NPS.

14:36 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 14th)

01:10 Seawater injection for Units 1 and 3 of Fukushima Dai-ichi NPS were temporarily interrupted due to the lack of seawater in pit.

03:20 Seawater injection for Unit 3 of Fukushima Dai-ichi NPS was resumed.

04:40 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

05:38 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on

Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:52 TEPCO reported to NISA the event (Unusual rise of the pressure in PCV) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS.

13:25 Regarding Unit 2 of Fukushima Dai-ichi NPS, TEPCO recognised the event (Loss of reactor cooling function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

22:13 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ni NPS.

22:35 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 15th)

00:00: The acceptance of experts from International Atomic Energy Agency (IAEA) was decided. NISA agreed to accept the offer of dispatching of the expert on NPS damage from IAEA considering the intention by Mr. Amano, Director General of IAEA. Therefore, the schedule of expert acceptance will be planned from now on according to the situation.

00:00: NISA also decided the acceptance of experts dispatched from U.S. Nuclear Regulatory Commission (NRC).

07:21 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:24 Incorporated Administration Agency, Japan Atomic Energy Agency (JAEA) reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre.

07:44 JAEA reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Science Research Institute.

08:54 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

10:30 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the directions as follows.

For Unit 4: To extinguish fire and to prevent the occurrence of re-criticality

For Unit 2: To inject water to reactor vessel promptly and to vent Drywell.

10:59 Considering the possibility of lingering situation, it was decided that the function of the Local Nuclear Emergency Response Headquarters was moved to the Fukushima Prefectural Office.

11:00 The Prime Minister directed the in-house stay area.

In-house stay was additionally directed to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS considering in-reactor situation.

16:30 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

22:00 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the following direction.

For Unit 4: To implement the water injection to the Spent Fuel Pool.

23:46 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 18th)

13:00 Ministry of Education, Culture, Sports, Science and Technology decided to reinforce the nation-wide monitoring survey in the emergency of Fukushima Dai-ichi and Dai-ni NPS.

15:55 TEPCO reported to NISA on the accidents and failure at Units 1, 2, 3 and 4 of Fukushima Dai-ichi NPS (Leakage of the radioactive materials inside of the reactor buildings to non-controlled area of radiation) pursuant to the Article 62-3 of the Nuclear Regulation Act.

16:48 Japan Atomic Power Co. reported to NISA accidents and failures in Tokai NPS (Failure of the seawater pump motor of the Emergency Diesel Generator 2C) pursuant to the Article 62-3 of the Nuclear Regulation Act.

(March 19th)

07:44 The second unit of Emergency Diesel Generator (A) for Unit 6 started up.

TEPCO reported to NISA that the pump for RHR (C) for Unit 5 started up and started to cooling Spent Fuel Storage Pool. (Power supply: Emergency Diesel Generator for Unit 6)

08:58 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 20th)

23:30 Directive from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisoma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village) was issued regarding the change of the reference value for the screening level for decontamination of radioactivity.

(March 21st)

07:45 Directive titled as "Administration of the stable Iodine" was issued from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village), which directs the above-mentioned governor and the heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

16:45 Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" was issued from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village), which directs the above-mentioned governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

17:50 Directive from the Director-general of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Gunma was issued, which direct the above-mentioned governors to issue a request to relevant businesses and people to suspend shipment of spinach, *Kakina* (a green vegetable) and raw milk for the time being.

(March 22nd)

16:00 NISA received the response (Advice) from Nuclear Safety Commission Emergency Technical Advisory Body to the request for advice made by NISA, regarding the report from TEPCO titled as "The Results of Analysis of Seawater" dated March 22nd.

(March 25th)

NISA directed orally to the TEPCO regarding the exposure of workers at the turbine building of Unit 3 of Fukushima Dai-ichi Nuclear Power Station occurred on March 24th, to review immediately and to improve its radiation control measures from the viewpoint of preventing a recurrence.

(March 28th)

Regarding the mistake in the evaluation of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, NISA directed TEPCO orally to prevent the recurrence of such a mistake.

13:50 Receiving the suggestion by the special meeting of Nuclear Safety Commission (NSC) (Stagnant water on the underground floor of the turbine building at Fukushima Dai-ichi Plant Unit 2), NISA directed TEPCO orally to add the sea water monitoring points and carry out the groundwater monitoring.

Regarding the delay in the reporting of the water confirmed outside of the turbine buildings, NISA directed TEPCO to accomplish the communication in the company on significant information in a timely manner and to report it in a timely and appropriate manner.

(March 29th)

11:16 The report was received, regarding the accident and trouble etc. in Onagawa NPS of Tohoku Electric Power Co. Inc. (the trouble of pump of component cooling water system etc. in Unit 2 and the fall of heavy oil tank for auxiliary boiler of Unit 1 by tsunami), pursuant to the Article 62-3 of the Nuclear Regulation Act and the Article 3 of the Ministerial Ordinance for the Reports related to Electricity.

In order to strengthen the system to assist the nuclear accident sufferers, the "Team to Assist the Lives of the Nuclear Accident Sufferers" headed by the Minister of Economy, Trade and Industry was established and the visits, etc. by the team to relevant cities, towns and villages were carried out.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.1 for the residents within the area from 20 km to 30 km radius.

(March 30th)

Directions as to the implementation of the emergency safety measures for the other power stations considering the accident of Fukushima Dai-ichi and Dai-ni NPSs in 2011 was issued and handed to each electric power company and the relevant organization.

(March 31st)

Regarding the break-in of the propaganda vehicle to Fukushima Dai-ni NPS on 31 March, NISA directed TEPCO orally to take the carefully thought-out measures regarding physical protection, etc.

NISA alerted TEPCO to taking the carefully though-out measures regarding radiation control for workers.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.2 for the residents within the area from 20 km to 30 km radius.

(April 1st)

NISA strictly alerted TEPCO to taking appropriate measures concerning the following three matters regarding the mistake in the result of nuclide analysis.

- Regarding the past evaluation results on nuclide analysis, all the nuclides erroneously evaluated should be identified and the re-evaluation on them should be promptly carried out.
- The causes for the erroneous evaluation should be investigated and the thorough measures for preventing the recurrence should be taken.
- Immediate notification should be done in the stage when any erroneous evaluation results, etc. are identified.

(April 2nd)

Regarding the outflow of the liquid including radioactive materials from the area around the Intake Channel of Unit 2 of Fukushima Dai-ichi NPS, NISA directed TEPCO orally to carry out nuclide analysis of the liquid sampled, to confirm whether there are other outflows from the same parts of the facilities as the one, from which the outflow was confirmed around the Unit 2, and to strengthen monitoring through sampling water at more points around the facilities concerned.

(April 4th)

On the imperative execution of the discharge to the sea as an emergency measure, NISA requested the technical advice of NSC and directed TEPCO to survey and confirm the impact of the spread of radioactive materials caused by the discharge, by ensuring continuity of the sea monitoring currently underway and enhancing it (Increase of the frequency of measuring as well as the number of monitoring points), disclose required information, as well as to enhance the strategy to minimize the discharge amount.

(April 5th)

Directions as to the implementation of advance notification and contact to the local governments with regard to taking measures related to discharge of radioactive materials from Fukushima Dai-ichi NPS, which have a possible impact on the environment, was issued.

(April 6th)

On the implementation of the nitrogen injection to PCV of Unit 1, NISA directed TEPCO on the following three points. (12:40 April 6th) ① Properly control the plant parameters, and take measures appropriately to ensure safety in response to changes in the parameters. ②Establish and implement an organizational structure and so on that will ensure the safety of the workers who will engage in the operation. ③As the possibility of leakage of the air in PCV to the outside due to the nitrogen injection cannot be ruled out, through the judicious and further enhanced monitoring, TEPCO shall survey and confirm the impact of the release and spreading of radioactive materials due to the nitrogen injection, and strive to disclose information.

(April 7th)

The Local Nuclear Emergency Response Headquarters issued the News Letter No.3 for the residents within the area from 20km to 30km radius. (April 7th)

(April 9th)

Due to the earthquake off the coast of Miyagi Prefecture occurred around 23:32 April 7th, all the Emergency Diesel Generators for Unit

1 of the Higashidori NPS of Tohoku Electric Power Co., Inc. were not workable. Considering this event, NISA issued the letters of direction titled "Regarding the Treatment of Emergency Power Generating Facilities in Terms of Safety Regulations (Directions)" to each Electricity Utility and other organizations concerned.

< Possibility on radiation exposure (As of 08:00 April 11th) >

1. Exposure of residents

(1) Including the about 60 evacuees from Futaba Public Welfare Hospital to Nihonmatsu City Fukushima Gender Equality Centre, as the result of measurement of 133 persons at the Centre, 23 persons counted more than 13,000 cpm were decontaminated.

(2) The 35 residents transferred from Futaba Public Welfare Hospital to Kawamata Town Saiseikai Kawamata Hospital by private bus arranged by Fukushima Prefecture were judged to be not contaminated by the Prefectural Response Centre.

(3) As for the about 100 residents in Futaba Town evacuated by bus, the results of measurement for 9 of the 100 residents were as follows. The evacuees, moving outside the Prefecture (Miyagi Prefecture), were divided into two groups, which joined later to Nihonmatsu City Fukushima Gender Equality Centre.

No. of Counts	No. of Persons
18,000 cpm	1
30,000-36,000 cpm	1
40,000 cpm	1
little less than 40,000 cpm*	1
very small counts	5

*(These results were measured without shoes, though the first measurement exceeded 100,000 cpm.)

(4) The screening was started at the Off site Centre in Okuma Town from March 12th to 15th. 162 people received examination until now. At the beginning, the reference value was set at 6,000 cpm. 110 people were at

the level below 6,000 cpm and 41 people were at the level of 6,000 cpm or more. When the reference value was increased to 13,000 cpm afterward, 8 people were at the level below 13,000 cpm and 3 people are at the level of 13,000 cpm or more.

The 5 out of 162 people examined were transported to hospital after being decontaminated.

(5) The Fukushima Prefecture carried out the evacuation of patients and personnel of the hospitals located within 10km area. The screening of all the members showed that 3 persons have the high counting rate. These members were transported to the secondary medical institute of exposure. As a result of the screening on 60 fire fighting personnel involved in the transportation activities, the radioactivity higher than twice of the back ground was detected on 3 members. Therefore, all the 60 members were decontaminated.

(6) Fukushima Prefecture has started the screening from 13 March. It is carried out by rotating the evacuation sites and at the 13 places (set up permanently) such as health offices. Up until April 8th, the screening was done to 138,662 people. Among them, 102 people were above the 100,000 cpm, but when measured these people again without clothes, etc., the counts decreased to 100,000 cpm and below, and there was no case which affects health.

2. Exposure of workers

As for the workers conducting operations in Fukushima Dai-ichi NPS, the total number of people who were at the level of exposure more than 100 mSv becomes 21.

For two out of the three workers who were confirmed to be at the level of exposure more than 170 mSv on March 24, the attachment of radioactive material on the skin of both legs was confirmed. As the two workers were judged to have a possibility of beta ray burn, they were transferred to the Fukushima Medical University Hospital, and after that, on March 25th, all of the three workers arrived at the National Institute of Radiological Sciences in the Chiba Prefecture. As the result of examination, the level of exposure of their legs was estimated to be from 2 to 3 Sv. The level of exposure of both legs and internal did not require medical treatment, but they decided to monitor the progress of all three workers in the hospital. All the three workers have been discharged from the hospital around the noon on 28 March.

At around 11:35 April 1st, a worker fell into the sea when he went on board the barge of the US Armed forces in order to adjust the hose. He was rescued immediately by other workers around without any injury and external contamination. In order to make double sure, the existence of internal radionuclide contaminant is being confirmed by a whole-body counter.

3. Others

(1) 4 members of Self-Defence Force who worked in Fukushima Dai-ichi NPS were injured by explosion. One member was transferred to National Institute of Radiological Sciences. After the examination, judged that there were wounds but no risk for health from the exposure, the one was released from the hospital on March 17th. No other exposure of the Self-Defence Force member was confirmed at the Ministry of Defence.

(2) As for policeman, the decontaminations of two policemen were confirmed by the National Police Agency. Nothing unusual was reported.

(3) On March 24th, examinations of thyroid gland for 66 children aged from 1 to 15 years old were carried out at the Kawamata Town public health Center. The result was at not at the level of having harmful influence.

(4) From March 26th to 27th, examinations of thyroid gland for 137 children aged from 0 to 15 years old were carried out at the Iwaki City Public Health Center. The result was not at the level of having harmful influence.

(5) From March 28th to 30th, examinations of thyroid gland for 946 children aged from 0 to 15 years old were carried out at the Kawamata Town Community Center and the Iidate Village Office. The result was not at the level of having harmful influence.

<Directive of screening levels for decontamination of radioactivity>

(1) On March 20th, the Local Nuclear Emergency Response Headquarters issued the directive to change the reference value for the screening level for decontamination of radioactivity as the following to the Prefectural

Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village).

Old: 40 Bq/cm^2 measured by a gamma-ray survey meter or 6,000 cpm

New: 1 μ Sv/hour (dose rate at 10cm distance) or 100,000cpm equivalent

<Directives of administrating stable Iodine during evacuation>

(1) On March 16th, the Local Nuclear Emergency Response Headquarters issued "Directive to administer the stable Iodine during evacuation from the evacuation area (20 km radius)" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village).

(2) On March 21st, the Local Nuclear Emergency Response Headquarters issued Directive titled as "Administration of the stable Iodine" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village), which directs the above-mentioned governor and heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

<Situation of the injured (As of 08:00 April 11th)>

1. Injury in Unit 1 of Fukushima Dai-ichi NPS due to earthquake on 11 March
   - Two employees (slightly, have already gone back working)
   - Two subcontract employees (one fracture in both legs, be in hospital)
   - Two died (After the earthquake, two TEPCO's employees missed and had been searched continuously. In the afternoon of March 30th, the two employees were found on the basement floor of the turbine building of Unit 4 and were confirmed dead by April 2nd.)

2. Injury due to the explosion of Unit 1 of Fukushima Dai-ichi NPS on 12 March
   - Four employees (two TEPCO's employees and two subcontractor's employees) were injured at the explosion and smoke of Unit 1 around the turbine building (non-controlled area of radiation) and were examined by Kawauchi Clinic. Two TEPCO's employees return to work again and two subcontractors' employees are under home treatment.

3. Injury due to the explosion of Unit 3 of Fukushima Dai-ichi NPS on 14 March.
   - Four TEPCO's employees (They have already return to work.)
   - Three subcontractor's employees (They have already return to work.)
   - Four members of Self-Defence Force (one of them was transported to National Institute of Radiological Sciences considering internal possible exposure. The examination resulted in no internal exposure. The member was discharged from the institute on March 17th.)

4. Other injuries
   - On the earthquake on 11 March, one subcontractor's employees (a crane operator) died in Fukushima Dai-ni NPS. (It seems that the tower crane broke and the operator room was crushed and the person was hit on the head.)
   - One emergency patient on 12 March. (Cerebral infarction, transported by the ambulance, be in hospital)
   - Ambulance was requested for one employee complaining the pain at left chest outside of control area on March 12. (Conscious, under home treatment)
   - Two employees complaining discomfort wearing full-face mask in the main control room were transported to Fukushima Dai-ni NPS for a consultation with an industrial doctor on 13 March. (One employee has already returned to work and the other is under home treatment.)
   - Two subcontractor's employees were injured during working at temporary control panel of power source in the Common Spent Fuel Pool, transported to where were industrial medical doctors the Fukushima Dai-ni NPS on 22 and 23 March. (One employee has already returned to work and the other is under home treatment.)

- On the afternoon of 7 April, a worker who was making sandbags at the soil disposal yard (spoil bank) on the north side of Fukushima Dai-ichi NPS got sick and was transported to J-Village for the body survey of contamination of radioactive materials. Being confirmed to be free from contamination, the worker was taken to the Iwaki City Kyouritsu Hospital by ambulance. On 8 April, the worker was diagnosed as dehydration and transient unconsciousness.
- At 09:19 April 9th, one subcontractor's employee was transported to a hospital as the worker wearing full-face mask felt discomfort during the work for cable processing in the Building of Water Processing, stepped on the manhole outside the building, which lid was shifted, and injured. As a result of medical examination, the worker was diagnosed as a right knee contusion and suspect of right knee medial collateral ligament injury. Furthermore, as a result of the body survey, it was confirmed that the worker was free from contamination of radioactive materials.
- Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body

<Situation of resident evacuation (As of 08:00 April 11th)>

At 11:00 March 15th, the Prime Minister directed in-house stay to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS. The directive was conveyed to Fukushima Prefecture and related municipalities.

Regarding the evacuation as far as 20-km from Fukushima Dai-ichi NPS and 10-km from Fukushima Dai-ni NPS, necessary measures have already been taken.

- The in-house stay in the area from 20 km to 30 km from Fukushima Dai-ichi NPS is made fully known to the residents concerned.
- Cooperating with Fukushima Prefecture, livelihood support to the residents in the in-house stay area are implemented.

・On March 28th, Chief Cabinet Secretary mentioned the continuation of the limited-access within the area of 20 km from Fukushima Dai-ichi NPS. On the same day, the Local Nuclear Emergency Response Headquarters notified the related municipalities of forbidding entry to the evacuation area within the 20 km zone.

<Directives regarding foods and drinks>

Directive from the Director-General of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Chiba was issued, which directed above-mentioned governors to suspend shipment and so on of the following products for the time being.

The Government Nuclear Emergency Response Headquarters organized the thoughts of imposing and lifting restrictions on shipment as follows, considering the NSC's advice.

- The area where restrictions on shipment to be imposed or lifted could be decided in units of the area where a prefecture is divided into, such as cities, towns, villages and so on, considering the spread of the contamination affected area and the actual situation of produce collection, etc.
- The restriction on shipment of the item, of which the result of the sample test exceeded the provisional regulation limits, shall be decided by judging in a comprehensive manner considering the regional spread of the contamination impact.
- Lifting the restrictions on shipment shall be implemented when a series of three results of nearly weekly tests for the item or the area falls below the provisional regulation limits, considering the situation of the Fukushima Dai-ichi NPS.
- However, the tests shall be carried out nearly weekly after the lifting, while the release of the radioactive materials from the NPS continues.

(1) Items under the suspension of shipment and restriction of intake (As of 08:00 April 11th)

Prefectures	Suspension of shipment	Restriction of intake
Fukushima Prefecture	Non-head type leafy vegetables, head type leafy	Non-head type leafy vegetables, head type leafy

	vegetables , flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna**, Rape, *Chijirena, Santouna**, *Kousaitai**, *Kakina**, *etc.*), Turnip, Raw milk (Except Kitakata-City, Bandai-Town, Inawashiro-Town, Mishima-Town, Aizumisato-Town, Shimogo-Town and Minamiaizu-Town)	vegetables, flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna,* Rape, *Chijirena, Santouna**, *Kousaitai**, *Kakina**, *etc.*)
Ibaraki Pref.	Spinach, *Kakina**, Parsley	
Tochigi Pref.	Spinach, *Kakina**	
Chiba Pref.	- Spinach from Katori City and Tako Town - Spinach, Qing-geng-cai, Garland chrysanthemum, Sanchu Asian lettuce, Celery and Parsley from Asahi City	

*a green vegetable

(2) Request for restriction of drinking for tap-water (As of 08:00 April 11th)

Scope under restriction	Water service (Local governments requested for restriction)
All residents	None
Babies ・Water services that continue to respond to the	<Fukushima Prefecture> Iitate small water service (Iitate Village, Fukushima Prefecture)

directive ・Tap-water supply service that continues to respond to the directive	 Non

<Directive regarding the ventilation when using heating equipments in the aria of indoor evacuation >

On March 21st, Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Hutaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Kazurao Village, Hirono Town, Iwaki City and Iidate Village) was issued, which directs those governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

< Fire Bureaus' Activities>

- From 11:00 till around 14:00 on March 22nd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the set up of large decontamination system.
- From 8:30 till 9:30, from 13:30 till 14:30 on March 23rd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the operation of large decontamination system.

(Contact Person)
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News Release

経済産業省
Ministry of Economy, Trade and Industry

April 15, 2011
Nuclear and Industrial Safety Agency

Regarding the result of nuclide analysis of radioactive materials etc. detected from Fukushima Dai-ichi Nuclear Power Station

Regarding the captioned issue, as TEPCO released as below, it is informed.

Reference 1: Detection of radioactive materials from the seawater near Fukushima Daiichi Nuclear Power Station (23rd release)
http://www.tepco.co.jp/en/press/corp-com/release/11041510-e.html

Reference 2: The results of nuclide analyses of radioactive materials in the air at the site of Fukushima Daiichi Nuclear Power Station (21th release)
http://www.tepco.co.jp/en/press/corp-com/release/11041511-e.html

Reference 3: Out flow of fluid containing radioactive materials to the ocean from areas near intake canal of Fukushima Daiichi Nuclear Power Station Unit 2 (continued report 11)
http://www.tepco.co.jp/en/press/corp-com/release/11041509-e.html

(Contact Person)
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April 11th, 2011

Fukushima Dai-ichi Monitoring points

① North side of main office building(approx. 0.5km from Unit 2 in northwest direction)
② Near Gymnasium(East side of MP-5) (approx. 0.9km from Unit 2 in westnorthwest direction)
③ Near West Gate (near MP-5) (approx. 1.1km from Unit 2 in west direction)
④ Front of near Main Gate (near MP-6) (approx. 1.0km from Unit 2 in westsouthwest direction)
⑤ Front of Earthquake Isolation Building (approx. 0.5km from Unit2 in northwest dirction)
⑥ South side of main office building
⑦ Main Gate
MC: Monitoring Car TM: Transportable Monitoring post

Monitoring points		③																							
Reading time		0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MC	Reading(μSv/h)	45.7	45.8	45.7	45.9	45.6	45.7	45.6	45.6	45.5	45.6	45.5	45.7	45.5	45.5	45.5	45.4	45.5	45.4	45.3	45.3	45.4	45.4	45.3	45.2
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μSv/h)*1	612	-	-	614	-	-	613	-	-	612	-	-	612	-	-	610	-	-	614	-	-	610	-	-
	⑦MG(μSv/h)*2	84	-	-	83	-	-	83	-	-	83	-	-	83	-	-	83	-	-	83	-	-	82	-	-
	③WG(μSv/h)*3	36	-	-	36	-	-	35	-	-	35	-	-	36	-	-	36	-	-	36	-	-	36	-	-
wind direction		E	NW	SSE	W	NW	NNE	NW	ENE	W	WNW	WNW	WNW	SW	W	WNW	W	WSW	WSW	WSW	W	W	W	WSW	WNW
wind speed (m/s)		0.4	0.4	0.5	0.4	0.5	0.5	0.4	0.3	0.5	0.6	0.6	0.8	0.6	0.6	0.8	0.8	0.6	0.8	0.7	0.6	0.6	0.7	0.8	0.6

*1: SMOB : South Side of Main Office Building
*2: MG: Main Gate
*3: WG:West Gate

Monitoring points		③																							
Reading time		4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:.00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MC	Reading(μSv/h)	45.2	45.3	45.3	45.1	45.2	45.1	45.2	45.1	45.1	45.1	45.1	44.9	44.8	44.8	45.1	45.0	44.9	45.1	44.9					
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND					
TM	⑥SMOB(μSv/h)*1	610	-	-	611	-	-	610	-	-	610	-	-	609	-	-	608	-	-	609					
	⑦MG(μSv/h)*2	83	-	-	82	-	-	83	-	-	82	-	-	83	-	-	82	-	-	83					
	③WG(μSv/h)*3	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36					
wind direction		N	NNW	S	WNW	NW	W	W	SW	W	W	WSW	W	WSW	WSW	W	W	W	N	N					
wind speed (m/s)		0.5	0.4	0.4	0.3	0.4	0.5	0.3	0.3	0.4	0.7	0.7	0.6	0.4	0.6	0.6	0.6	0.7	0.5	0.7					

Monitoring points		③																							
Reading time		8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MC	Reading(μSv/h)																								
	neutron																								
TM	⑥SMOB(μSv/h)*1																								
	⑦MG(μSv/h)*2																								
	③WG(μSv/h)*3																								
wind direction																									
wind speed (m/s)																									

April 10th, 2011

Fukushima Dai-ichi Monitoring points

① North side of main office building(approx. 0.5km from Unit 2 in northwest direction)
② Near Gymnasium(East side of MP-5) (approx. 0.9km from Unit 2 in westnorthwest direction)
③ Near West Gate (near MP-5) (approx. 1.1km from Unit 2 in west direction)
④ Front of near Main Gate (near MP-6) (approx. 1.0km from Unit 2 in westsouthwest direction)
⑤ Front of Earthquake Isolation Building (approx. 0.5km from Unit2 in northwest dirction)
⑥ South side of main office building
⑦ Main Gate
MC: Monitoring Car TM: Transportable Monitoring post

Monitoring points		③																							
Reading time		12:00	12:10	12:20	12:30	12:40	12:50	13:00	13:10	13:20	13:30	13:40	13:50	14:00	14:10	14:20	14:30	14:40	14:50	15:00	15:10	15:20	15:30	15:40	15:50
MC	Reading(μ Sv/h)	47.1	46.8	47.1	47.0	46.9	46.8	46.9	46.8	46.9	46.8	47.0	46.8	46.7	46.7	46.8	46.8	46.7	46.6	46.7	46.7	46.6	46.8	46.6	46.6
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μ Sv/h)*1	602	-	-	605	-	-	600	-	-	601	-	-	602	-	-	598	-	-	598	-	-	596	-	-
	⑦MG(μ Sv/h)*2	88	-	-	87	-	-	88	-	-	86	-	-	84	-	-	87	-	-	87	-	-	85	-	-
	③WG(μ Sv/h)*3	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-
wind direction		ESE	NE	E	E	E	ESE	ESE	ESE	ESE	SE	SE	SE	SE	SE	ESE	ESE	SSE	SSE	S	ESE	E	ESE	NE	ESE
wind speed (m/s)		2.7	2.3	2.4	2.5	2.0	2.3	2.8	2.4	3.5	2.7	2.2	2.7	2.9	3.0	2.3	2.2	2.6	2.2	2.1	2.5	2.8	2.0	2.5	2.2

*1: SMOB : South Side of Main Office Building
*2: MG: Main Gate
*3: WG:West Gate

Monitoring points		③																							
Reading time		16:00	16:10	16:20	16:30	16:40	16:50	17:00	17:10	17:20	17:30	17:40	17:50	18:00	18:10	18:20	18:30	18:40	18:50	19:00	19:10	19:20	19:30	19:40	19:50
MC	Reading(μ Sv/h)	46.6	46.5	46.5	46.6	46.6	46.5	46.5	46.5	46.5	46.5	46.4	46.4	46.5	46.4	46.3	46.3	46.3	46.3	46.3	46.2	46.3	46.1	46.2	46.2
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μ Sv/h)*1	598	-	-	597	-	-	598	-	-	601	-	-	598	-	-	601	-	-	604	-	-	605	-	-
	⑦MG(μ Sv/h)*2	86	-	-	86	-	-	86	-	-	85	-	-	86	-	-	85	-	-	84	-	-	84	-	-
	③WG(μ Sv/h)*3	35	-	-	35	-	-	35	-	-	35	-	-	35	-	-	35	-	-	35	-	-	36	-	-
wind direction		E	SE	E	ESE	SSE	E	SSE	S	S	SE	SSE	SSW	ESE	E	S	SW	SSW	SE	WSW	SSE	W	S	S	WSW
wind speed (m/s)		2.4	1.9	2.0	2.1	1.5	1.5	1.6	1.3	1.3	1.1	1.0	1.4	0.9	0.9	0.8	0.7	0.5	0.4	0.5	0.4	0.3	0.4	0.4	0.4

Monitoring points		③																							
Reading time		20:00	20:10	20:20	20:30	20:40	20:50	21:00	21:10	21:20	21:30	21:40	21:50	22:00	22:10	22:20	22:30	22:40	22:50	23:00	23:10	23:20	23:30	23:40	23:50
MC	Reading(μ Sv/h)	46.2	46.2	46.1	46.0	46.0	45.9	45.9	45.9	46.0	46.0	45.9	45.9	45.9	45.9	45.8	45.8	45.9	45.8	45.8	45.8	45.7	45.8	45.7	45.6
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μ Sv/h)*1	606	-	-	611	-	-	610	-	-	611	-	-	611	-	-	612	-	-	612	-	-	612	-	-
	⑦MG(μ Sv/h)*2	83	-	-	83	-	-	85	-	-	85	-	-	84	-	-	83	-	-	82	-	-	84	-	-
	③WG(μ Sv/h)*3	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-
wind direction		WSW	WSW	SW	W	S	WSW	WSW	W	SSE	WSW	WSW	SW	SE	WSW	SSW	WSW	WSW	SW	WSW	W	S	S	NE	NNE
wind speed (m/s)		0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.3	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.6	0.6	0.6	0.5	0.4	0.3	0.3	0.3

April 10th, 2011

Fukushima Dai-ichi Monitoring points

① North side of main office building(approx. 0.5km from Unit 2 in northwest direction)
② Near Gymnasium(East side of MP-5) (approx. 0.9km from Unit 2 in westnorthwest direction)
③ Near West Gate (near MP-5) (approx. 1.1km from Unit 2 in west direction)
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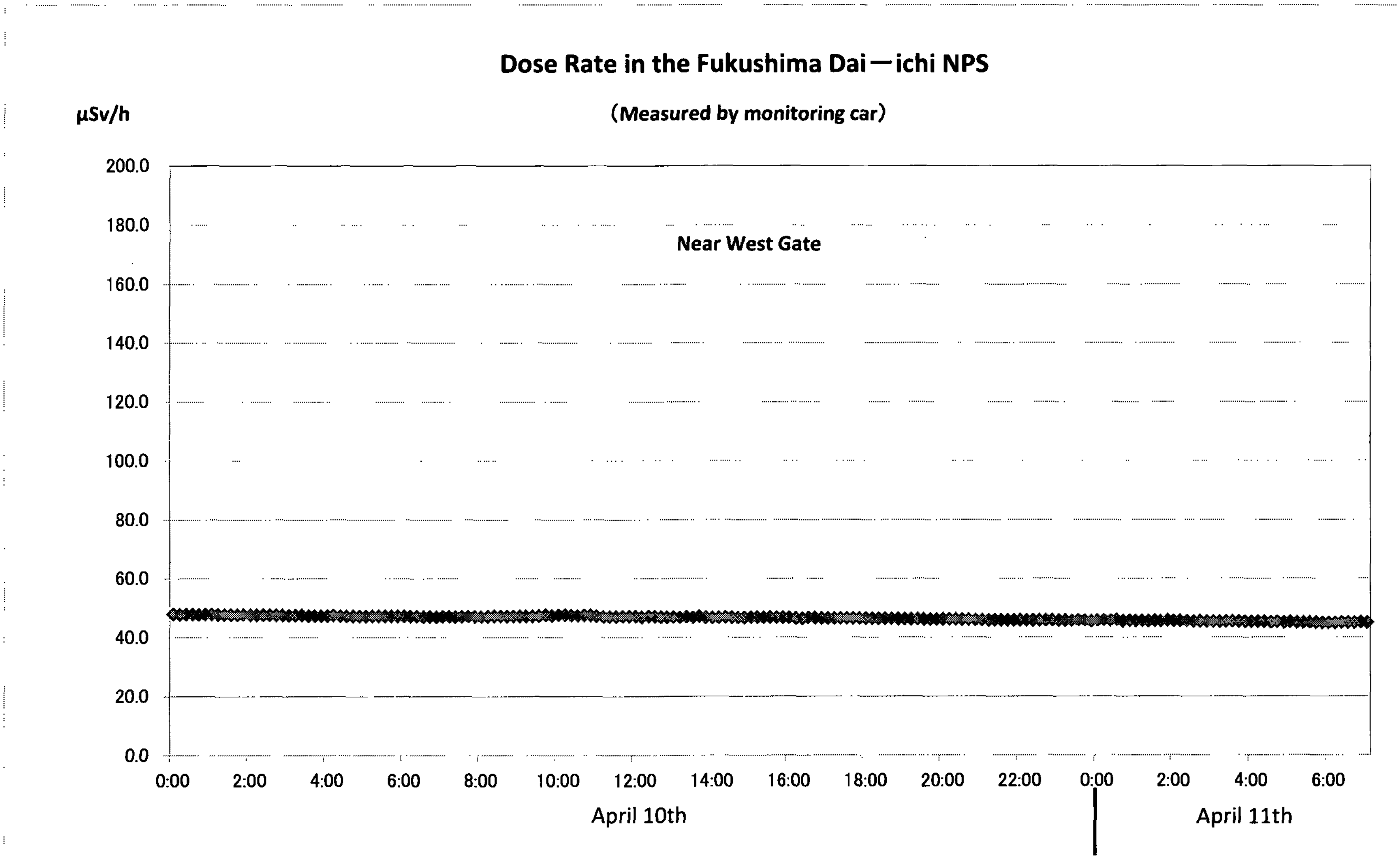
⑥ South side of main office building
⑦ Main Gate
MC: Monitoring Car TM: Transportable Monitoring post

Monitoring points		③																							
Reading time		0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MC	Reading(μ Sv/h)	47.9	47.8	47.8	47.8	47.6	47.7	47.7	47.7	47.7	47.7	47.6	47.7	47.6	47.6	47.6	47.6	47.4	47.4	47.4	47.4	47.5	47.3	47.3	47.2
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μ Sv/h)*1	620	-	-	620	-	-	623	-	-	622	-	-	623	-	-	621	-	-	621	-	-	618	-	-
	⑦MG(μ Sv/h)*2	87	-	-	86	-	-	86	-	-	86	-	-	86	-	-	86	-	-	86	-	-	87	-	-
	③WG(μ Sv/h)*3	37	-	-	38	-	-	38	-	-	37	-	-	37	-	-	37	-	-	37	-	-	37	-	-
wind direction		S	NNW	WNW	WSW	WSW	SW	WSW	WSW	SSW	SW	SW	S	WNW	NW	W	NW	WNW	WNW	W	W	WSW	NW	W	WNW
wind speed (m/s)		0.4	0.3	0.4	0.4	0.6	0.6	0.4	0.4	0.2	0.3	0.4	0.3	0.5	0.4	2.0	0.3	0.4	0.4	0.5	0.4	0.5	0.6	0.6	0.5

*1: SMOB : South Side of Main Office Building
*2: MG: Main Gate
*3: WG:West Gate

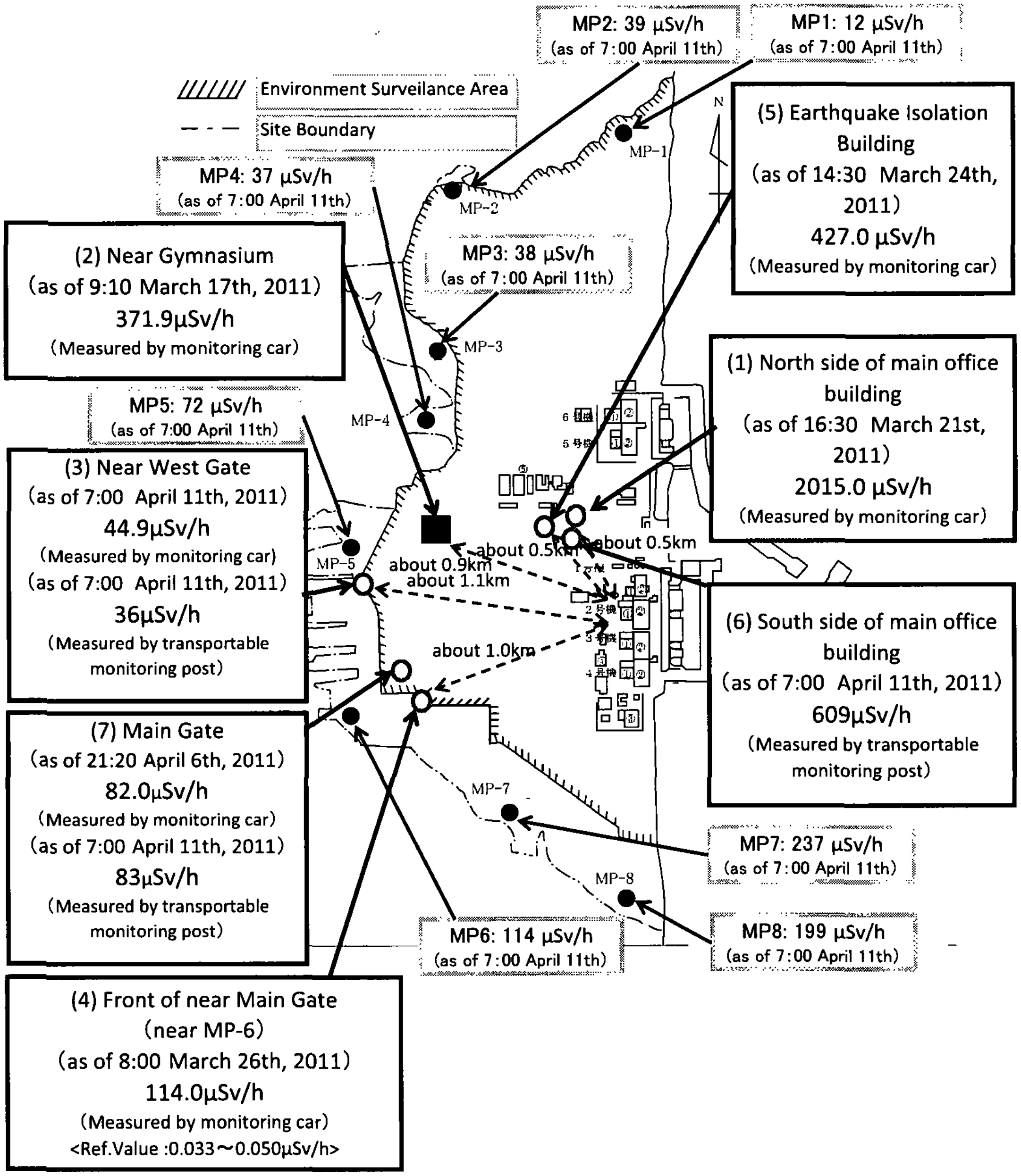
Monitoring points		③																							
Reading time		4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MC	Reading(μ Sv/h)	47.3	47.4	47.3	47.2	47.3	47.2	47.2	47.2	47.2	47.2	47.2	47.1	47.1	47.1	47.1	47.0	47.1	47.0	47.1	47.1	47.0	47.1	47.1	47.1
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μ Sv/h)*1	622	-	-	621	-	-	619	-	-	619	-	-	622	-	-	622	-	-	621	-	-	621	-	-
	⑦MG(μ Sv/h)*2	85	-	-	86	-	-	86	-	-	85	-	-	87	-	-	86	-	-	86	-	-	85	-	-
	③WG(μ Sv/h)*3	37	-	-	37	-	-	37	-	-	37	-	-	38	-	-	37	-	-	37	-	-	37	-	-
wind direction		WNW	W	W	W	WSW	SW	WSW	W	WSW	WSW	W	W	W	W	WNW	SW	WSW	W	NW	N	N	ENE	NE	SE
wind speed (m/s)		0.5	0.5	0.8	0.9	0.7	0.7	0.8	0.7	0.6	0.5	0.6	0.7	0.5	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.6	0.9	0.7	0.8

Monitoring points		③																							
Reading time		8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MC	Reading(μ Sv/h)	47.0	47.1	47.2	47.2	47.0	47.1	47.1	47.1	47.1	47.3	47.6	47.4	47.6	47.6	47.4	47.3	47.4	47.4	47.2	47.1	47.1	47.1	47.1	47.1
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μ Sv/h)*1	617	-	-	615	-	-	611	-	-	610	-	-	607	-	-	609	-	-	602			605	-	-
	⑦MG(μ Sv/h)*2	86	-	-	86	-	-	85	-	-	85	-	-	85	-	-	85	-	-	86			86	-	-
	③WG(μ Sv/h)*3	37	-	-	37	-	-	37	-	-	37	-	-	37	-	-	37	-	-	36			37	-	-
wind direction		NE	E	E	ESE	SE	E	NE	ESE	E	NE	SE	NE	NE	E	E	ESE	E	NE	E	SSE	E	ESE	ESE	ESE
wind speed (m/s)		0.7	1.9	2.3	2.1	2.4	1.3	1.6	1.7	2.4	1.9	2.0	2.4	2.3	2.4	2.6	2.0	2.2	2.5	2.0	2.7	2.0	2.2	2.8	2.8


Dose Rate in the Fukushima Dai－ichi NPS
(Measured by monitoring car)
μSv/h
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Near West Gate
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
April 10th
April 11th

Fukushima Dai−ichi NPS

as of 7:00, April 11th, 2011



Fukushima Dai-ni (TEPCO's Monitaring Post)

April 11, 2011 monitoring point	0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MP1 (μ Sv/h)	3.340	3.331	3.324	3.341	3.333	3.337	3.342	3.358	3.327	3.329	3.319	3.330	3.328	3.333	3.332	3.337	3.323	3.339	3.325	3.318	3.318	3.311	3.316	3.324
MP2 (μ Sv/h)	2.492	2.483	2.499	2.500	2.504	2.505	2.496	2.502	2.491	2.503	2.488	2.491	2.503	2.486	2.486	2.490	2.483	2.478	2.495	2.497	2.486	2.483	2.484	2.494
MP3 (μ Sv/h)	3.594	3.573	3.600	3.578	3.588	3.586	3.587	3.584	3.608	3.586	3.587	3.580	3.578	3.566	3.589	3.576	3.579	3.583	3.573	3.564	3.577	3.571	3.579	3.556
MP4 (μ Sv/h)	2.814	2.812	2.822	2.826	2.811	2.800	2.795	2.814	2.806	2.805	2.802	2.818	2.817	2.815	2.807	2.791	2.795	2.803	2.800	2.801	2.812	2.803	2.786	2.797
MP5 (μ Sv/h)	2.834	2.830	2.823	2.820	2.828	2.816	2.809	2.810	2.814	2.825	2.805	2.804	2.814	2.803	2.803	2.799	2.831	2.806	2.807	2.816	2.795	2.824	2.800	2.804
MP6 (μ Sv/h)	2.770	2.773	2.765	2.767	2.763	2.778	2.765	2.779	2.770	2.782	2.751	2.779	2.763	2.759	2.750	2.776	2.769	2.757	2.761	2.759	2.764	2.760	2.764	2.764
MP7 (μ Sv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SSW	SSW	SSW	SSW	SW	SW	SW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SW	SSW	SSW	SSW	SSW	S	SSW	S	SSW
wind speed (m/s)	10.2	9.2	9.7	7.8	5.3	4.5	6.1	6.8	7.4	6.3	6.6	6.3	6.2	4.7	4.4	2.5	3.2	3.2	3.3	3.0	2.2	4.1	4.4	4.4

*1: NM: Not measured due to the malfunction

April 11, 2011 monitoring point	4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MP1 (μ Sv/h)	3.312	3.309	3.307	3.309	3.308	3.320	3.313	3.317	3.307	3.323	3.311	3.301	3.317	3.298	3.316	3.296	3.303	3.310	3.300	3.290				
MP2 (μ Sv/h)	2.490	2.481	2.484	2.482	2.482	2.486	2.473	2.481	2.485	2.482	2.470	2.481	2.468	2.475	2.480	2.466	2.482	2.484	2.473	2.467				
MP3 (μ Sv/h)	3.559	3.578	3.565	3.562	3.573	3.558	3.564	3.574	3.555	3.566	3.565	3.538	3.552	3.548	3.565	3.570	3.555	3.546	3.546	3.553				
MP4 (μ Sv/h)	2.794	2.796	2.786	2.796	2.796	2.795	2.790	2.795	2.788	2.804	2.795	2.791	2.795	2.788	2.778	2.794	2.796	2.793	2.789	2.790				
MP5 (μ Sv/h)	2.804	2.805	2.807	2.801	2.793	2.815	2.789	2.785	2.791	2.797	2.797	2.789	2.798	2.785	2.799	2.796	2.800	2.793	2.799	2.791				
MP6 (μ Sv/h)	2.773	2.759	2.769	2.753	2.750	2.769	2.754	2.760	2.764	2.758	2.748	2.758	2.749	2.749	2.759	2.748	2.753	2.756	2.749	2.758				
MP7 (μ Sv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1				
wind direction	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SW	SW	SW	SW	SW	SW	WSW	WSW	SW				
wind speed (m/s)	4.0	4.7	5.5	6.0	5.6	5.0	5.4	6.4	6.7	7.3	8.6	7.8	7.5	5.1	5.4	6.0	6.4	2.9	2.2	2.9				

April 11, 2011 monitoring point	8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MP1 (μ Sv/h)																								
MP2 (μ Sv/h)																								
MP3 (μ Sv/h)																								
MP4 (μ Sv/h)																								
MP5 (μ Sv/h)																								
MP6 (μ Sv/h)																								
MP7 (μ Sv/h)																								
wind direction																								
wind speed (m/s)																								

Fukushima Dai-ni (TEPCO's Monitaring Post)

April 10, 2011																								
monitoring point	12:00	12:10	12:20	12:30	12:40	12:50	13:00	13:10	13:20	13:30	13:40	13:50	14:00	14:10	14:20	14:30	14:40	14:50	15:00	15:10	15:20	15:30	15:40	15:50
MP1(μSv/h)	3.423	3.424	3.419	3.401	3.423	3.442	3.420	3.411	3.413	3.406	3.400	3.409	3.413	3.405	3.410	3.367	3.378	3.372	3.384	3.379	3.365	3.357	3.376	3.358
MP2(μSv/h)	2.556	2.559	2.553	2.555	2.547	2.556	2.547	2.543	2.548	2.544	2.547	2.559	2.538	2.528	2.539	2.532	2.541	2.543	2.541	2.533	2.540	2.532	2.529	2.527
MP3(μSv/h)	3.662	3.667	3.661	3.660	3.659	3.649	3.661	3.644	3.645	3.641	3.663	3.652	3.633	3.644	3.649	3.640	3.638	3.645	3.635	3.642	3.646	3.641	3.634	3.636
MP4(μSv/h)	2.879	2.882	2.878	2.880	2.882	2.870	2.865	2.880	2.880	2.874	2.862	2.864	2.870	2.863	2.853	2.867	2.848	2.838	2.826	2.833	2.828	2.834	2.836	2.825
MP5(μSv/h)	2.878	2.854	2.891	2.857	2.881	2.874	2.874	2.870	2.872	2.886	2.879	2.881	2.889	2.865	2.872	2.878	2.864	2.866	2.853	2.863	2.848	2.847	2.846	2.833
MP6(μSv/h)	2.810	2.821	2.825	2.831	2.830	2.832	2.816	2.815	2.826	2.833	2.839	2.833	2.823	2.832	2.833	2.812	2.825	2.806	2.815	2.815	2.817	2.805	2.811	2.824
MP7(μSv/h)	2.050	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SE	SE	SE	ESE	SE	SE	ESE	SE	SSE	S	SE	SSE	S	SSE	SSE	S	ESE	ESE	SSE	S	S	SSE	SSE	SE
wind speed (m/s)	2.1	2.8	2.7	2.3	2.7	2.2	1.7	2.7	3.2	6.4	2.8	4.2	2.5	3.0	4.4	4.1	1.9	2.2	3.7	7.0	6.5	7.3	6.6	3.0

*1: NM: Not measured due to the malfunction

April 10, 2011																								
monitoring point	16:00	16:10	16:20	16:30	16:40	16:50	17:00	17:10	17:20	17:30	17:40	17:50	18:00	18:10	18:20	18:30	18:40	18:50	19:00	19:10	19:20	19:30	19:40	19:50
MP1(μSv/h)	3.365	3.373	3.372	3.365	3.382	3.360	3.374	3.371	3.372	3.369	3.378	3.381	3.377	3.374	3.370	3.375	3.364	3.371	3.365	3.361	3.351	3.361	3.358	3.356
MP2(μSv/h)	2.528	2.516	2.525	2.518	2.529	2.512	2.514	2.525	2.517	2.517	2.521	2.523	2.515	2.521	2.530	2.506	2.509	2.516	2.524	2.511	2.503	2.518	2.503	2.501
MP3(μSv/h)	3.618	3.645	3.633	3.626	3.633	3.619	3.625	3.625	3.629	3.631	3.623	3.638	3.619	3.631	3.613	3.621	3.617	3.612	3.628	3.615	3.618	3.618	3.620	3.598
MP4(μSv/h)	2.834	2.832	2.838	2.833	2.819	2.824	2.844	2.833	2.836	2.828	2.836	2.832	2.835	2.826	2.829	2.823	2.827	2.839	2.819	2.819	2.815	2.833	2.818	2.829
MP5(μSv/h)	2.854	2.846	2.839	2.845	2.843	2.840	2.834	2.830	2.833	2.841	2.836	2.835	2.836	2.821	2.831	2.835	2.848	2.840	2.831	2.841	2.825	2.819	2.829	2.828
MP6(μSv/h)	2.812	2.794	2.802	2.790	2.794	2.802	2.784	2.794	2.771	2.783	2.780	2.794	2.787	2.775	2.783	2.785	2.775	2.779	2.777	2.779	2.769	2.785	2.770	2.789
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	S	S	SSE	SSE	S	S	SSE	SE	SSE	S	SSE	S	S	S	S	S	S	S	S	S	S	S	S	SSW
wind speed (m/s)	3.9	5.2	5.7	6.4	7.2	7.3	7.4	3.8	6.2	5.6	4.0	4.5	5.8	7.4	8.0	7.3	7.7	6.8	8.0	8.5	7.5	8.1	8.0	8.4

April 10, 2011																								
monitoring point	20:00	20:10	20:20	20:30	20:40	20:50	21:00	21:10	21:20	21:30	21:40	21:50	22:00	22:10	22:20	22:30	22:40	22:50	23:00	23:10	23:20	23:30	23:40	23:50
MP1(μSv/h)	3.351	3.360	3.355	3.352	3.367	3.351	3.368	3.356	3.367	3.348	3.355	3.351	3.343	3.347	3.344	3.354	3.340	3.340	3.354	3.339	3.350	3.332	3.343	3.340
MP2(μSv/h)	2.511	2.493	2.510	2.514	2.502	2.507	2.499	2.509	2.502	2.496	2.511	2.512	2.512	2.501	2.522	2.500	2.507	2.499	2.499	2.498	2.497	2.501	2.505	2.496
MP3(μSv/h)	3.627	3.605	3.614	3.593	3.602	3.606	3.604	3.599	3.607	3.591	3.597	3.604	3.591	3.611	3.597	3.611	3.610	3.595	3.601	3.577	3.585	3.594	3.583	3.594
MP4(μSv/h)	2.831	2.818	2.823	2.820	2.828	2.812	2.828	2.810	2.821	2.817	2.815	2.829	2.810	2.815	2.821	2.821	2.830	2.816	2.816	2.821	2.802	2.812	2.808	2.811
MP5(μSv/h)	2.838	2.812	2.841	2.830	2.810	2.817	2.821	2.826	2.827	2.819	2.824	2.814	2.827	2.811	2.819	2.818	2.813	2.822	2.804	2.826	2.819	2.815	2.825	2.827
MP6(μSv/h)	2.771	2.782	2.786	2.775	2.772	2.781	2.769	2.782	2.763	2.763	2.779	2.770	2.775	2.780	2.765	2.771	2.767	2.772	2.791	2.756	2.772	2.770	2.773	2.787
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SSW	SSW	SSW	S	SSW	SSW	SSW	S	S	S	SSW	SSW	S	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW
wind speed (m/s)	9.4	10.5	10.9	9.8	9.1	9.4	9.9	9.4	9.3	8.8	7.7	8.9	8.2	8.4	7.5	7.7	8.2	7.9	7.7	9.9	10.5	10.5	9.1	10.1

2011/4/11 17:29

Fukushima Dai-ni (TEPCO's Monitaring Post)

April 10, 2011																								
monitoring point	0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MP1(μSv/h)	3.441	3.447	3.461	3.439	3.423	3.439	3.438	3.456	3.456	3.459	3.436	3.437	3.450	3.446	3.437	3.445	3.433	3.449	3.434	3.445	3.427	3.438	3.442	3.462
MP2(μSv/h)	2.580	2.572	2.570	2.557	2.575	2.564	2.583	2.597	2.592	2.579	2.576	2.575	2.559	2.580	2.564	2.559	2.560	2.577	2.577	2.557	2.572	2.592	2.591	2.636
MP3(μSv/h)	3.722	3.709	3.723	3.715	3.713	3.724	3.724	3.727	3.710	3.703	3.705	3.711	3.698	3.724	3.705	3.711	3.700	3.713	3.711	3.688	3.697	3.709	3.716	3.742
MP4(μSv/h)	2.900	2.887	2.904	2.884	2.887	2.900	2.899	2.900	2.918	2.908	2.883	2.897	2.893	2.900	2.896	2.897	2.894	2.896	2.890	2.887	2.874	2.897	2.891	2.925
MP5(μSv/h)	2.917	2.915	2.898	2.897	2.910	2.888	2.930	2.911	2.924	2.923	2.918	2.889	2.905	2.913	2.906	2.899	2.908	2.900	2.893	2.878	2.890	2.900	2.901	2.955
MP6(μSv/h)	2.830	2.825	2.818	2.825	2.823	2.827	2.830	2.823	2.835	2.833	2.829	2.824	2.832	2.824	2.839	2.821	2.812	2.830	2.817	2.808	2.795	2.835	2.828	2.830
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	N	N	N	N	N	N	NNE	N	N	NNE	NNE	NNE	NNE	NNE	N	N	NNE	NE	NNE	NNE	NNE	N	N	N
wind speed (m/s)	3.6	3.5	2.3	2.9	2.0	1.7	3.5	3.8	2.3	3.2	4.6	3.6	4.2	4.4	3.1	6.0	0.8	2.2	3.4	4.7	3.5	3.3	5.4	5.5

*1: NM: Not measured due to the malfunction

April 10, 2011																								
monitoring point	4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MP1(μSv/h)	3.440	3.430	3.427	3.427	3.409	3.431	3.423	3.414	3.409	3.417	3.407	3.398	3.416	3.409	3.415	3.400	3.402	3.409	3.389	3.409	3.419	3.408	3.401	3.409
MP2(μSv/h)	2.581	2.560	2.558	2.548	2.551	2.555	2.554	2.560	2.554	2.548	2.543	2.555	2.549	2.540	2.542	2.531	2.547	2.536	2.540	2.551	2.526	2.540	2.547	2.534
MP3(μSv/h)	3.705	3.692	3.672	3.693	3.678	3.671	3.689	3.686	3.674	3.693	3.693	3.683	3.667	3.676	3.667	3.673	3.666	3.661	3.664	3.666	3.668	3.682	3.659	3.663
MP4(μSv/h)	2.894	2.890	2.873	2.883	2.874	2.868	2.867	2.881	2.861	2.874	2.865	2.873	2.885	2.871	2.871	2.875	2.854	2.870	2.866	2.860	2.862	2.875	2.869	2.874
MP5(μSv/h)	2.926	2.886	2.888	2.893	2.892	2.883	2.888	2.870	2.864	2.887	2.872	2.891	2.865	2.875	2.868	2.873	2.879	2.877	2.859	2.884	2.873	2.875	2.882	2.871
MP6(μSv/h)	2.843	2.823	2.819	2.809	2.804	2.798	2.820	2.804	2.809	2.795	2.778	2.807	2.807	2.802	2.792	2.794	2.794	2.800	2.806	2.784	2.796	2.796	2.792	2.781
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	N	N	N	N	NNW	NNW	N	NNW	NNW	N	NNW	NNW	N	N	N	NNW	N	N	N	N	N	N	N	NNE
wind speed (m/s)	5.1	4.1	4.1	4.4	2.7	3.1	3.4	2.9	3.0	3.1	2.4	2.2	2.8	2.3	3.2	2.2	3.1	3.2	3.5	2.4	1.6	2.0	3.2	3.1

April 10, 2011																								
monitoring point	8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MP1(μSv/h)	3.406	3.420	3.420	3.411	3.416	3.408	3.400	3.396	3.400	3.396	3.400	3.409	3.399	3.404	3.415	3.401	3.410	3.410	3.422	3.398	3.436	3.417	3.408	3.412
MP2(μSv/h)	2.539	2.555	2.530	2.541	2.549	2.539	2.546	2.544	2.547	2.548	2.544	2.553	2.548	2.547	2.560	2.542	2.544	2.549	2.560	2.555	2.538	2.550	2.537	2.538
MP3(μSv/h)	3.667	3.669	3.668	3.676	3.668	3.672	3.671	3.666	3.663	3.651	3.667	3.667	3.658	3.669	3.669	3.665	3.662	3.655	3.660	3.657	3.669	3.657	3.669	3.668
MP4(μSv/h)	2.871	2.880	2.863	2.858	2.866	2.873	2.878	2.876	2.875	2.879	2.871	2.872	2.871	2.885	2.891	2.888	2.895	2.888	2.888	2.901	2.890	2.877	2.878	2.877
MP5(μSv/h)	2.874	2.868	2.863	2.867	2.868	2.849	2.876	2.864	2.876	2.875	2.872	2.862	2.875	2.876	2.854	2.871	2.856	2.880	2.861	2.880	2.886	2.863	2.863	2.866
MP6(μSv/h)	2.799	2.805	2.800	2.806	2.815	2.799	2.811	2.812	2.815	2.812	2.810	2.808	2.808	2.823	2.813	2.812	2.824	2.817	2.833	2.819	2.826	2.819	2.831	2.838
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	NNE	NE	NNE	NNE	NE	NE	NE	NE	E	ENE	ENE	ENE	ENE	E	E	ESE	E	E	SE	SE	SE	SSE	S	SE
wind speed (m/s)	3.0	4.1	4.2	2.4	2.3	2.1	3.1	2.5	3.0	2.5	3.0	2.7	2.9	2.4	2.0	1.9	2.7	2.9	1.9	2.3	3.0	3.3	3.0	2.0

Fukushima Dai-ni NPS

as of 7:00, April 11th, 2011

Location of Monitoring Post

MP1 : 3.290 μSv/h (as of 7:10 April 11th)
(Ref. Value:0.035～0.054 μSv/h)

MP2 : 2.467 μSv/h (as of 7:10 April 11th)
(Ref. Value:0.042～0.062 μSv/h)

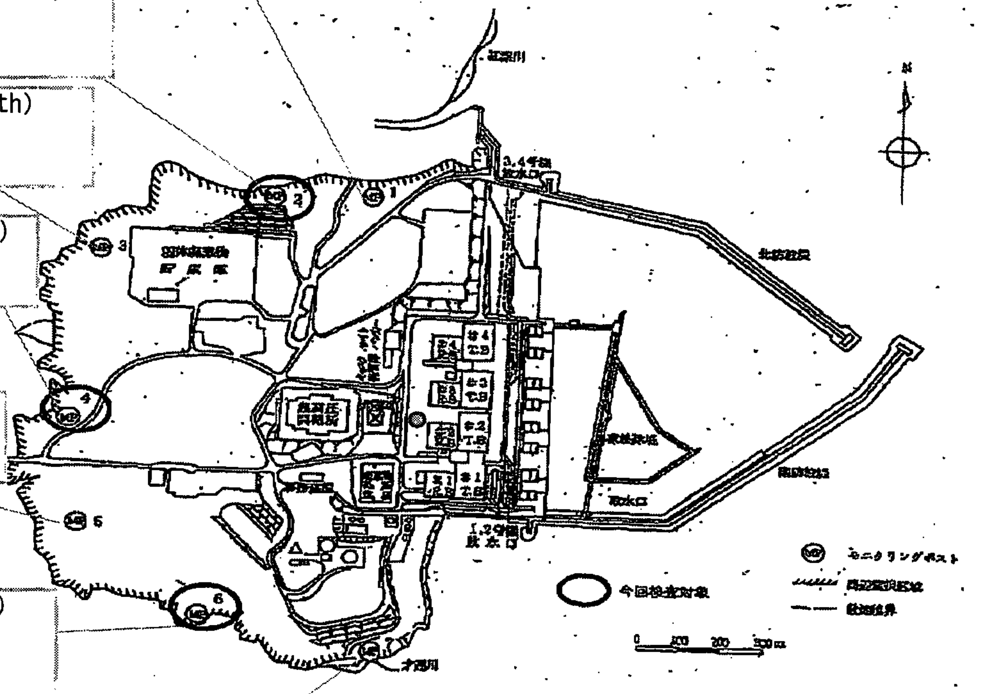
MP3 : 3.553 μSv/h (as of 7:10 April 11th)
(Ref. Valur:0.036～0.052 μSv/h)

MP4 : 2.790 μSv/h (as of 7:10 April 11th)
(Ref. value: 0.036～0.052 μSv/h)

MP5 : 2.791 μSv/h (as of 7:10 April 11th)
(Ref. Value:0.041～0.058 μSv/h)

MP6 : 2.758 μSv/h (as of 7:10 April 11th)
(Ref. value:0.044～0.063 μSv/h)

MP7 : 2.050 μSv/h (as of 12:00 April 10th)
(Ref. Value: 0.043～0.062 μSv/h)



Results of environmental monitoring at each NPSs etc. (as of 9pm April 10th, 2011)

unit: μ Sv/h

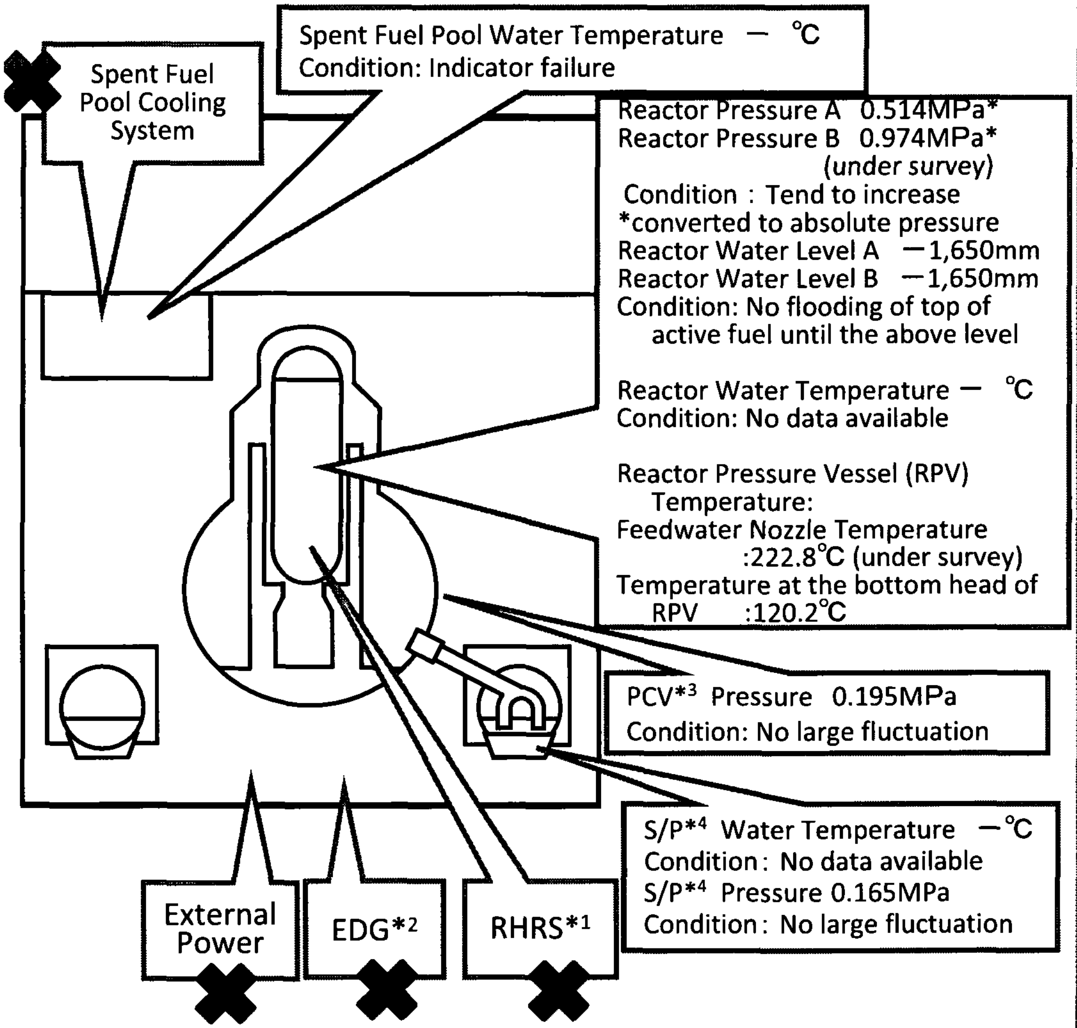
Range of normal average value	Company	NPS	April 10, 2011											
			0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00
0.023～0.027	Hokkaido Electric Power Co.	Tomari NPS	0.031	0.031	0.032	0.032	0.032	0.032	0.032	0.031	0.032	0.032	0.032	0.031
0.024～0.060	Tohoku Electric Power Co.	Onagawa NPS	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
0.012～0.060		Higashidori NPS	0.017	0.017	0.018	0.017	0.017	0.017	0.018	0.017	0.017	0.017	0.017	0.018
0.033～0.050	Tokyo Electric Power Co.	*Fukushima Dai-ichi*※	47.9	47.7	47.6	47.4	47.3	47.2	47.1	47.1	47.0	47.1	47.6	47.2
0.036～0.052		Fukushima Dai-ni	3.722	3.724	3.698	3.711	3.705	3.689	3.667	3.664	3.667	3.671	3.658	3.660
0.011～0.159		Kashiwazaki kariwa NPS	0.066	0.065	0.066	0.065	0.066	0.065	0.065	0.065	0.066	0.066	0.065	0,065
0.036～0.053	Japan Atomic Power Co.	Tokai Dai-ni NPS	0.410	0.410	0.414	0.411	0.416	0.413	0.414	0.418	0.418	0.419	0.420	0.420
0.039～0.110		Tsuruga NPS	0.074	0.075	0.074	0.075	0.075	0.075	0.074	0.076	0.075	0.075	0.075	0.074
0.064～0.108	Chubu Electric Power Co.	Hamaoka NPS	0.044	0.044	0.044	0.044	0.044	0.044	0.043	0.044	0.044	0.043	0.044	0.044
0.0207～0.132	Hokuriku Electric Power Co.	Shika NPS	0.033	0.032	0.033	0.033	0.033	0.033	0.033	0.032	0.032	0.032	0.032	0.033
0.028～0.130	Chugoku Electric Power Co.	Shimane NPS	0.029	0.030	0.030	0.028	0.031	0.029	0.030	0.031	0.029	0.030	0.030	0.030
0.070～0.077	Kansai Electric Power Co.	Mihama NPS	0.072	0.073	0.074	0.073	0.074	0.074	0.075	0.073	0.074	0.071	0.072	0.073
0.045～0.047		Takahama NPS	0.042	0.042	0.043	0.042	0.043	0.042	0.043	0.042	0.043	0.042	0.043	0.043
0.036～0.040		Ooi NPS	0.036	0.036	0.035	0.035	0.035	0.036	0.035	0.036	0.035	0.036	0.036	0.035
0.011～0.080	Shikoku Electeic Power Co.	Ikata NPS	0.014	0.014	0.015	0.014	0.014	0.014	0.014	0.014	0.015	0.015	0.015	0.015
0.023～0.087	Kyushu Electric Power Co.	Genkai NPS	0.027	0.026	0.026	0.026	0.027	0.025	0.026	0.026	0.027	0.027	0.026	0.025
0.034～0.120		Sendai NPS	0.037	0.038	0.038	0.036	0.037	0.038	0.036	0.037	0.039	0.039	0.040	0.040
0.009～0.069	Japan Nuclear Fuel Limited	Japan Nuclear Fuel Reprocessing Plant	0.017	0.016	0.017	0.016	0.016	0.017	0.016	0.016	0.016	0.016	0.017	0.016
0.009～0.071		Japan Nuclear Fuel Plant Disposal	0.022	0.023	0.023	0.023	0.023	0.022	0.022	0.022	0.023	0.022	0.022	0.022

※ There could be a small deviation on the monitoring time and area because of the operational situation of Fukushima Dai-ichi NPS.

Range of normal average value	Company	NPS	April 10, 2011											
			12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
0.023～0.027	Hokkaido Electric Power Co.	Tomari NPS	0.031	0.032	0.032	0.032	0.031	0.031	0.031	0.031	0.031	0.031		
0.024～0.060	Tohoku Electric Power Co.	Onagawa NPS	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.35	0.34		
0.012～0.060		Higashidori NPS	0.018	0.017	0.017	0.018	0.017	0.017	0.017	0.017	0.017	0.017		
0.033～0.050	Tokyo Electric Power Co.	Fukushima Dai-ichi※	47.1	46.9	46.7	46.7	46.6	46.5	46.5	46.3	46.2	45.9		
0.036～0.052		Fukushima Dai-ni	3.662	3.661	3.633	3.635	3.618	3.625	3.619	3.628	3.627	3.604		
0.011～0.159		Kashiwazaki kariwa NPS	0.065	0.065	0.065	0.067	0.065	0.066	0.066	0.065	0.067	0.066		
0.036～0.053	Japan Atomic Power Co.	Tokai Dai-ni NPS	0.419	0.421	0.420	0.416	0.416	0.414	0.414	0.413	0.414	0.410		
0.039～0.110		Tsuruga NPS	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.077		
0.064～0.108	Chubu Electric Power Co.	Hamaoka NPS	0.043	0.043	0.044	0.043	0.044	0.043	0.043	0.043	0.043	0.043		
0.0207～0.132	Hokuriku Electric Power Co.	Shika NPS	0.032	0.032	0.033	0.033	0.033	0.033	0.032	0.033	0.033	0.033		
0.028～0.130	Chugoku Electric Power Co.	Shimane NPS	0.030	0.030	0.031	0.030	0.029	0.029	0.030	0.030	0.029	0.030		
0.070～0.077	Kansai Electric Power Co.	Mihama NPS	0.073	0.072	0.072	0.074	0.072	0.073	0.074	0.073	0.075	0.075		
0.045～0.047		Takahama NPS	0.043	0.043	0.043	0.043	0.042	0.043	0.043	0.043	0.042	0.043		
0.036～0.040		Ooi NPS	0.035	0.035	0.035	0.035	0.033	0.035	0.035	0.036	0.035	0.036		
0.011～0.080	Shikoku Electeic Power Co.	Ikata NPS	0.015	0.015	0.015	0.014	0.014	0.014	0.013	0.014	0.014	0.014		
0.023～0.087	Kyushu Electric Power Co.	Genkai NPS	0.027	0.026	0.026	0.026	0.025	0.026	0.025	0.026	0.027	0.026		
0.034～0.120		Sendai NPS	0.036	0.036	0.035	0.038	0.036	0.037	0.036	0.036	0.036	0.035		
0.009～0.069	Japan Nuclear Fuel Limited	Japan Nuclear Fuel Reprocessing Plant	0.017	0.016	0.016	0.017	0.017	0.016	0.017	0.017	0.017	0.017		
0.009～0.071		Japan Nuclear Fuel Plant Disposal	0.022	0.022	0.022	0.023	0.022	0.022	0.022	0.022	0.023	0.022		

※ There could be a small deviation on the monitoring time and area because of the operational situation of Fukushima Dai-ichi NPS.

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 1 (As of 02:00 April 11th, 2011)



*1 Residual Heat Removal System
*2 Emergency Diesel Generator
*3 Primary Containment Vessel
*4 Suppression Pool

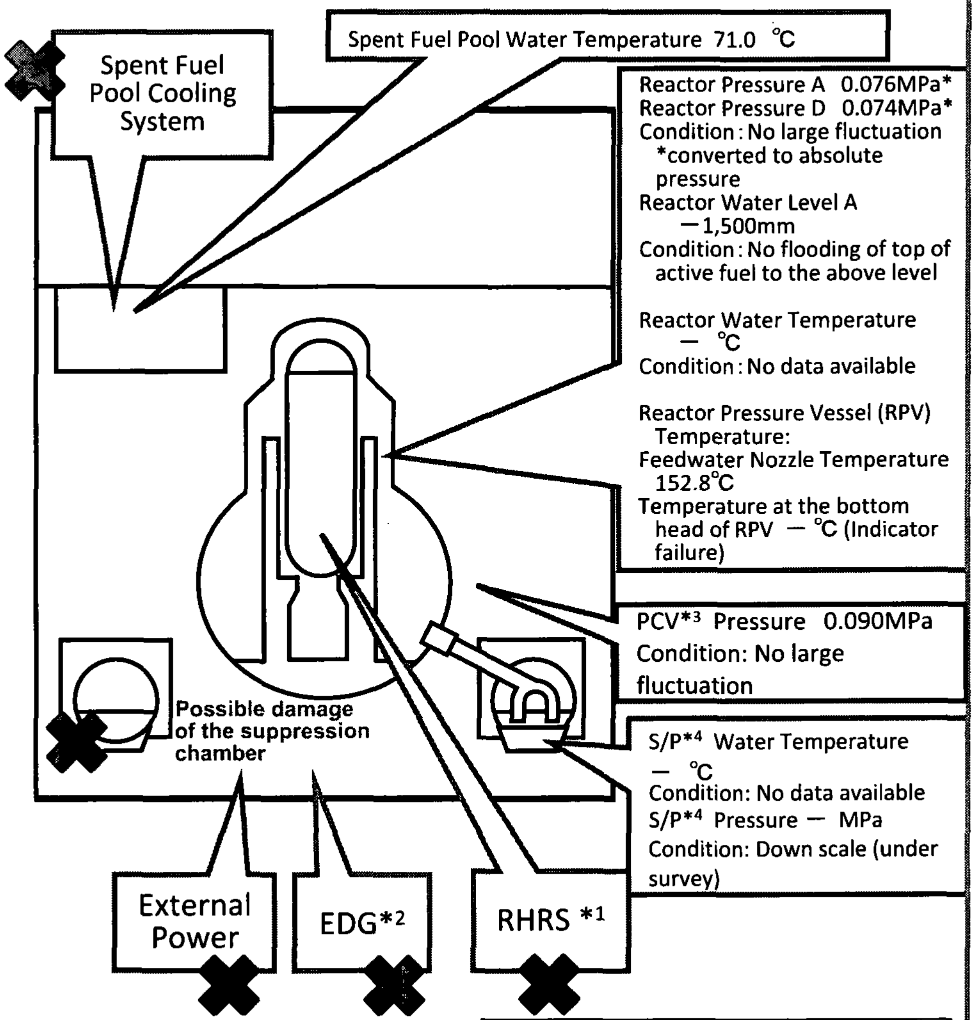
Major Events after the earthquake

- 11th 14:46 Under operation, Automatic shutdown by the earthquake
- 11th 15:42 Report based on the Article 10 (Total loss of A/C power)
- 11th 16:36 Occurrence of the Article 15 event (Inability of water injection of the Emergency Core Cooling System)
- 12th 01:20 Occurrence of the Article 15 event (Unusual rise of the pressure in PCV)
- 12th 10:17 Started to vent.
- 12th 15:36 Sound of explosion
- 12th 20:20 Started to inject seawater and borated water to the Reactor Core.
- 23rd 02:33 The amount of injected water to the Reactor Core was increased utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$)
  09:00 Switched to the Feedwater Line only.($18m^3/h \rightarrow 11m^3/h$)
- 24th 11:30 Lighting in the Central Control Room was recovered.
- 25th 15:37 Started to inject fresh water.
- 29th 08:32 Switched to the water injection to the Reactor Core using the temporary motor-driven pump.
- 31st 12:00 ~2nd 15:26 Started to transfer the stagnant water from the Condensate Storage Tank (CST) to the Surge Tank of Suppression Pool Water (SPT)
- 31st 13:03~16:04 Water spray by Concrete Pump Truck (Fresh water)
- 3rd 12:02 The power supply to the temporary motor-driven pump was switched from the temporary power supply to the external power supply.
- 3rd 13:55 Started to transfer the water from the Condenser to CST.
- 6th 22:30 Started the operation for the injection of nitrogen to PCV.
- 7th 01:31 Confirmed starting the injection of nitrogen to PCV.
- 9th 04:10 Started using highly pure nitrogen generator in the injection of nitrogen to PCV.
- 10th 09:30 Completed transferring the water from the Condenser to CST.

Current Conditions : Fresh water is being injected to the Spent Fuel Pool and the Reactor Core

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 2
(As of 02:00 April 11th, 2011)



*1 Residual Heat Removal System
*2 Emergency Diesel Generator
*3 Primary Containment Vessel
*4 Suppression Pool

Current Conditions : Fresh water is being injected to the Spent Fuel Pool and the Reactor Core

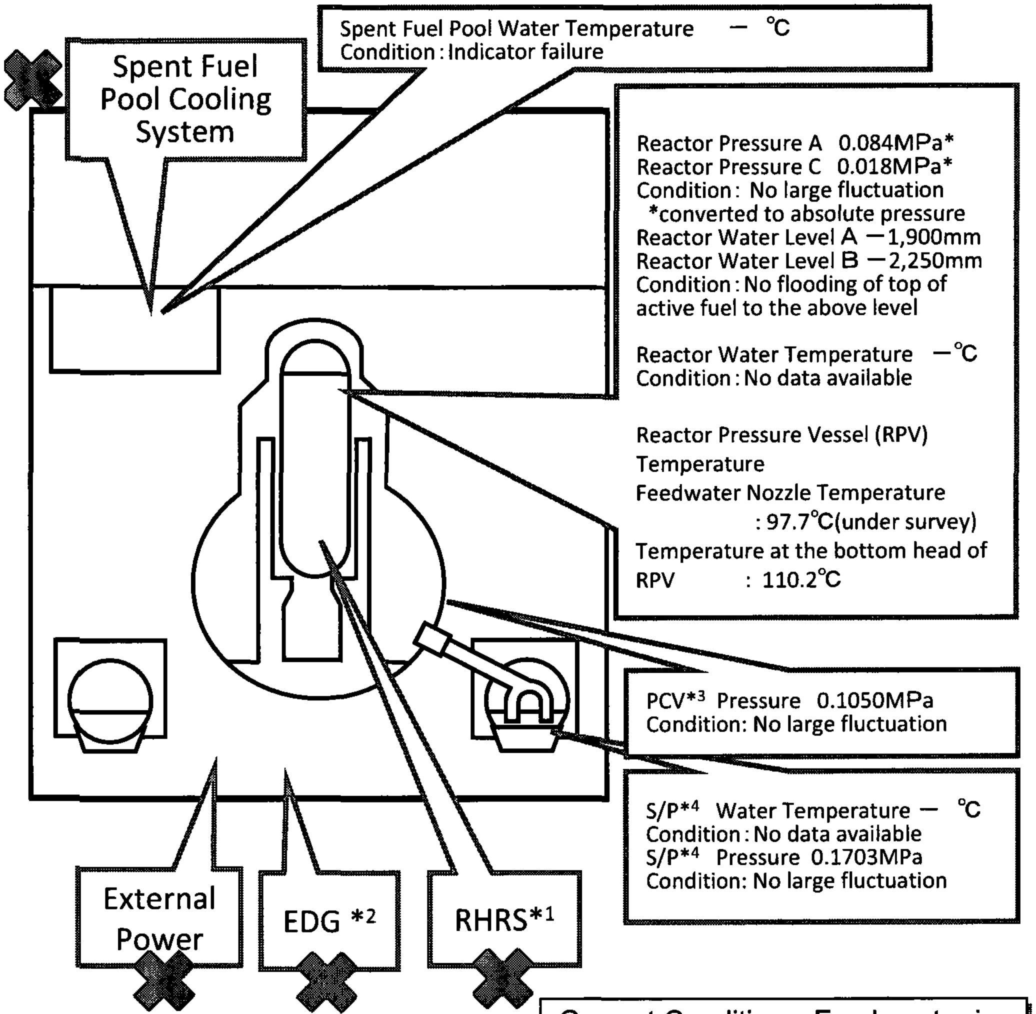
(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Major Events after the earthquake

11th 14:46 Under operation, Automatic shutdown by the earthquake
11th 15:42 Report based on the Article 10 (Total loss of A/C power)
11th 16:36 Occurrence of the Article 15 event (Inability of water injection of the Emergency Core Cooling System)
13th 11:00 Started to vent.
14th 13:25 Occurrence of the Article 15 event (Loss of reactor cooling functions)
14th 16:34 Started to inject seawater to the Reactor Core.
14th 22:50 Occurrence of the Article 15 event (Unusual rise of the pressure in PCV)
15th 00:02 Started to vent.
15th 06:10 Sound of explosion
15th around 06:20 Possible damage of the suppression chamber
20th 15:05～17:20 Approximately 40 ton seawater injection to the Spent Fuel Pool (SFP) via the Fuel Pool Cooling Line (FPC)
20th 15:46 Power Center received electricity.
21st 18:22 White smoke generated. The smoke died down and almost invisible at 07:11 March 22nd.
22nd 16:07 Injection of around 18 tons of seawater to SFP
25th 10:30～12:19 Sea water injection to SFP via FPC
26th 10:10 Started to inject fresh water to the Reactor Core.
26th 16:46 Lighting in the Central Control Room was recovered.
27th 18:31 Switched to the water injection to the core using the temporary motor-driven pump.
29th 16:30～18:25 Switched to the temporary motor-driven pump injecting fresh water to SFP.
29th 16:45～1st 11:50 *Transferred the water from the Condensate Storage Tank (CST) to the* Surge Tank of Suppression Pool Water (SPT)
30th 9:25～23:50 Confirmed malfunction of the temporary motor-driven pump injecting fresh water to SFP(9:45). Switched to the injection using the fire pump Truck, but suspended as cracks were confirmed in the hose. (12:47, 13:10) Resumed injection of fresh water(19:05)
1st 14:56～17:05 Injection of fresh water from FPC to SFP using the temporary motor-driven pump.
2nd around 9:30 The water, of which the dose rate was at the level of more than 1,000mSv/h, was confirmed to be collected in the pit located near the Intake Channel of Unit 2. The outflow from the lateral surface of the pit into the sea was also confirmed.
2nd 17:10 Started to transfer the water from the Condenser to the Condensate Storage Tank (CST).
3rd 12:12 The power supply to the temporary motor-driven pump was switched from the temporary power supply to the external power supply.
3rd 13:47～14:30 20 bags of sawdust, 80 bags of high polymer absorbent and 3 bags of cutting-processed newspaper were put into the Pit for the Conduit.
4th 7:08～7:11 Approximately 13kg of tracer (bath agent) was put in from the Pit for the Duct for Seawater Pipe.
4th 11:05～13:37 Injection of fresh water from FPC to SFP using the temporary motor-driven pump.
5th 14:15 Tracer is confirmed to outflow through the permeable layer around the pit into the sea.
15:07 Started to inject coagulant.
6th around 5:38 The water outflow from the lateral surface of the pit was confirmed to stopped.
7th 13:29～14:34 *Freshwater injection to SFP via FPC (Around 36 ton)*
9th 13:10 Completed transferring the water from the Condenser to CST.
10th 10:37～12:38 Freshwater injection to SFP via FPC using the temporary motor-driven pump (Around 60 ton).

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 3

(As of 02:00 April 11th, 2011)



*1 Residual Heat Removal System
*2 Emergency Diesel Generator
*3 Primary Containment Vessel
*4 Suppression Pool

Current Conditions : Fresh water is being injected to the Spent Fuel Pool and the Reactor Core

Major Events after the earthquake

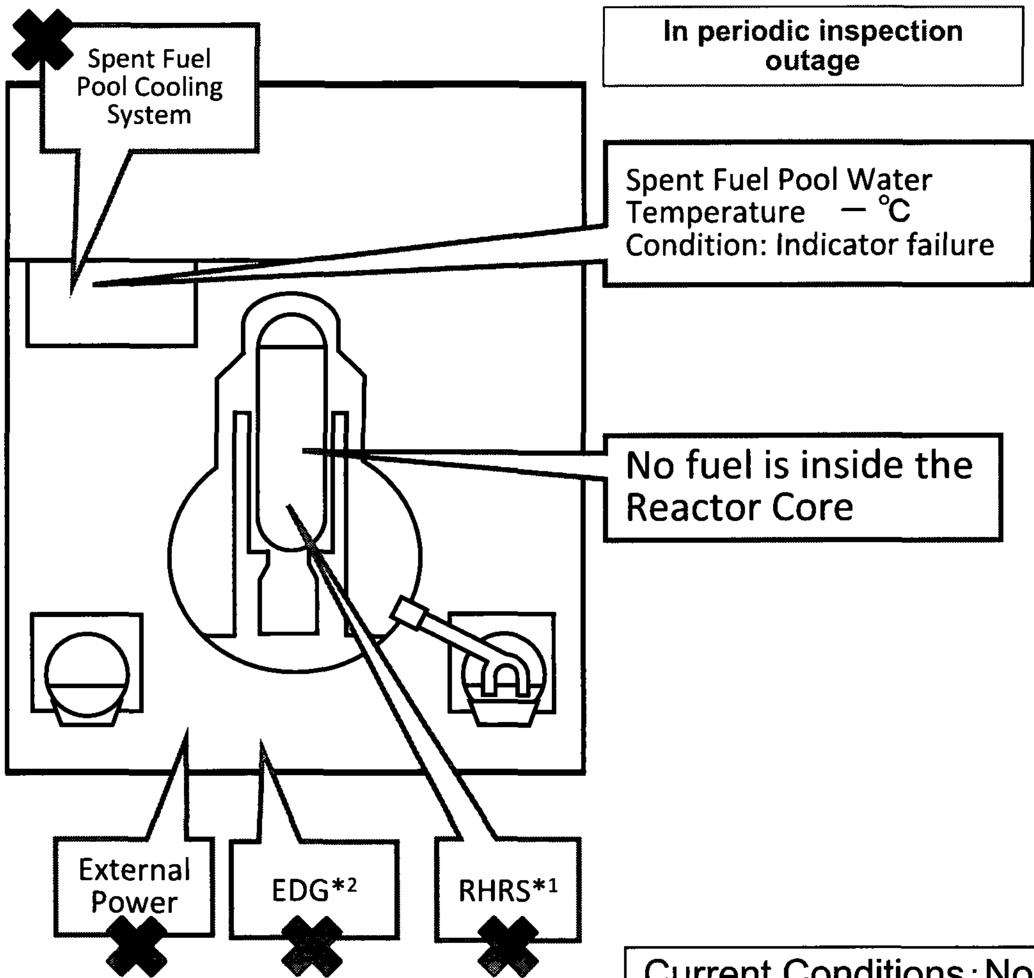
- 11th 14:46 Under operation, Automatic shutdown by the earthquake
- 11th 15:42 Report based on the Article 10 (Total loss of A/C power)
- 13th 05:10 Occurrence of the Article 15 event (Inability of water injection of the Emergency Core Cooling System)
- 13th 08:41 Started to vent.
- 13th 13:12 Started to inject seawater and borated water to the Reactor Core.
- 14th 05:20 Started to vent.
- 14th 07:44 Occurrence of the Article 15 event (Unusual rise of the pressure in PCV)
- 14th 11:01 Sound of explosion
- 16th around 08:30 White smoke generated.
- 17th 09:48∼10:01 Water discharge by the helicopters of Self-Defense Force
- 17th 19:05∼19:15 Water spray from the ground by High pressure water-cannon trucks of Police
- 17th 19:35∼20:09 Water spray from the ground by fire engines of Self-Defense Force
- 18th before 14:00∼14:38 Water spray from the ground by 6 fire engines of Self-Defense Force
- 18th ∼14:45 Water spray from the ground by a fire engine of the US Military
- 19th *00:30 ∼01:10 Water spray by Hyper Rescue Unit of Tokyo Fire Department*
- 19th 14:10 ∼ 20th 03:40 Water spray by Hyper Rescue Unit of Tokyo Fire Department
- 20th 11:00 Pressure of PCV rose(320kPa).Afterward fell.
- 20th 21:36 ∼ 21st 03:58 Water spray by Hyper Rescue Unit of Tokyo Fire Department
- 21st around 15:55 Grayish smoke generated and was confirmed to be died down at 17:55.
- 22nd 15:10 ∼16:00 Water spray by Hyper Rescue Unit of Tokyo Fire Department and Osaka City Fire Bureau.
- 22nd 22:46 Lighting in the Central Control Room was recovered.
- 23rd 11:03 ∼13:20 Injection of about 35 ton of sea water to the Spent Fuel Pool (SFP) via the Fuel Pool Cooling Line (FPC)
- 23rd around 16:20 Black smoke generated and was confirmed to died down at around 23:30 and 24th 04:50.
- 24th 05:35∼16:05 Injection of around 120 ton of sea water to SFP via FPC
- 25th 13:28∼16:00 Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department
- 25th 18:02 Started fresh water injection to the core.
- 27th 12:34∼14:36 Water spray by Concrete Pump Truck
- 28th 17:40∼31st around 8:40 Transferring the water from the Condensate Storage Tank (CST) to the Surge Tank of Suppression Pool Water (SPT)
- 28th 20:30 Switched to the water injection to the core using a temporary motor-driven pump.

<Water spray by Concrete Pump Truck (Fresh water)>

- 29th 14:17∼18:18, 31st 16:30∼19:33, 2nd 09:52∼12:54, 4th 17:03∼19:19, 7th 06:53 ∼08:53, 8th 17:06∼20:00
- 3rd 12:18 The power supply to the temporary motor-driven pump was switched from the temporary power supply to the external power supply.

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 4
(As of 02:00 April 11th, 2011)



*1 Residual Heat Removal System

*2 Emergency Diesel Generator

*3 Reactor Pressure Vessel

Major events after the earthquake

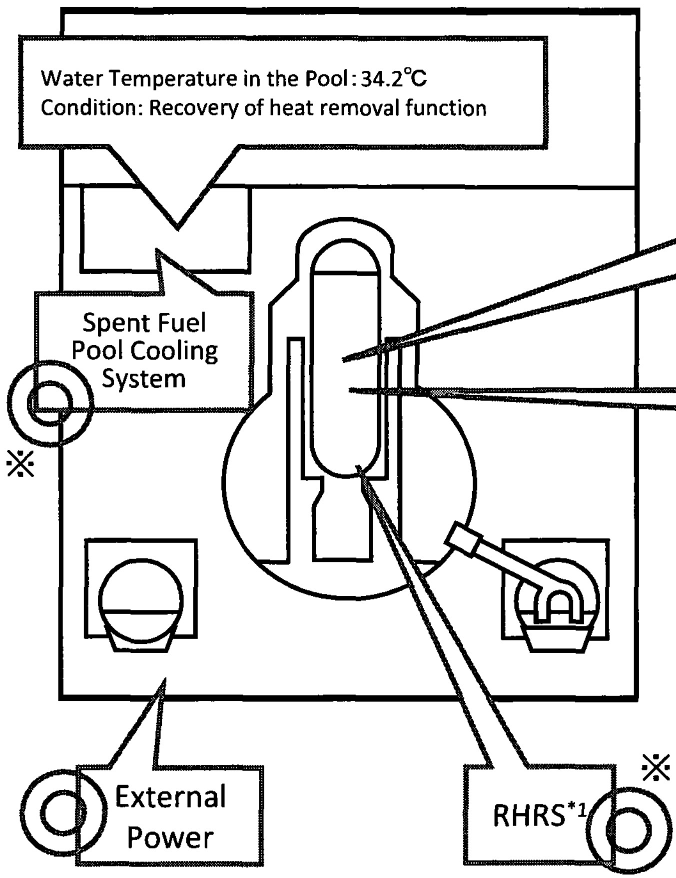
In periodic inspection outage when the earthquake occurred
14th 04:08 Water temperature in the Spent Fuel Pool (SFP), 84°C
15th 06:14 Confirmed the partial damage of wall in the 4th floor.
15th 09:38 Fire occurred in the 3rd floor. (12:25 extinguished)
16th 05:45 Fire occurred. TEPCO couldn't confirm any fire on the ground. (06:15)
20th 08:21～09:40 Water spray over SFP by Self-Defense Force
20th around 18:30～19:46 Water spray over SFP by Self-Defense Force
21st 06:37～08:41 Water spray over SFP by Self-Defense Force
21st around 15:00 Work for laying cable to Power Center was completed.
22nd 10:35 Power Center received electricity.
<Water spray by Concrete Pump Truck>
22nd 17:17～20:32, 23rd 10:00～13:02, 24th 14:36～17:30, 25th 19:05～22:07, 27th 16:55～19:25
5th 06:05～10:20 Sea water injection to SFP via the Fuel Pool Cooling Line (FPC)
29th 11:50 Lighting in the Central Control Room was recovered.
< Water spray by Concrete Pump Truck (Fresh water)>
30th 14:04～18:33, 1st 08:28～14:14, 3rd 17:14～22:16, 5th 17:35～18:22, 7th 18:23～19:40, 9th 17:07～19:24

Current Conditions: No fuel is in RPV*3.
Fresh water is being injected to the Spent Fuel Pool.

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 5
(As of 02:00 April 11th, 2011)

In periodic inspection outage



*1 Residual Heat Removal System

Reactor Pressure : 0.108MPa*
Reactor Water Level : 1,974mm
Reactor Water Temperature : 36.3℃
Condition : Pressure is under control.
*converted to absolute pressure

Reactor Pressure Vessel Temperature:
Monitoring by Reactor Water Temperature

※Heat removal was carried out alternately with the water in the Reactor Core and in the Spent Fuel Pool.

Current Conditions :

20th 14:30 Cold shutdown

21st 11:36 Receiving electricity from external power supply

23rd 17:24 Pump for Residual Heat Removal Seawater System (RHRS) was automatically stopped when the power supply was switched from the temporary to the permanent.

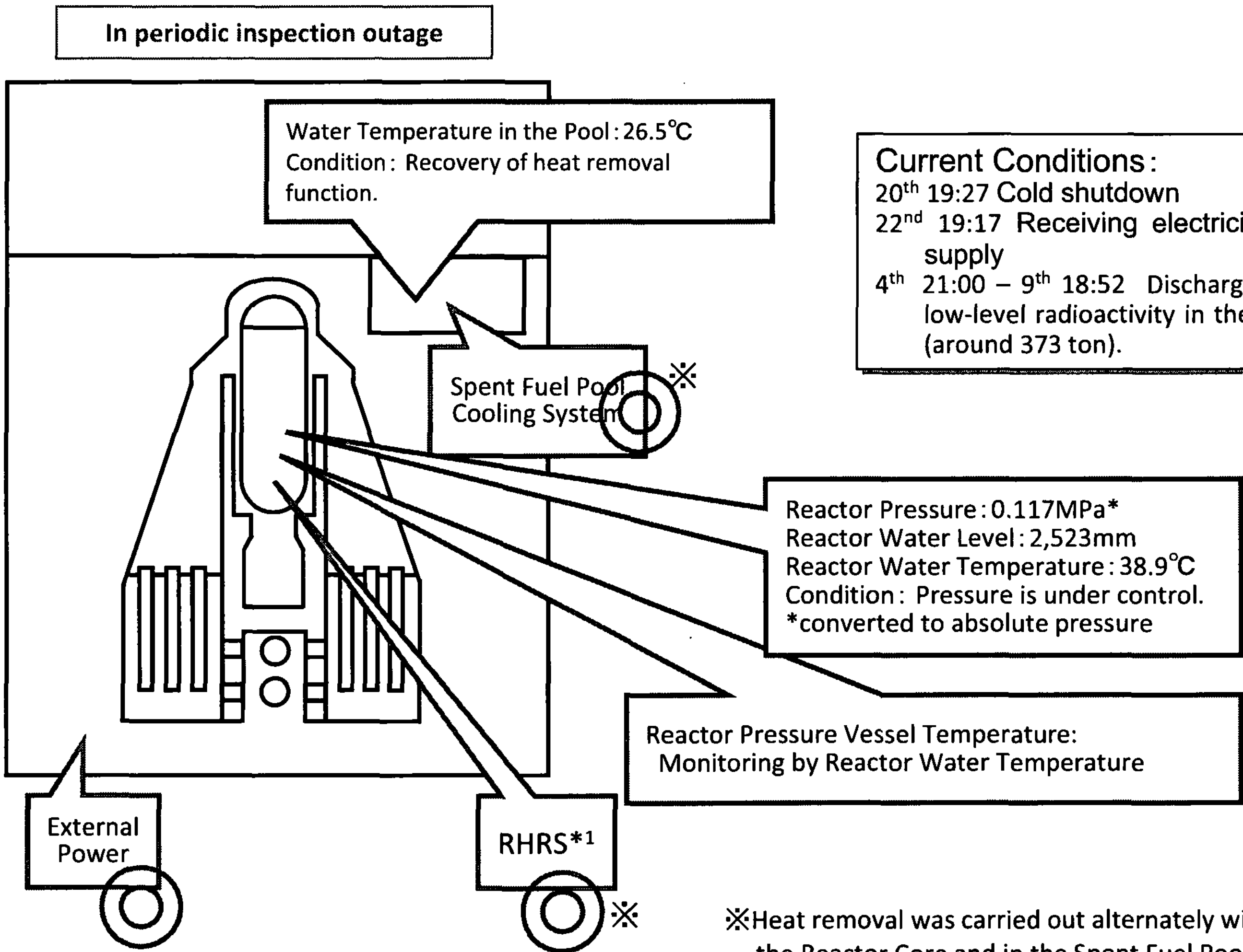
24th 16:14 Repair of the RHRS pump was completed.

24th 16:35 Started to cooling.

4th 21:00 – 8th 12:14 Discharged the groundwater with low-level radioactivity in the Sub Drain Pit to the sea (around 950 ton).

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 6
(As of 02:00 April 11th, 2011)



Current Conditions :

20th 19:27 Cold shutdown

22nd 19:17 Receiving electricity from external power supply

4th 21:00 – 9th 18:52 Discharged the groundwater with low-level radioactivity in the Sub Drain Pit to the sea (around 373 ton).

※Heat removal was carried out alternately with the water in the Reactor Core and in the Spent Fuel Pool.

*1 Residual Heat Removal System

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

News Release

経済産業省
Ministry of Economy, Trade and Industry

Extract

April 16, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 96th Release)
(As of 08:00 April 16th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)

● Fukushima Dai-ichi NPS

- Fresh water spray of around 140t for Unit 4 using Concrete Pump Truck (50t/h) was started (From 14:30 till 18:29 April 15th)
- 3 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 3 and the Inlet Screen Pump Room of Unit 4. (From 14:30 till 15:45 April 15th)
- Temporary boards to stop water (4 steel plates out of 7) were installed on the ocean-side of the Inlet Bar Screen of Unit 2. (From 9:00 till 14:15 April 15th)
- The test implementation of spraying antiscattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 on the mountain-side of the Common Pool. (From 11:30 till 13:00 April 15th)
- Removal of rubble (Amount equivalent to a container) using remote-control heavy machineries was carried out. (From 09:00 till 15:45 April 15th)
- As a countermeasure for tsunami, the distribution boards, etc. for the pumps injecting water to the reactors of Units 1 to 3 were transferred to a hill. (From 10:19 till 17:00 April 15)

2. Actions taken by NISA

- NISA directed General Electricity Utilities and other organizations concerned to consider the measures to ensure reliability on external power supply due to the temporary loss of external power supply at NPSs, etc. caused by ground faults in part of electric power system when the earthquake off the coast of Miyagi Prefecture occurred on April 7, 2011.

2011/4/12 11:30

April 11th, 2011

Fukushima Dai-ichi Monitoring points

① North side of main office building(approx. 0.5km from Unit 2 in northwest direction)
② Near Gymnasium(East side of MP-5) (approx. 0.9km from Unit 2 in westnorthwest direction)
③ Near West Gate (near MP-5) (approx. 1.1km from Unit 2 in west direction)
④ Front of near Main Gate (near MP-6) (approx. 1.0km from Unit 2 in westsouthwest direction)
⑤ Front of Earthquake Isolation Building (approx. 0.5km from Unit2 in northwest dirction)
⑥ South side of main office building
⑦ Main Gate
MC: Monitoring Car TM: Transportable Monitoring post

Monitoring points		③																							
Reading time		12:00	12:10	12:20	12:30	12:40	12:50	13:00	13:10	13:20	13:30	13:40	13:50	14:00	14:10	14:20	14:30	14:40	14:50	15:00	15:10	15:20	15:30	15:40	15:50
MC	Reading(μSv/h)	44.4	44.4	44.4	44.4	44.4	44.4	44.3	44.3	44.3	44.2	44.4	44.3	44.3	44.2	44.2	44.2	44.1	44.1	44.2					
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND					
TM	⑥SMOB(μSv/h)*1	584	–	–	585	–	–	583	–	–	583	–	–	586	–	–	584	–	–	588					
	⑦MG(μSv/h)*2	82	–	–	83	–	–	82	–	–	81	–	–	81	–	–	82	–	–	80					
	③WG(μSv/h)*3	35	–	–	34	–	–	34	–	–	34	–	–	34	–	–	34	–	–	35					
wind direction		E	NE	N	NE	SW	NE	ENE	NE	W	N	E	NE	N	NE	W	NE	N	NW	NW					
wind speed (m/s)		2.2	1.9	1.3	1.2	1.2	1.3	1.4	1.3	0.9	0.9	1.1	1.0	1.0	1.1	1.0	1.0	1.2	1.2	1.5					

*1: SMOB : South Side of Main Office Building
*2: MG: Main Gate
*3: WG:West Gate

Monitoring points		③																							
Reading time		16:00	16:10	16:20	16:30	16:40	16:50	17:00	17:10	17:20	17:30	17:40	17:50	18:00	18:10	18:20	18:30	18:40	18:50	19:00	19:10	19:20	19:30	19:40	19:50
MC	Reading(μSv/h)																								
	neutron																								
TM	⑥SMOB(μSv/h)*1																								
	⑦MG(μSv/h)*2																								
	③WG(μSv/h)*3																								
wind direction																									
wind speed (m/s)																									

Monitoring points		③																							
Reading time		20:00	20:10	20:20	20:30	20:40	20:50	21:00	21:10	21:20	21:30	21:40	21:50	22:00	22:10	22:20	22:30	22:40	22:50	23:00	23:10	23:20	23:30	23:40	23:50
MC	Reading(μSv/h)																								
	neutron																								
TM	⑥SMOB(μSv/h)*1																								
	⑦MG(μSv/h)*2																								
	③WG(μSv/h)*3																								
wind direction																									
wind speed (m/s)																									

April 11th, 2011

Fukushima Dai-ichi Monitoring points

① North side of main office building(approx. 0.5km from Unit 2 in northwest direction)
② Near Gymnasium(East side of MP-5) (approx. 0.9km from Unit 2 in westnorthwest direction)
③ Near West Gate (near MP-5) (approx. 1.1km from Unit 2 in west direction)
④ Front of near Main Gate (near MP-6) (approx. 1.0km from Unit 2 in westsouthwest direction)
⑤ Front of Earthquake Isolation Building (approx. 0.5km from Unit2 in northwest dirction)
⑥ South side of main office building
⑦ Main Gate
MC: Monitoring Car TM: Transportable Monitoring post

Monitoring points		③																							
Reading time		0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MC	Reading(μSv/h)	45.7	45.8	45.7	45.9	45.6	45.7	45.6	45.6	45.5	45.6	45.5	45.7	45.5	45.5	45.5	45.4	45.5	45.4	45.3	45.3	45.4	45.4	45.3	45.2
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μSv/h)*1	612	–	–	614	–	–	613	–	–	612	–	–	612	–	–	610	–	–	614	–	–	610	–	–
	⑦MG(μSv/h)*2	84	–	–	83	–	–	83	–	–	83	–	–	83	–	–	83	–	–	83	–	–	82	–	–
	③WG(μSv/h)*3	36	–	–	36	–	–	35	–	–	35	–	–	36	–	–	36	–	–	36	–	–	36	–	–
wind direction		E	NW	SSE	W	NW	NNE	NW	ENE	W	WNW	WNW	WNW	SW	W	WNW	W	WSW	WSW	WSW	W	W	W	WSW	WNW
wind speed (m/s)		0.4	0.4	0.5	0.4	0.5	0.5	0.4	0.3	0.5	0.6	0.6	0.8	0.6	0.6	0.8	0.8	0.6	0.8	0.7	0.6	0.6	0.7	0.8	0.6

*1: SMOB : South Side of Main Office Building
*2: MG: Main Gate
*3: WG:West Gate

Monitoring points		③																							
Reading time		4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:.00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MC	Reading(μSv/h)	45.2	45.3	45.3	45.1	45.2	45.1	45.2	45.1	45.1	45.1	45.1	44.9	44.8	44.8	45.1	45.0	44.9	45.1	44.9	45.1	45.1	46.1	46.1	46.1
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μSv/h)*1	610	–	–	611	–	–	610	–	–	610	–	–	609	–	–	608	–	–	609	–	–	609	–	–
	⑦MG(μSv/h)*2	83	–	–	82	–	–	83	–	–	82	–	–	83	–	–	82	–	–	83	–	–	84	–	–
	③WG(μSv/h)*3	36	–	–	36	–	–	36	–	–	36	–	–	36	–	–	36	–	–	36	–	–	35	–	–
wind direction		N	NNW	S	WNW	NW	W	W	SW	W	W	WSW	W	WSW	WSW	W	W	W	N	N	N	S	E	E	E
wind speed (m/s)		0.5	0.4	0.4	0.3	0.4	0.5	0.3	0.3	0.4	0.7	0.7	0.6	0.4	0.6	0.6	0.6	0.7	0.5	0.7	0.6	0.7	0.6	0.9	0.9

Monitoring points		③																							
Reading time		8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MC	Reading(μSv/h)	46.4	45.6	45.6	45.4	45.4	46.2	45.2	45.2	45.3	45.2	45.1	44.9	45.1	45.1	44.8	44.7	45.1	44.8	44.8	44.8	44.8	44.8	44.7	44.8
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μSv/h)*1	610	–	–	603	–	–	603	–	–	596	–	–	594	–	–	594	–	–	591	–	–	592	–	–
	⑦MG(μSv/h)*2	84	–	–	82	–	–	83	–	–	84	–	–	82	–	–	85	–	–	84	–	–	82	–	–
	③WG(μSv/h)*3	37	–	–	36	–	–	36	–	–	35	–	–	35	–	–	35	–	–	35	–	–	35	–	–
wind direction		E	ENE	SSW	E	ESE	E	E	E	SE	SE	E	ESE	ESE	E	E	ESE	E	E	SE	E	ESE	ESE	E	NW
wind speed (m/s)		0.7	0.8	0.8	0.6	1.4	2.4	1.6	1.4	1.3	1.6	1.4	1.5	2.3	2.6	2.0	1.9	1.7	2.1	1.2	1.2	1.6	2.3	1.8	1.6

April 10th, 2011

Fukushima Dai-ichi Monitoring points

① North side of main office building(approx. 0.5km from Unit 2 in northwest direction)
② Near Gymnasium(East side of MP-5) (approx. 0.9km from Unit 2 in westnorthwest direction)
③ Near West Gate (near MP-5) (approx. 1.1km from Unit 2 in west direction)
④ Front of near Main Gate (near MP-6) (approx. 1.0km from Unit 2 in westsouthwest direction)
⑤ Front of Earthquake Isolation Building (approx. 0.5km from Unit2 in northwest dirction)
⑥ South side of main office building
⑦ Main Gate
MC: Monitoring Car TM: Transportable Monitoring post

Monitoring points	③																							
Reading time	12:00	12:10	12:20	12:30	12:40	12:50	13:00	13:10	13:20	13:30	13:40	13:50	14:00	14:10	14:20	14:30	14:40	14:50	15:00	15:10	15:20	15:30	15:40	15:50
MC Reading(μSv/h)	47.1	46.8	47.1	47.0	46.9	46.8	46.9	46.8	46.9	46.8	47.0	46.8	46.7	46.7	46.8	46.8	46.7	46.6	46.7	46.7	46.6	46.8	46.6	46.6
MC neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM ⑥SMOB(μSv/h)*1	602	-	-	605	-	-	600	-	-	601	-	-	602	-	-	598	-	-	598	-	-	596	-	-
TM ⑦MG(μSv/h)*2	88	-	-	87	-	-	88	-	-	86	-	-	84	-	-	87	-	-	87	-	-	85	-	-
TM ③WG(μSv/h)*3	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-
wind direction	ESE	NE	E	E	E	ESE	ESE	ESE	ESE	SE	SE	SE	SE	SE	ESE	ESE	SSE	SSE	S	ESE	E	ESE	NE	ESE
wind speed (m/s)	2.7	2.3	2.4	2.5	2.0	2.3	2.8	2.4	3.5	2.7	2.2	2.7	2.9	3.0	2.3	2.2	2.6	2.2	2.1	2.5	2.8	2.0	2.5	2.2

*1: SMOB : South Side of Main Office Building
*2: MG: Main Gate
*3: WG:West Gate

Monitoring points	③																							
Reading time	16:00	16:10	16:20	16:30	16:40	16:50	17:00	17:10	17:20	17:30	17:40	17:50	18:00	18:10	18:20	18:30	18:40	18:50	19:00	19:10	19:20	19:30	19:40	19:50
MC Reading(μSv/h)	46.6	46.5	46.5	46.6	46.6	46.5	46.5	46.5	46.5	46.5	46.4	46.4	46.5	46.4	46.3	46.3	46.3	46.3	46.3	46.2	46.3	46.1	46.2	46.2
MC neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM ⑥SMOB(μSv/h)*1	598	-	-	597	-	-	598	-	-	601	-	-	598	-	-	601	-	-	604	-	-	605	-	-
TM ⑦MG(μSv/h)*2	86	-	-	86	-	-	86	-	-	85	-	-	86	-	-	85	-	-	84	-	-	84	-	-
TM ③WG(μSv/h)*3	35	-	-	35	-	-	35	-	-	35	-	-	35	-	-	35	-	-	35	-	-	36	-	-
wind direction	E	SE	E	ESE	SSE	E	SSE	S	S	SE	SSE	SSW	ESE	E	S	SW	SSW	SE	WSW	SSE	W	S	S	WSW
wind speed (m/s)	2.4	1.9	2.0	2.1	1.5	1.5	1.6	1.3	1.3	1.1	1.0	1.4	0.9	0.9	0.8	0.7	0.5	0.4	0.5	0.4	0.3	0.4	0.4	0.4

Monitoring points	③																							
Reading time	20:00	20:10	20:20	20:30	20:40	20:50	21:00	21:10	21:20	21:30	21:40	21:50	22:00	22:10	22:20	22:30	22:40	22:50	23:00	23:10	23:20	23:30	23:40	23:50
MC Reading(μSv/h)	46.2	46.2	46.1	46.0	46.0	45.9	45.9	45.9	46.0	46.0	45.9	45.9	45.9	45.9	45.8	45.8	45.9	45.8	45.8	45.8	45.7	45.8	45.7	45.6
MC neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM ⑥SMOB(μSv/h)*1	606	-	-	611	-	-	610	-	-	611	-	-	611	-	-	612	-	-	612	-	-	612	-	-
TM ⑦MG(μSv/h)*2	83	-	-	83	-	-	85	-	-	85	-	-	84	-	-	83	-	-	82	-	-	84	-	-
TM ③WG(μSv/h)*3	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-	36	-	-
wind direction	WSW	WSW	SW	W	S	WSW	WSW	W	SSE	WSW	WSW	SW	SE	WSW	SSW	WSW	WSW	SW	WSW	W	S	S	NE	NNE
wind speed (m/s)	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.3	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.6	0.6	0.6	0.5	0.4	0.3	0.3	0.3

April 10th, 2011

Fukushima Dai-ichi Monitoring points

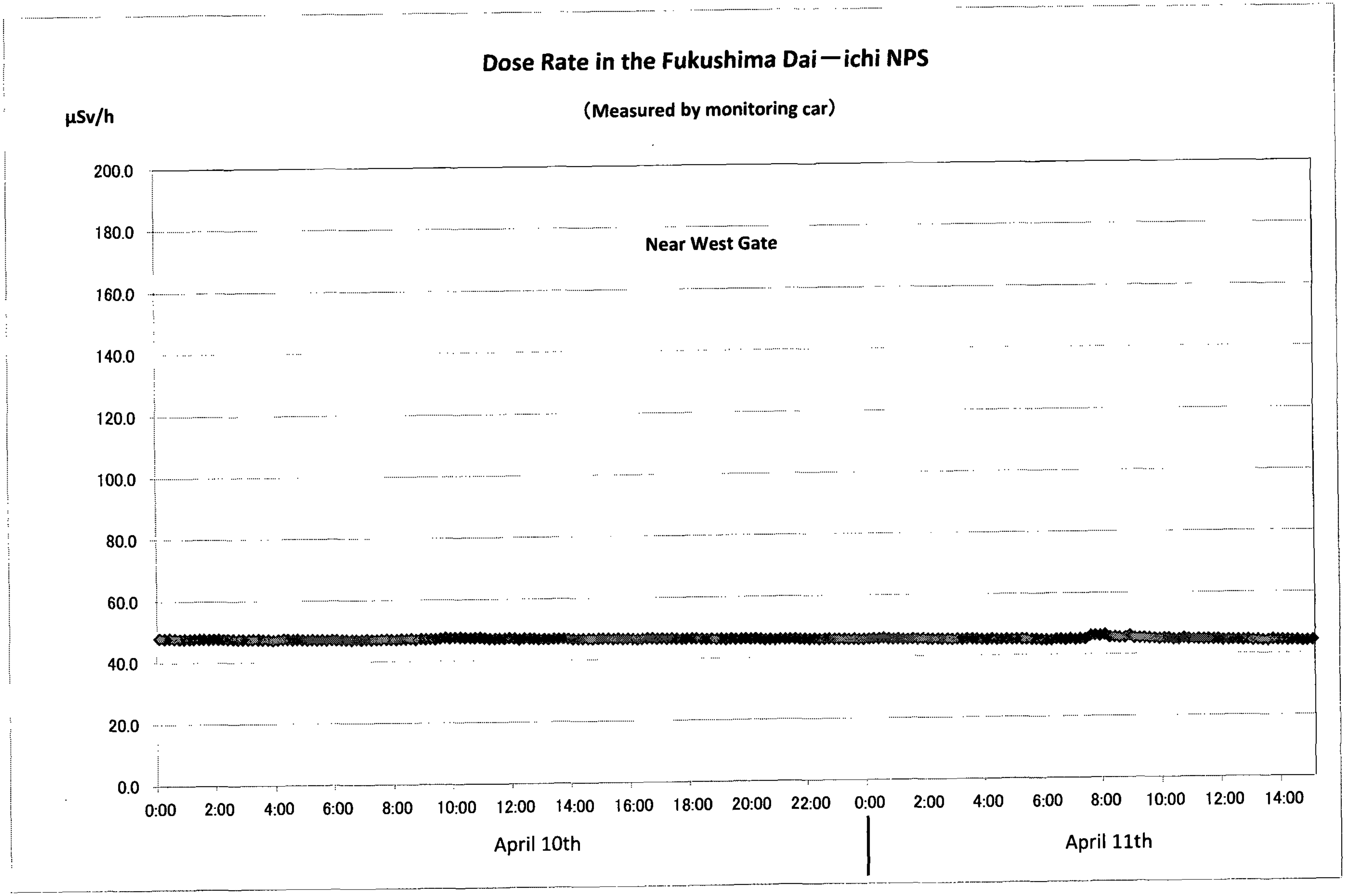
① North side of main office building(approx. 0.5km from Unit 2 in northwest direction)
② Near Gymnasium(East side of MP-5) (approx. 0.9km from Unit 2 in westnorthwest direction)
③ Near West Gate (near MP-5) (approx. 1.1km from Unit 2 in west direction)
④ Front of near Main Gate (near MP-6) (approx. 1.0km from Unit 2 in westsouthwest direction)
⑤ Front of Earthquake Isolation Building (approx. 0.5km from Unit2 in northwest dirction)
⑥ South side of main office building
⑦ Main Gate
MC: Monitoring Car　TM: Transportable Monitoring post

Monitoring points		③																							
Reading time		0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MC	Reading(μSv/h)	47.9	47.8	47.8	47.8	47.6	47.7	47.7	47.7	47.7	47.7	47.6	47.7	47.6	47.6	47.6	47.6	47.4	47.4	47.4	47.4	47.5	47.3	47.3	47.2
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μSv/h)*1	620	-	-	620	-	-	623	-	-	622	-	-	623	-	-	621	-	-	621	-	-	618	-	-
	⑦MG(μSv/h)*2	87	-	-	86	-	-	86	-	-	86	-	-	86	-	-	86	-	-	86	-	-	87	-	-
	③WG(μSv/h)*3	37	-	-	38	-	-	38	-	-	37	-	-	37	-	-	37	-	-	37	-	-	37	-	-
wind direction		S	NNW	WNW	WSW	WSW	SW	WSW	WSW	SSW	SW	SW	S	WNW	NW	W	NW	WNW	WNW	W	W	WSW	NW	W	WNW
wind speed (m/s)		0.4	0.3	0.4	0.4	0.6	0.6	0.4	0.4	0.2	0.3	0.4	0.3	0.5	0.4	2.0	0.3	0.4	0.4	0.5	0.4	0.5	0.6	0.6	0.5

*1: SMOB : South Side of Main Office Building
*2: MG: Main Gate
*3: WG:West Gate

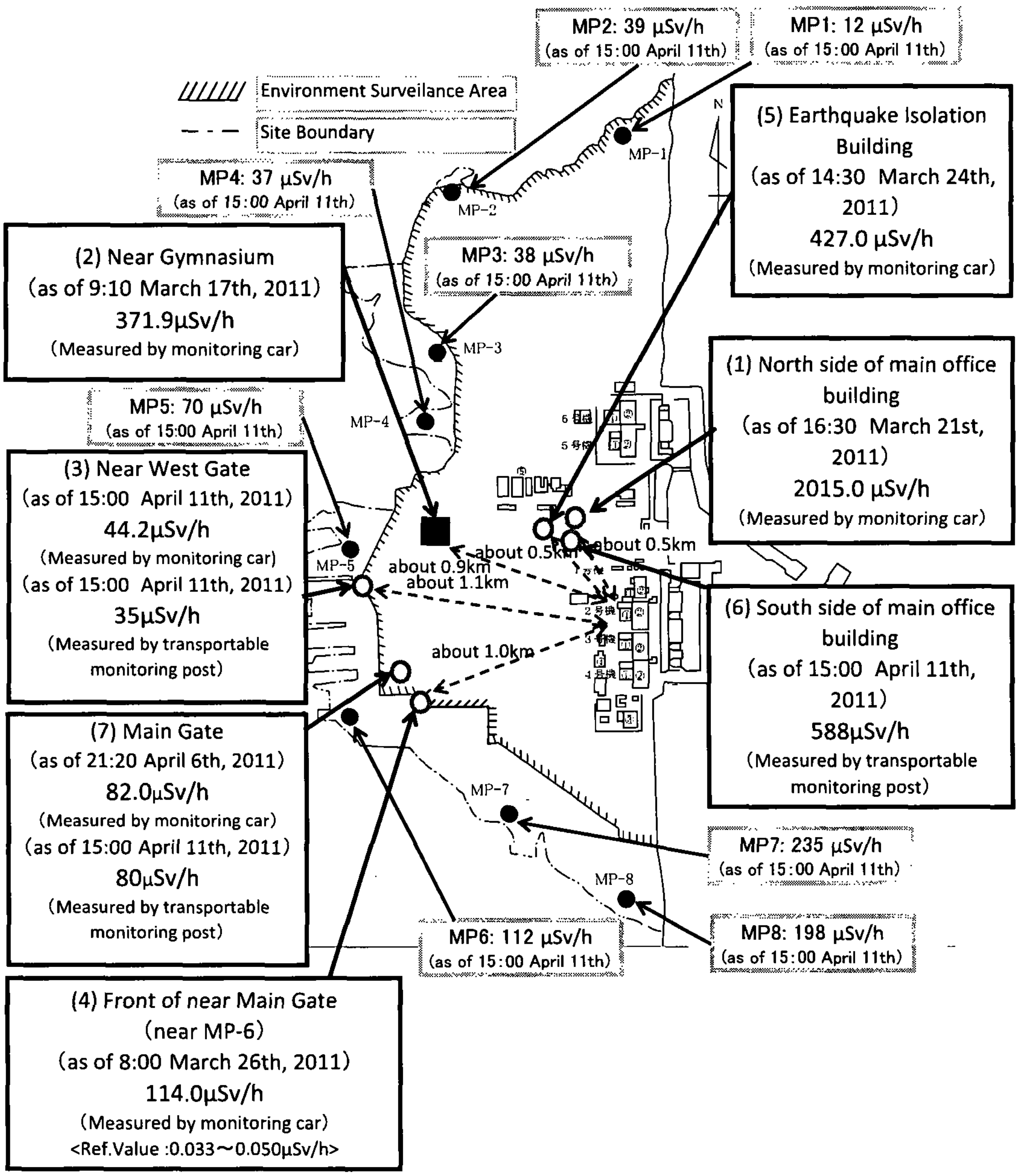
Monitoring points		③																							
Reading time		4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MC	Reading(μSv/h)	47.3	47.4	47.3	47.2	47.3	47.2	47.2	47.2	47.2	47.2	47.2	47.1	47.1	47.1	47.1	47.0	47.1	47.0	47.1	47.1	47.0	47.1	47.1	47.1
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μSv/h)*1	622	-	-	621	-	-	619	-	-	619	-	-	622	-	-	622	-	-	621	-	-	621	-	-
	⑦MG(μSv/h)*2	85	-	-	86	-	-	86	-	-	85	-	-	87	-	-	86	-	-	86	-	-	85	-	-
	③WG(μSv/h)*3	37	-	-	37	-	-	37	-	-	37	-	-	38	-	-	37	-	-	37	-	-	37	-	-
wind direction		WNW	W	W	W	WSW	SW	WSW	W	WSW	WSW	W	W	W	W	WNW	SW	WSW	W	NW	N	N	ENE	NE	SE
wind speed (m/s)		0.5	0.5	0.8	0.9	0.7	0.7	0.8	0.7	0.6	0.5	0.6	0.7	0.5	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.6	0.9	0.7	0.8

Monitoring points		③																							
Reading time		8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MC	Reading(μSv/h)	47.0	47.1	47.2	47.2	47.0	47.1	47.1	47.1	47.1	47.3	47.6	47.4	47.6	47.6	47.4	47.3	47.4	47.4	47.2	47.1	47.1	47.1	47.1	47.1
	neutron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TM	⑥SMOB(μSv/h)*1	617	-	-	615	-	-	611	-	-	610	-	-	607	-	-	609	-	-	602			605	-	-
	⑦MG(μSv/h)*2	86	-	-	86	-	-	85	-	-	85	-	-	85	-	-	85	-	-	86			86	-	-
	③WG(μSv/h)*3	37	-	-	37	-	-	37	-	-	37	-	-	37	-	-	37	-	-	36			37	-	-
wind direction		NE	E	E	ESE	SE	E	NE	ESE	E	NE	SE	NE	NE	E	E	ESE	E	NE	E	SSE	E	ESE	ESE	ESE
wind speed (m/s)		0.7	1.9	2.3	2.1	2.4	1.3	1.6	1.7	2.4	1.9	2.0	2.4	2.3	2.4	2.6	2.0	2.2	2.5	2.0	2.7	2.0	2.2	2.8	2.8


Dose Rate in the Fukushima Dai－ichi NPS
（Measured by monitoring car）
μSv/h
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Near West Gate
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
April 10th
April 11th

Fukushima Dai−ichi NPS

as of 17:00, April 11th, 2011



Fukushima Dai-ni (TEPCO's Monitaring Post)

April 11, 2011																								
monitoring point	12:00	12:10	12:20	12:30	12:40	12:50	13:00	13:10	13:20	13:30	13:40	13:50	14:00	14:10	14:20	14:30	14:40	14:50	15:00	15:10	15:20	15:30	15:40	15:50
MP1 (μ Sv/h)	3.293	3.296	3.300	3.277	3.285	3.271	3.280	3.276	3.274	3.269	3.266	3.282	3.267	3.290	3.294	3.305	3.291	3.282	3.273					
MP2 (μ Sv/h)	2.477	2.472	2.469	2.456	2.462	2.462	2.473	2.453	2.454	2.459	2.453	2.466	2.459	2.465	2.477	2.491	2.461	2.466	2.455					
MP3 (μ Sv/h)	3.532	3.542	3.527	3.527	3.524	3.519	3.527	3.526	3.538	3.525	3.518	3.529	3.510	3.527	3.540	3.536	3.527	3.514	3.527					
MP4 (μ Sv/h)	2.759	2.770	2.763	2.753	2.755	2.762	2.774	2.765	2.765	2.766	2.761	2.751	2.769	2.771	2.751	2.768	2.753	2.759	2.755					
MP5 (μ Sv/h)	2.792	2.781	2.780	2.786	2.795	2.773	2.761	2.771	2.766	2.780	2.773	2.761	2.772	2.774	2.786	2.786	2.769	2.701	2.663					
MP6 (μ Sv/h)	2.758	2.756	2.748	2.742	2.751	2.746	2.739	2.741	2.751	2.732	2.755	2.732	2.735	2.730	2.735	2.746	2.736	2.742	2.716					
MP7 (μ Sv/h)	1.960	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1					
wind direction	SSE	SSE	SSE	NNE	NNE	NNE	NNE	NNE	N	NNE	NNE	NNE	NNE	N	N	N	N	NNW	N					
wind speed (m/s)	4.4	3.5	2.6	6.8	6.8	8.3	9.1	5.7	5.8	5.1	6.1	3.8	6.0	4.0	6.3	4.2	5.5	3.3	2.0					

*1: NM: Not measured due to the malfunction

April 11, 2011																								
monitoring point	16:00	16:10	16:20	16:30	16:40	16:50	17:00	17:10	17:20	17:30	17:40	17:50	18:00	18:10	18:20	18:30	18:40	18:50	19:00	19:10	19:20	19:30	19:40	19:50
MP1 (μ Sv/h)																								
MP2 (μ Sv/h)																								
MP3 (μ Sv/h)																								
MP4 (μ Sv/h)																								
MP5 (μ Sv/h)																								
MP6 (μ Sv/h)																								
MP7 (μ Sv/h)																								
wind direction																								
wind speed (m/s)																								

April 11, 2011																								
monitoring point	20:00	20:10	20:20	20:30	20:40	20:50	21:00	21:10	21:20	21:30	21:40	21:50	22:00	22:10	22:20	22:30	22:40	22:50	23:00	23:10	23:20	23:30	23:40	23:50
MP1 (μ Sv/h)																								
MP2 (μ Sv/h)																								
MP3 (μ Sv/h)																								
MP4 (μ Sv/h)																								
MP5 (μ Sv/h)																								
MP6 (μ Sv/h)																								
MP7 (μ Sv/h)																								
wind direction																								
wind speed (m/s)																								

2011/4/12 11:30

Fukushima Dai-ni (TEPCO's Monitaring Post)

April 11, 2011																								
monitoring point	0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MP1(μSv/h)	3.340	3.331	3.324	3.341	3.333	3.337	3.342	3.358	3.327	3.329	3.319	3.330	3.328	3.333	3.332	3.337	3.323	3.339	3.325	3.318	3.318	3.311	3.316	3.324
MP2(μSv/h)	2.492	2.483	2.499	2.500	2.504	2.505	2.496	2.502	2.491	2.503	2.488	2.491	2.503	2.486	2.486	2.490	2.483	2.478	2.495	2.497	2.486	2.483	2.484	2.494
MP3(μSv/h)	3.594	3.573	3.600	3.578	3.588	3.586	3.587	3.584	3.608	3.586	3.587	3.580	3.578	3.566	3.589	3.576	3.579	3.583	3.573	3.564	3.577	3.571	3.579	3.556
MP4(μSv/h)	2.814	2.812	2.822	2.826	2.811	2.800	2.795	2.814	2.806	2.805	2.802	2.818	2.817	2.815	2.807	2.791	2.795	2.803	2.800	2.801	2.812	2.803	2.786	2.797
MP5(μSv/h)	2.834	2.830	2.823	2.820	2.828	2.816	2.809	2.810	2.814	2.825	2.805	2.804	2.814	2.803	2.803	2.799	2.831	2.806	2.807	2.816	2.795	2.824	2.800	2.804
MP6(μSv/h)	2.770	2.773	2.765	2.767	2.763	2.778	2.765	2.779	2.770	2.782	2.751	2.779	2.763	2.759	2.750	2.776	2.769	2.757	2.761	2.759	2.764	2.760	2.764	2.764
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SSW	SSW	SSW	SSW	SW	SW	SW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SW	SSW	SSW	SSW	SSW	S	SSW	S	SSW
wind speed (m/s)	10.2	9.2	9.7	7.8	5.3	4.5	6.1	6.8	7.4	6.3	6.6	6.3	6.2	4.7	4.4	2.5	3.2	3.2	3.3	3.0	2.2	4.1	4.4	4.4

*1: NM: Not measured due to the malfunction

April 11, 2011																								
monitoring point	4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MP1(μSv/h)	3.312	3.309	3.307	3.309	3.308	3.320	3.313	3.317	3.307	3.323	3.311	3.301	3.317	3.298	3.316	3.296	3.303	3.310	3.300	3.290	3.317	3.309	3.313	3.308
MP2(μSv/h)	2.490	2.481	2.484	2.482	2.482	2.486	2.473	2.481	2.485	2.482	2.470	2.481	2.468	2.475	2.480	2.466	2.482	2.484	2.473	2.467	2.467	2.475	2.486	2.488
MP3(μSv/h)	3.559	3.578	3.565	3.562	3.573	3.558	3.564	3.574	3.555	3.566	3.565	3.538	3.552	3.548	3.565	3.570	3.555	3.546	3.546	3.553	3.562	3.556	3.574	3.539
MP4(μSv/h)	2.794	2.796	2.786	2.796	2.796	2.795	2.790	2.795	2.788	2.804	2.795	2.791	2.795	2.788	2.778	2.794	2.796	2.793	2.789	2.790	2.792	2.781	2.792	2.789
MP5(μSv/h)	2.804	2.805	2.807	2.801	2.793	2.815	2.789	2.785	2.791	2.797	2.797	2.789	2.798	2.785	2.799	2.796	2.800	2.793	2.799	2.791	2.796	2.800	2.801	2.804
MP6(μSv/h)	2.773	2.759	2.769	2.753	2.750	2.769	2.754	2.760	2.764	2.758	2.748	2.758	2.749	2.749	2.759	2.748	2.753	2.756	2.749	2.758	2.761	2.765	2.750	2.734
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SW	SW	SW	SW	SW	SW	WSW	WSW	SW	SW	SW	SW	SW
wind speed (m/s)	4.0	4.7	5.5	6.0	5.6	5.0	5.4	6.4	6.7	7.3	8.6	7.8	7.5	5.1	5.4	6.0	6.4	2.9	2.2	2.9	3.0	3.5	3.0	1.4

April 11, 2011																								
monitoring point	8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MP1(μSv/h)	3.312	3.304	3.299	3.305	3.306	3.312	3.302	3.311	3.300	3.288	3.318	3.288	3.300	3.304	3.287	3.302	3.299	3.303	3.312	3.313	3.294	3.298	3.307	3.300
MP2(μSv/h)	2.482	2.490	2.483	2.480	2.481	2.469	2.463	2.487	2.474	2.483	2.482	2.477	2.486	2.479	2.479	2.487	2.474	2.480	2.495	2.473	2.483	2.481	2.467	2.474
MP3(μSv/h)	3.562	3.567	3.547	3.560	3.552	3.558	3.549	3.554	3.548	3.563	3.543	3.559	3.542	3.542	3.535	3.543	3.550	3.536	3.540	3.537	3.539	3.527	3.539	3.526
MP4(μSv/h)	2.791	2.795	2.805	2.796	2.791	2.792	2.784	2.780	2.795	2.797	2.779	2.777	2.785	2.779	2.787	2.784	2.785	2.794	2.766	2.799	2.793	2.779	2.789	2.773
MP5(μSv/h)	2.795	2.790	2.794	2.785	2.793	2.798	2.797	2.787	2.787	2.783	2.795	2.776	2.780	2.772	2.799	2.794	2.787	2.796	2.796	2.792	2.807	2.787	2.794	2.791
MP6(μSv/h)	2.749	2.760	2.747	2.770	2.762	2.742	2.747	2.748	2.776	2.743	2.758	2.765	2.747	2.762	2.752	2.759	2.760	2.748	2.748	2.737	2.755	2.745	2.758	2.756
MP7(μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SW	SSW	SSW	SSW	ESE	S	S	ENE	ENE	ENE	E	SE	SE	SSE	S	SSE	SE	SE	SE	S	S	S	S	SSE
wind speed (m/s)	1.3	1.2	1.8	1.6	0.4	0.7	0.9	1.6	2.9	2.7	3.4	3.0	3.0	3.4	5.3	4.9	3.2	1.9	2.2	5.3	6.3	6.2	4.5	4.1

Fukushima Dai-ni (TEPCO's Monitaring Post)

April 10, 2011																								
monitoring point	12:00	12:10	12:20	12:30	12:40	12:50	13:00	13:10	13:20	13:30	13:40	13:50	14:00	14:10	14:20	14:30	14:40	14:50	15:00	15:10	15:20	15:30	15:40	15:50
MP1 (μSv/h)	3.423	3.424	3.419	3.401	3.423	3.442	3.420	3.411	3.413	3.406	3.400	3.409	3.413	3.405	3.410	3.367	3.378	3.372	3.384	3.379	3.365	3.357	3.376	3.358
MP2 (μSv/h)	2.556	2.559	2.553	2.555	2.547	2.556	2.547	2.543	2.548	2.544	2.547	2.559	2.538	2.528	2.539	2.532	2.541	2.543	2.541	2.533	2.540	2.532	2.529	2.527
MP3 (μSv/h)	3.662	3.667	3.661	3.660	3.659	3.649	3.661	3.644	3.645	3.641	3.663	3.652	3.633	3.644	3.649	3.640	3.638	3.645	3.635	3.642	3.646	3.641	3.634	3.636
MP4 (μSv/h)	2.879	2.882	2.878	2.880	2.882	2.870	2.865	2.880	2.880	2.874	2.862	2.864	2.870	2.863	2.853	2.867	2.848	2.838	2.826	2.833	2.828	2.834	2.836	2.825
MP5 (μSv/h)	2.878	2.854	2.891	2.857	2.881	2.874	2.874	2.870	2.872	2.886	2.879	2.881	2.889	2.865	2.872	2.878	2.864	2.866	2.853	2.863	2.848	2.847	2.846	2.833
MP6 (μSv/h)	2.810	2.821	2.825	2.831	2.830	2.832	2.816	2.815	2.826	2.833	2.839	2.833	2.823	2.832	2.833	2.812	2.825	2.806	2.815	2.815	2.817	2.805	2.811	2.824
MP7 (μSv/h)	2.050	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SE	SE	SE	ESE	SE	SE	ESE	SE	SSE	S	SE	SSE	S	SSE	SSE	S	ESE	ESE	SSE	S	S	SSE	SSE	SE
wind speed (m/s)	2.1	2.8	2.7	2.3	2.7	2.2	1.7	2.7	3.2	6.4	2.8	4.2	2.5	3.0	4.4	4.1	1.9	2.2	3.7	7.0	6.5	7.3	6.6	3.0

*1: NM: Not measured due to the malfunction

April 10, 2011																								
monitoring point	16:00	16:10	16:20	16:30	16:40	16:50	17:00	17:10	17:20	17:30	17:40	17:50	18:00	18:10	18:20	18:30	18:40	18:50	19:00	19:10	19:20	19:30	19:40	19:50
MP1 (μSv/h)	3.365	3.373	3.372	3.365	3.382	3.360	3.374	3.371	3.372	3.369	3.378	3.381	3.377	3.374	3.370	3.375	3.364	3.371	3.365	3.361	3.351	3.361	3.358	3.356
MP2 (μSv/h)	2.528	2.516	2.525	2.518	2.529	2.512	2.514	2.525	2.517	2.517	2.521	2.523	2.515	2.521	2.530	2.506	2.509	2.516	2.524	2.511	2.503	2.518	2.503	2.501
MP3 (μSv/h)	3.618	3.645	3.633	3.626	3.633	3.619	3.625	3.625	3.629	3.631	3.623	3.638	3.619	3.631	3.613	3.621	3.617	3.612	3.628	3.615	3.618	3.618	3.620	3.598
MP4 (μSv/h)	2.834	2.832	2.838	2.833	2.819	2.824	2.844	2.833	2.836	2.828	2.836	2.832	2.835	2.826	2.829	2.823	2.827	2.839	2.819	2.819	2.815	2.833	2.818	2.829
MP5 (μSv/h)	2.854	2.846	2.839	2.845	2.843	2.840	2.834	2.830	2.833	2.841	2.836	2.835	2.836	2.821	2.831	2.835	2.848	2.840	2.831	2.841	2.825	2.819	2.829	2.828
MP6 (μSv/h)	2.812	2.794	2.802	2.790	2.794	2.802	2.784	2.794	2.771	2.783	2.780	2.794	2.787	2.775	2.783	2.785	2.775	2.779	2.777	2.779	2.769	2.785	2.770	2.789
MP7 (μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	S	S	SSE	SSE	S	S	SSE	SE	SSE	S	SSE	S	S	S	S	S	S	S	S	S	S	S	S	SSW
wind speed (m/s)	3.9	5.2	5.7	6.4	7.2	7.3	7.4	3.8	6.2	5.6	4.0	4.5	5.8	7.4	8.0	7.3	7.7	6.8	8.0	8.5	7.5	8.1	8.0	8.4

April 10, 2011																								
monitoring point	20:00	20:10	20:20	20:30	20:40	20:50	21:00	21:10	21:20	21:30	21:40	21:50	22:00	22:10	22:20	22:30	22:40	22:50	23:00	23:10	23:20	23:30	23:40	23:50
MP1 (μSv/h)	3.351	3.360	3.355	3.352	3.367	3.351	3.368	3.356	3.367	3.348	3.355	3.351	3.343	3.347	3.344	3.354	3.340	3.340	3.354	3.339	3.350	3.332	3.343	3.340
MP2 (μSv/h)	2.511	2.493	2.510	2.514	2.502	2.507	2.499	2.509	2.502	2.496	2.511	2.512	2.512	2.501	2.522	2.500	2.507	2.499	2.499	2.498	2.497	2.501	2.505	2.496
MP3 (μSv/h)	3.627	3.605	3.614	3.593	3.602	3.606	3.604	3.599	3.607	3.591	3.597	3.604	3.591	3.611	3.597	3.611	3.610	3.595	3.601	3.577	3.585	3.594	3.583	3.594
MP4 (μSv/h)	2.831	2.818	2.823	2.820	2.828	2.812	2.828	2.810	2.821	2.817	2.815	2.829	2.810	2.815	2.821	2.821	2.830	2.816	2.816	2.821	2.802	2.812	2.808	2.811
MP5 (μSv/h)	2.838	2.812	2.841	2.830	2.810	2.817	2.821	2.826	2.827	2.819	2.824	2.814	2.827	2.811	2.819	2.818	2.813	2.822	2.804	2.826	2.819	2.815	2.825	2.827
MP6 (μSv/h)	2.771	2.782	2.786	2.775	2.772	2.781	2.769	2.782	2.763	2.763	2.779	2.770	2.775	2.780	2.765	2.771	2.767	2.772	2.791	2.756	2.772	2.770	2.773	2.787
MP7 (μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	SSW	SSW	SSW	S	SSW	SSW	SSW	S	S	S	SSW	SSW	S	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW	SSW
wind speed (m/s)	9.4	10.5	10.9	9.8	9.1	9.4	9.9	9.4	9.3	8.8	7.7	8.9	8.2	8.4	7.5	7.7	8.2	7.9	7.7	9.9	10.5	10.5	9.1	10.1

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Fukushima Dai-ni (TEPCO's Monitaring Post)

April 10, 2011																								
monitoring point	0:00	0:10	0:20	0:30	0:40	0:50	1:00	1:10	1:20	1:30	1:40	1:50	2:00	2:10	2:20	2:30	2:40	2:50	3:00	3:10	3:20	3:30	3:40	3:50
MP1 (μSv/h)	3.441	3.447	3.461	3.439	3.423	3.439	3.438	3.456	3.456	3.459	3.436	3.437	3.450	3.446	3.437	3.445	3.433	3.449	3.434	3.445	3.427	3.438	3.442	3.462
MP2 (μSv/h)	2.580	2.572	2.570	2.557	2.575	2.564	2.583	2.597	2.592	2.579	2.576	2.575	2.559	2.580	2.564	2.559	2.560	2.577	2.577	2.557	2.572	2.592	2.591	2.636
MP3 (μSv/h)	3.722	3.709	3.723	3.715	3.713	3.724	3.724	3.727	3.710	3.703	3.705	3.711	3.698	3.724	3.705	3.711	3.700	3.713	3.711	3.688	3.697	3.709	3.716	3.742
MP4 (μSv/h)	2.900	2.887	2.904	2.884	2.887	2.900	2.899	2.900	2.918	2.908	2.883	2.897	2.893	2.900	2.896	2.897	2.894	2.896	2.890	2.887	2.874	2.897	2.891	2.925
MP5 (μSv/h)	2.917	2.915	2.898	2.897	2.910	2.888	2.930	2.911	2.924	2.923	2.918	2.889	2.905	2.913	2.906	2.899	2.908	2.900	2.893	2.878	2.890	2.900	2.901	2.955
MP6 (μSv/h)	2.830	2.825	2.818	2.825	2.823	2.827	2.830	2.823	2.835	2.833	2.829	2.824	2.832	2.824	2.839	2.821	2.812	2.830	2.817	2.808	2.795	2.835	2.828	2.830
MP7 (μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	N	N	N	N	N	N	NNE	N	N	NNE	NNE	NNE	NNE	NNE	N	N	NNE	NE	NNE	NNE	NNE	N	N	N
wind speed (m/s)	3.6	3.5	2.3	2.9	2.0	1.7	3.5	3.8	2.3	3.2	4.6	3.6	4.2	4.4	3.1	6.0	0.8	2.2	3.4	4.7	3.5	3.3	5.4	5.5

*1: NM: Not measured due to the malfunction

April 10, 2011																								
monitoring point	4:00	4:10	4:20	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:10	7:20	7:30	7:40	7:50
MP1 (μSv/h)	3.440	3.430	3.427	3.427	3.409	3.431	3.423	3.414	3.409	3.417	3.407	3.398	3.416	3.409	3.415	3.400	3.402	3.409	3.389	3.409	3.419	3.408	3.401	3.409
MP2 (μSv/h)	2.581	2.560	2.558	2.548	2.551	2.555	2.554	2.560	2.554	2.548	2.543	2.555	2.549	2.540	2.542	2.531	2.547	2.536	2.540	2.551	2.526	2.540	2.547	2.534
MP3 (μSv/h)	3.705	3.692	3.672	3.693	3.678	3.671	3.689	3.686	3.674	3.693	3.693	3.683	3.667	3.676	3.667	3.673	3.666	3.661	3.664	3.666	3.668	3.682	3.659	3.663
MP4 (μSv/h)	2.894	2.890	2.873	2.883	2.874	2.868	2.867	2.881	2.861	2.874	2.865	2.873	2.885	2.871	2.871	2.875	2.854	2.870	2.866	2.860	2.862	2.875	2.869	2.874
MP5 (μSv/h)	2.926	2.886	2.888	2.893	2.892	2.883	2.888	2.870	2.864	2.887	2.872	2.891	2.865	2.875	2.868	2.873	2.879	2.877	2.859	2.884	2.873	2.875	2.882	2.871
MP6 (μSv/h)	2.843	2.823	2.819	2.809	2.804	2.798	2.820	2.804	2.809	2.795	2.778	2.807	2.807	2.802	2.792	2.794	2.794	2.800	2.806	2.784	2.796	2.796	2.792	2.781
MP7 (μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	N	N	N	N	NNW	NNW	N	NNW	NNW	N	NNW	NNW	N	N	N	NNW	N	N	N	N	N	N	N	NNE
wind speed (m/s)	5.1	4.1	4.1	4.4	2.7	3.1	3.4	2.9	3.0	3.1	2.4	2.2	2.8	2.3	3.2	2.2	3.1	3.2	3.5	2.4	1.6	2.0	3.2	3.1

April 10, 2011																								
monitoring point	8:00	8:10	8:20	8:30	8:40	8:50	9:00	9:10	9:20	9:30	9:40	9:50	10:00	10:10	10:20	10:30	10:40	10:50	11:00	11:10	11:20	11:30	11:40	11:50
MP1 (μSv/h)	3.406	3.420	3.420	3.411	3.416	3.408	3.400	3.396	3.400	3.396	3.400	3.409	3.399	3.404	3.415	3.401	3.410	3.410	3.422	3.398	3.436	3.417	3.408	3.412
MP2 (μSv/h)	2.539	2.555	2.530	2.541	2.549	2.539	2.546	2.544	2.547	2.548	2.544	2.553	2.548	2.547	2.560	2.542	2.544	2.549	2.560	2.555	2.538	2.550	2.537	2.538
MP3 (μSv/h)	3.667	3.669	3.668	3.676	3.668	3.672	3.671	3.666	3.663	3.651	3.667	3.667	3.658	3.669	3.669	3.665	3.662	3.655	3.660	3.657	3.669	3.657	3.669	3.668
MP4 (μSv/h)	2.871	2.880	2.863	2.858	2.866	2.873	2.878	2.876	2.875	2.879	2.871	2.872	2.871	2.885	2.891	2.888	2.895	2.888	2.888	2.901	2.890	2.877	2.878	2.877
MP5 (μSv/h)	2.874	2.868	2.863	2.867	2.868	2.849	2.876	2.864	2.876	2.875	2.872	2.862	2.875	2.876	2.854	2.871	2.856	2.880	2.861	2.880	2.886	2.863	2.863	2.866
MP6 (μSv/h)	2.799	2.805	2.800	2.806	2.815	2.799	2.811	2.812	2.815	2.812	2.810	2.808	2.808	2.823	2.813	2.812	2.824	2.817	2.833	2.819	2.826	2.819	2.831	2.838
MP7 (μSv/h)	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1	NM *1
wind direction	NNE	NE	NNE	NNE	NE	NE	NE	NE	E	ENE	ENE	ENE	ENE	E	E	ESE	E	E	SE	SE	SE	SSE	S	SE
wind speed (m/s)	3.0	4.1	4.2	2.4	2.3	2.1	3.1	2.5	3.0	2.5	3.0	2.7	2.9	2.4	2.0	1.9	2.7	2.9	1.9	2.3	3.0	3.3	3.0	2.0

Fukushima Dai-ni NPS

as of 17:00, April 11th, 2011

MP1 : 3.273 μSv/h (as of 15:00 April 11th)
(Ref. Value:0.035～0.054 μSv/h)

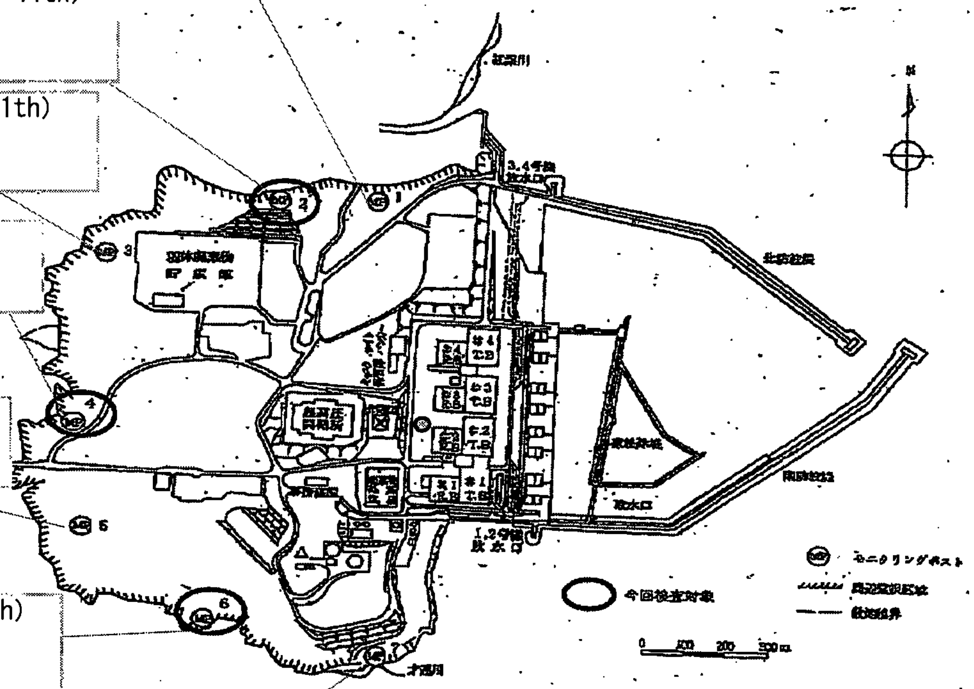
Location of Monitoring Post

MP2 : 2.455 μSv/h (as of 15:00 April 11th)
(Ref. Value:0.042～0.062 μSv/h)

MP3 : 3.527 μSv/h (as of 15:00 April 11th)
(Ref. Valur:0.036～0.052 μSv/h)

MP4 : 2.755 μSv/h (as of 15:00 April 11th)
(Ref. value: 0.036～0.052 μSv/h)

MP5 : 2.663 μSv/h (as of 15:00 April 11th)
(Ref. Value:0.041～0.058 μSv/h)



MP6 : 2.716 μSv/h (as of 15:00 April 11th)
(Ref. value:0.044～0.063 μSv/h)

MP7 : 1.960 μSv/h (as of 12:00 April 11th)
(Ref. Value: 0.043～0.062 μSv/h)

添付資料(2)

Results of environmental monitoring at each NPSs etc. (as of 9am April 11th, 2011)

unit : μ Sv/h

Range of normal average value	Company	NPS	April 10, 2011 12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
0.023～0.027	Hokkaido Electric Power Co.	Tomari NPS	0.031	0.032	0.032	0.032	0.031	0.031	0.031	0.031	0.031	0.031	0.035	0.042
0.024～0.060	Tohoku Electric Power Co.	Onagawa NPS	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.35	0.34	0.34	0.34
0.012～0.060		Higashidori NPS	0.018	0.017	0.017	0.018	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.018
0.033～0.050	Tokyo Electric Power Co.	Fukushima Dai-ichi※	47.1	46.9	46.7	46.7	46.6	46.5	46.5	46.3	46.2	45.9	45.9	45.8
0.036～0.052		Fukushima Dai-ni	3.662	3.661	3.633	3.635	3.618	3.625	3.619	3.628	3.627	3.604	3.591	3.601
0.011～0.159		Kashiwazaki kariwa NPS	0.065	0.065	0.065	0.067	0.065	0.066	0.066	0.065	0.067	0.066	0.065	0.066
0.036～0.053	Japan Atomic Power Co.	Tokai Dai-ni NPS	0.419	0.421	0.420	0.416	0.416	0.414	0.414	0.413	0.414	0.410	0.411	0.412
0.039～0.110		Tsuruga NPS	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.077	0.076	0.076
0.064～0.108	Chubu Electric Power Co.	Hamaoka NPS	0.043	0.043	0.044	0.043	0.044	0.043	0.043	0.043	0.043	0.043	0.043	0.043
0.0207～0.132	Hokuriku Electric Power Co.	Shika NPS	0.032	0.032	0.033	0.033	0.033	0.033	0.032	0.033	0.033	0.033	0.033	0.033
0.028～0.130	Chugoku Electric Power Co.	Shimane NPS	0.030	0.030	0.031	0.030	0.029	0.029	0.030	0.030	0.029	0.030	0.030	0.030
0.070～0.077	Kansai Electric Power Co.	Mihama NPS	0.073	0.072	0.072	0.074	0.072	0.073	0.074	0.073	0.075	0.075	0.074	0.073
0.045～0.047		Takahama NPS	0.043	0.043	0.043	0.043	0.042	0.043	0.043	0.043	0.042	0.043	0.042	0.043
0.036～0.040		Ooi NPS	0.035	0.035	0.035	0.035	0.033	0.035	0.035	0.036	0.035	0.036	0.037	0.036
0.011～0.080	Shikoku Electeic Power Co.	Ikata NPS	0.015	0.015	0.015	0.014	0.014	0.014	0.013	0.014	0.014	0.014	0.014	0.014
0.023～0.087	Kyushu Electric Power Co.	Genkai NPS	0.027	0.026	0.026	0.026	0.025	0.026	0.025	0.026	0.027	0.026	0.026	0.025
0.034～0.120		Sendai NPS	0.036	0.036	0.035	0.038	0.036	0.037	0.036	0.036	0.036	0.035	0.040	0.040
0.009～0.069	Japan Nuclear Fuel Limited	Japan Nuclear Fuel Reprocessing Plant	0.017	0.016	0.016	0.017	0.017	0.016	0.017	0.017	0.017	0.017	0.017	0.016
0.009～0.071		Japan Nuclear Fuel Plant Disposal	0.022	0.022	0.022	0.023	0.022	0.022	0.022	0.022	0.023	0.022	0.023	0.022

※ There could be a small deviation on the monitoring time and area because of the operational situation of Fukushima Dai-ichi NPS.

Range of normal average value	Company	NPS	April 11, 2011 0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00
0.023～0.027	Hokkaido Electric Power Co.	Tomari NPS	0.037	0.040	0.034	0.033	0.032	0.032	0.032	0.032	0.032	0.032		
0.024～0.060	Tohoku Electric Power Co.	Onagawa NPS	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.35		
0.012～0.060		Higashidori NPS	0.017	0.017	0.018	0.017	0.017	0.019	0.020	0.020	0.018	0.017		
0.033～0.050	Tokyo Electric Power Co.	Fukushima Dai-ichi※	45.7	45.6	45.5	45.3	45.2	45.2	44.8	44.9	46.4	45.2		
0.036～0.052		Fukushima Dai-ni	3.594	3.587	3.578	3.573	3.559	3.564	3.552	3.546	3.562	3.549		
0.011～0.159		Kashiwazaki kariwa NPS	0.067	0.066	0.066	0.066	0.067	0.065	0.066	0.067	0.066	0.066		
0.036～0.053	Japan Atomic Power Co.	Tokai Dai-ni NPS	0.411	0.411	0.410	0.409	0.408	0.407	0.406	0.408	0.412	0.412		
0.039～0.110		Tsuruga NPS	0.075	0.076	0.074	0.077	0.074	0.076	0.075	0.075	0.077	0.077		
0.064～0.108	Chubu Electric Power Co.	Hamaoka NPS	0.043	0.043	0.043	0.043	0.043	0.043	0.044	0.043	0.044	0.043		
0.0207～0.132	Hokuriku Electric Power Co.	Shika NPS	0.034	0.034	0.034	0.034	0.034	0.034	0.033	0.033	0.033	0.032		
0.028～0.130	Chugoku Electric Power Co.	Shimane NPS	0.031	0.031	0.030	0.030	0.030	0.031	0.031	0.030	0.031	0.030		
0.070～0.077	Kansai Electric Power Co.	Mihama NPS	0.073	0.075	0.074	0.073	0.073	0.073	0.075	0.075	0.075	0.075		
0.045～0.047		Takahama NPS	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043		
0.036～0.040		Ooi NPS	0.037	0.037	0.037	0.037	0.037	0.036	0.037	0.036	0.036	0.036		
0.011～0.080	Shikoku Electeic Power Co.	Ikata NPS	0.013	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014		
0.023～0.087	Kyushu Electric Power Co.	Genkai NPS	0.026	0.026	0.024	0.026	0.026	0.025	0.026	0.026	0.026	0.026		
0.034～0.120		Sendai NPS	0.038	0.041	0.038	0.037	0.038	0.036	0.036	0.037	0.038	0.039		
0.009～0.069	Japan Nuclear Fuel Limited	Japan Nuclear Fuel Reprocessing Plant	0.017	0.016	0.017	0.016	0.017	0.020	0.018	0.018	0.017	0.017		
0.009～0.071		Japan Nuclear Fuel Plant Disposal	0.023	0.023	0.023	0.023	0.023	0.025	0.025	0.024	0.024	0.023		

※ There could be a small deviation on the monitoring time and area because of the operational situation of Fukushima Dai-ichi NPS.

Fukushima Dai-ichi Nuclear Power Station Major Parameters of the Plant (As of 02:00, April 11th)

Unit No.	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Situation of water injection	Injecting fresh water via the Water Supply Line. Flow rate of injected water : 6 m^3/h (As of 17:30, April 3rd) temporary measuring instrument	Injecting fresh water via the Fire Extinguish Line. Flow rate of injected water : 7 m^3/h (As of 19:00, April 7th) temporary measuring instrument	Injecting fresh water via the Fire Extinguish Line. Flow rate of injected water: 7 m^3/h (As of 17:32, April 3rd) temporary measuring instrument	Under shutdown	Under shutdown	Under shutdown
Reactor water level	Fuel range A : -1,650mm Fuel range B : -1,650mm (As of 00:00, April 11th)	Fuel range A : -1,500mm (As of 02:00, April 11th)	Fuel range A:-1,900mm Fuel range B:-2,250mm (As of 00:00, April 11th)	#2	Shutdown range measurement 1,974mm (As of 02:00, April 11th)	Shutdown range measurement 2,523mm (As of 02:00, April 11th)
Reactor pressure	0.413MPa g(A) 0.873MPa g(B) #3 (As of 00:00, April 11th)	-0.025MPa g (A) -0.027MPa g (D) (As of 02:00,April 11th)	-0.017MPa g (A) -0.083MPa g (C) (As of 00:00, April 11th)	#2	0.007MPa g (As of 02:00, April 11th)	0.016MPa g (As of 02:00, April 11th)
Reactor water temperature	(Impossible collection due to low system flow rate)			#2	36.3℃ (As of 02:00, April 11th)	38.9℃ (As of 02:00, April 11th)
Reactor Pressure Vessel (RPV) temperature	Feedwater nozzle temperature: 222.8℃ #3 Temperature at the bottom head of RPV: 120.2℃ (As of 02:00, April 11th)	Feedwater nozzle temperature: 152.8℃ Temperature at the bottom head of RPV: #1 (As of 02:00, April 11th)	Feedwater nozzle temperature: 97.7℃ #3 Temperature at the bottom head of RPV: 110.2℃ (As of 00:00, April 11th)	Unit 4 No heating element (fuel) inside the reactor Unit 5,6 Monitoring by the reactor water temperature		
D/W*1 Pressure, S/C*2 Pressure	D/W: 0.195MPa abs S/C: 0.165MPa abs (As of 02:00, April 11th)	D/W: 0.090MPa abs S/C: #1 (As of 02:00, April 11th)	D/W: 0.1050MPa abs S/C: 0.1703MPa abs (As of 00:00, April 11th)	#2		
CAMS*3	D/W: #1 S/C: 1.12×10^{1}Sv/h (As of 02:00, April 11th)	D/W: 2.86×10^{1}Sv/h S/C: 7.24×10^{-1}Sv/h (As of 02:00,April 11th)	D/W: 1.78×10^{1}Sv/h S/C: 6.90×10^{-1}Sv/h (As of 00:00, April 11th)	#2		
D/W*1 design operating pressure	0.384MPa g(0.485MPa abs)	0.384MPa g(0.485MPa abs)	0.384MPa g(0.485MPa abs)	#2		
D/W*1 maximum operating pressure	0.427MPa g(0.528MPa abs)	0.427MPa g(0.528MPa abs)	0.427MPa g(0.528MPa abs)			
Spent Fuel Pool water	#1	71.0℃ (As of 02:00, April 11th)	#1	#1	34.2℃ (As of 02:00, April 11th)	26.5℃ (As of 02:00, April 11th)
FPC skimmer level	4,500mm (As of 00:00, April 11th)	5,850mm (As of 02:00, April 11th)	#1	4,900mm (As of 00:00, April 11th)	#2	
Power supply	Receiving external power supply (P/C*4 2C)		Receiving external power supply (P/ C*4 4D)		Receiving external power supply	

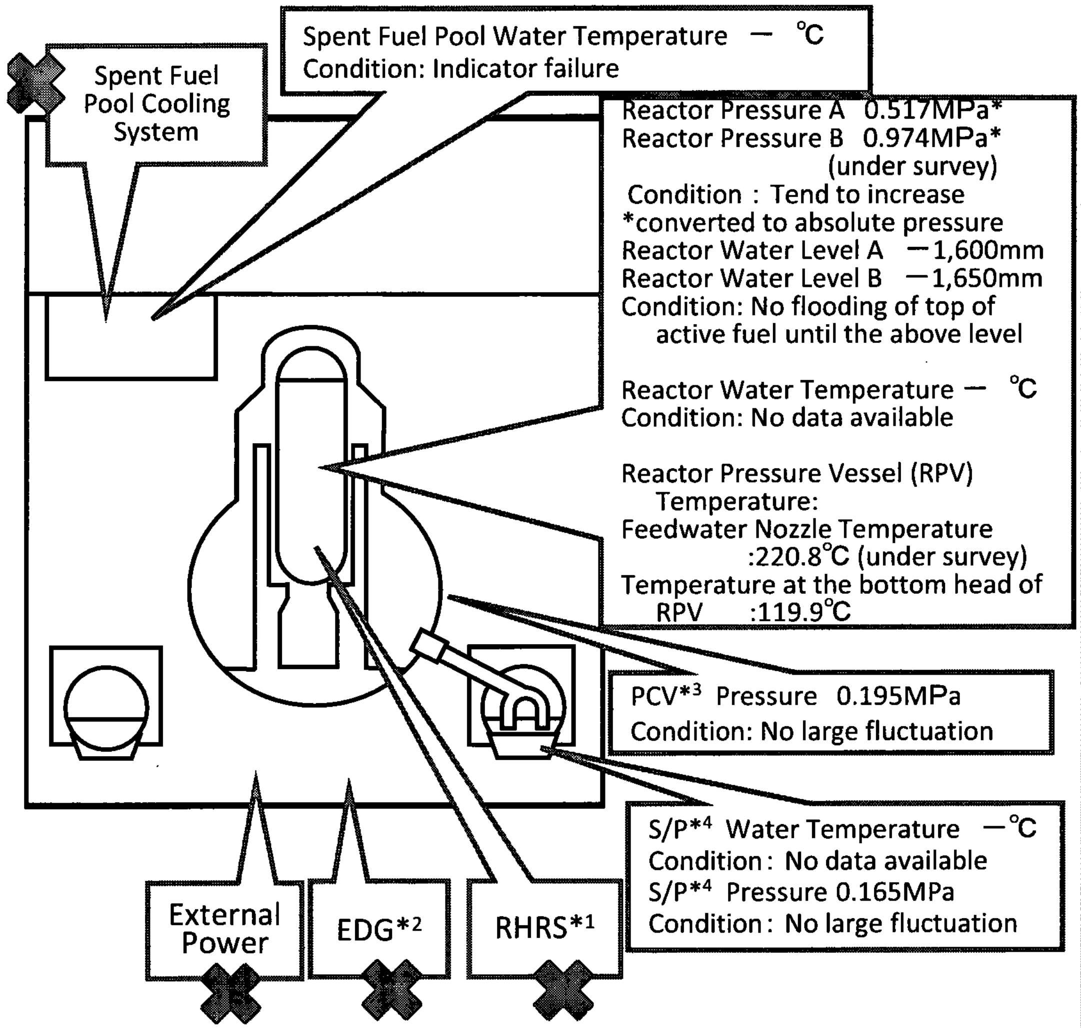
Other information		Common pool: about 31 ℃ (As of 7:40, April 10th)	Unit5: SHC*5 mode (From 18:44 April 10th)	Unit6: Supplemental Fuel Pool Cooling mode (From 18:13 April 10th)

Pressure conversion	Gauge pressure (MPa g) = Absolute pressure (MPa abs) – Atmospheric pressure (Normal atmospheric pressure 0.1013MPa) Absolute pressure (MPa abs) = Gauge pressure (MPa g) + Atmospheric pressure (Normal atmospheric pressure 0.1013MPa)

*1 D/W : Dry Well
*2 S/C : Suppression Chamber
*3 CAMS : Containment Atmospheric Monitoring System
*4 P/C : Power Center
*5 SHC : Shutdown Cooling

#1 : Measuring instrument malfunction
#2 : Except from data collection
#3 : Under investigation of the change of the situation

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 1 (As of 13:00 April 11th, 2011)



*1 Residual Heat Removal System
*2 Emergency Diesel Generator
*3 Primary Containment Vessel
*4 Suppression Pool

Major Events after the earthquake

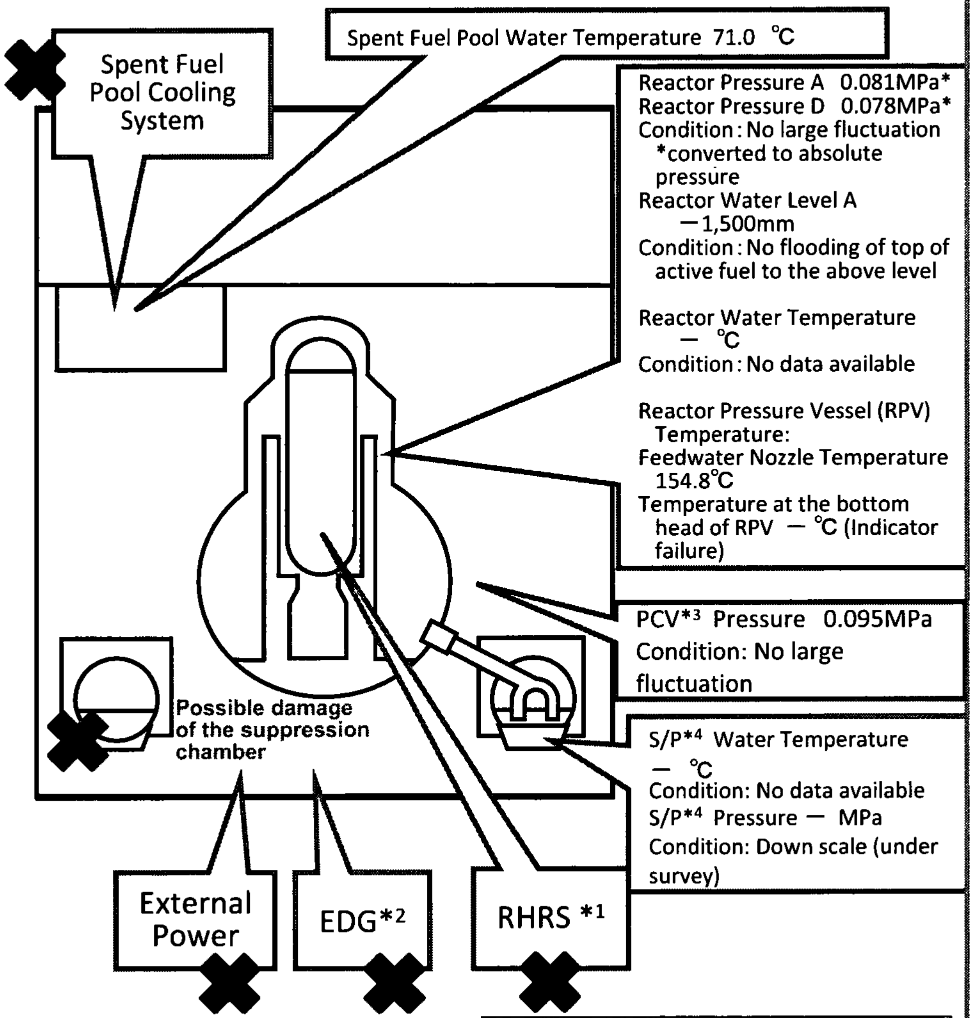
- 11th 14:46 Under operation, Automatic shutdown by the earthquake
- 11th 15:42 Report based on the Article 10 (Total loss of A/C power)
- 11th 16:36 Occurrence of the Article 15 event (Inability of water injection of the Emergency Core Cooling System)
- 12th 01:20 Occurrence of the Article 15 event (Unusual rise of the pressure in PCV)
- 12th 10:17 Started to vent.
- 12th 15:36 Sound of explosion
- 12th 20:20 Started to inject seawater and borated water to the Reactor Core.
- 23rd 02:33 The amount of injected water to the Reactor Core was increased utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$)
  09:00 Switched to the Feedwater Line only.($18m^3/h \rightarrow 11m^3/h$)
- 24th 11:30 Lighting in the Central Control Room was recovered.
- 25th 15:37 Started to inject fresh water.
- 29th 08:32 Switched to the water injection to the Reactor Core using the temporary motor-driven pump.
- 31st 12:00 ~2nd 15:26 Started to transfer the stagnant water from the Condensate Storage Tank (CST) to the Surge Tank of Suppression Pool Water (SPT)
- 31st 13:03~16:04 Water spray by Concrete Pump Truck (Fresh water)
- 3rd 12:02 The power supply to the temporary motor-driven pump was switched from the temporary power supply to the external power supply.
- 3rd 13:55 Started to transfer the water from the Condenser to CST.
- 6th 22:30 Started the operation for the injection of nitrogen to PCV.
- 7th 01:31 Confirmed starting the injection of nitrogen to PCV.
- 9th 04:10 Started using highly pure nitrogen generator in the injection of nitrogen to PCV.
- 10th 09:30 Completed transferring the water from the Condenser to CST.

Current Conditions : Fresh water is being injected to the Spent Fuel Pool and the Reactor Core

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 2

(As of 13:00 April 11th, 2011)



*1 Residual Heat Removal System
*2 Emergency Diesel Generator
*3 Primary Containment Vessel
*4 Suppression Pool

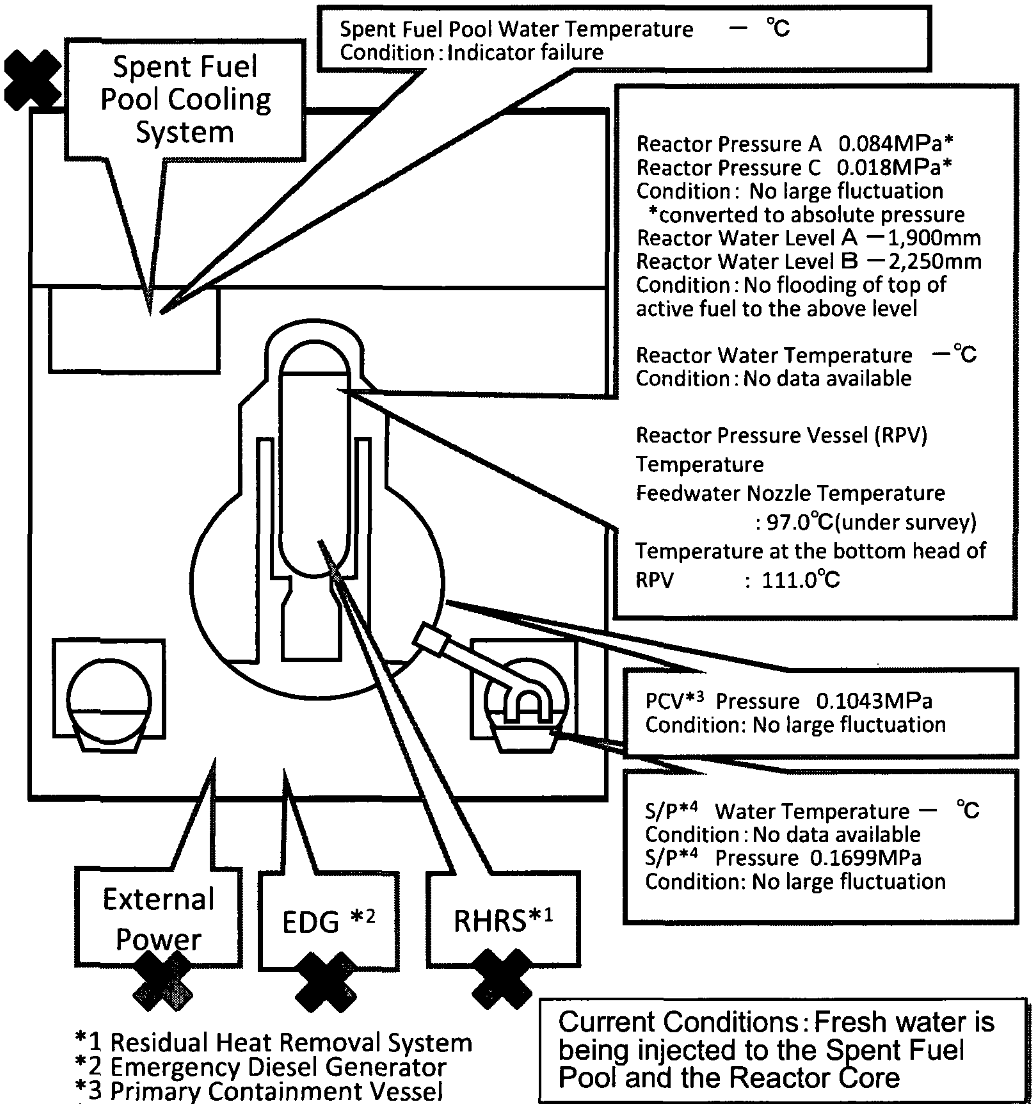
Current Conditions : Fresh water is being injected to the Spent Fuel Pool and the Reactor Core

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Major Events after the earthquake

11th 14:46 Under operation, Automatic shutdown by the earthquake
11th 15:42 Report based on the Article 10 (Total loss of A/C power)
11th 16:36 Occurrence of the Article 15 event (Inability of water injection of the Emergency Core Cooling System)
13th 11:00 Started to vent.
14th 13:25 Occurrence of the Article 15 event (Loss of reactor cooling functions)
14th 16:34 Started to inject seawater to the Reactor Core.
14th 22:50 Occurrence of the Article 15 event (Unusual rise of the pressure in PCV)
15th 00:02 Started to vent.
15th 06:10 Sound of explosion
15th around 06:20 Possible damage of the suppression chamber
20th 15:05～17:20 Approximately 40 ton seawater injection to the Spent Fuel Pool (SFP) via the Fuel Pool Cooling Line (FPC)
20th 15:46 Power Center received electricity.
21st 18:22 White smoke generated. The smoke died down and almost invisible at 07:11 March 22nd.
22nd 16:07 Injection of around 18 tons of seawater to SFP
25th 10:30～12:19 Sea water injection to SFP via FPC
26th 10:10 Started to inject fresh water to the Reactor Core.
26th 16:46 Lighting in the Central Control Room was recovered.
27th 18:31 Switched to the water injection to the core using the temporary motor-driven pump.
29th 16:30～18:25 Switched to the temporary motor-driven pump injecting fresh water to SFP.
29th 16:45～1st 11:50 Transferred the water from the Condensate Storage Tank (CST) to the Surge Tank of Suppression Pool Water (SPT)
30th 9:25～23:50 Confirmed malfunction of the temporary motor-driven pump injecting fresh water to SFP(9:45). Switched to the injection using the fire pump Truck, but suspended as cracks were confirmed in the hose. (12:47, 13:10) Resumed injection of fresh water(19:05)
1st 14:56～17:05 Injection of fresh water from FPC to SFP using the temporary motor-driven pump.
2nd around 9:30 The water, of which the dose rate was at the level of more than 1,000mSv/h, was confirmed to be collected in the pit located near the Intake Channel of Unit 2. The outflow from the lateral surface of the pit into the sea was also confirmed.
2nd 17:10 Started to transfer the water from the Condenser to the Condensate Storage Tank (CST).
3rd 12:12 The power supply to the temporary motor-driven pump was switched from the temporary power supply to the external power supply.
3rd 13:47～14:30 20 bags of sawdust, 80 bags of high polymer absorbent and 3 bags of cutting-processed newspaper were put into the Pit for the Conduit.
4th 7:08～7:11 Approximately 13kg of tracer (bath agent) was put in from the Pit for the Duct for Seawater Pipe.
4th 11:05～13:37 Injection of fresh water from FPC to SFP using the temporary motor-driven pump.
5th 14:15 Tracer is confirmed to outflow through the permeable layer around the pit into the sea.
15:07 Started to inject coagulant.
6th around 5:38 The water outflow from the lateral surface of the pit was confirmed to stopped.
7th 13:29～14:34 Freshwater injection to SFP via FPC (Around 36 ton)
9th 13:10 Completed transferring the water from the Condenser to CST.
10th 10:37～12:38 Freshwater injection to SFP via FPC using the temporary motor-driven pump (Around 60 ton).

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 3
(As of 13:00 April 11th, 2011)



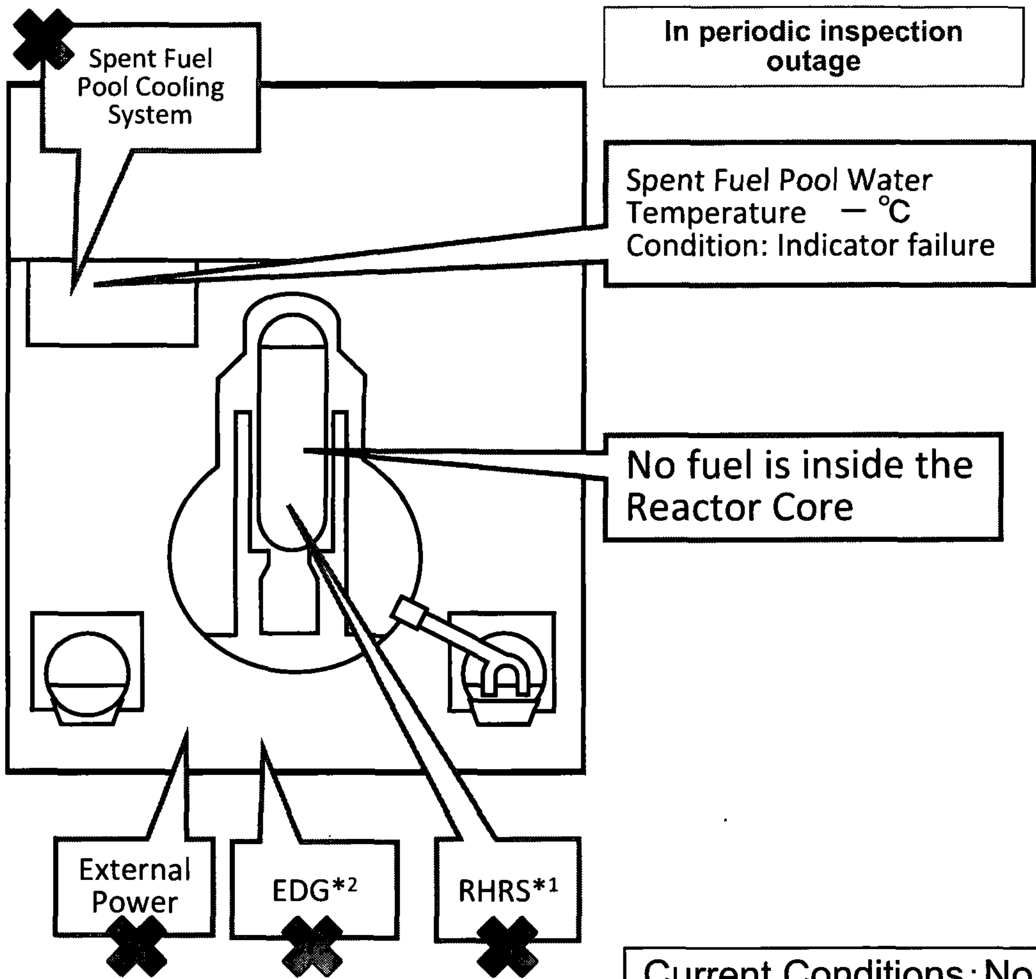
*1 Residual Heat Removal System
*2 Emergency Diesel Generator
*3 Primary Containment Vessel
*4 Suppression Pool

Major Events after the earthquake

11th 14:46 Under operation, Automatic shutdown by the earthquake
11th 15:42 Report based on the Article 10 (Total loss of A/C power)
13th 05:10 Occurrence of the Article 15 event (Inability of water injection of the Emergency Core Cooling System)
13th 08:41 Started to vent.
13th 13:12 Started to inject seawater and borated water to the Reactor Core.
14th 05:20 Started to vent.
14th 07:44 Occurrence of the Article 15 event (Unusual rise of the pressure in PCV)
14th 11:01 Sound of explosion
16th around 08:30 White smoke generated.
17th 09:48～10:01 Water discharge by the helicopters of Self-Defense Force
17th 19:05～19:15 Water spray from the ground by High pressure water-cannon trucks of Police
17th 19:35～20:09 Water spray from the ground by fire engines of Self-Defense Force
18th before 14:00～14:38 Water spray from the ground by 6 fire engines of Self-Defense Force
18th ～14:45 Water spray from the ground by a fire engine of the US Military
19th 00:30 ～01:10 Water spray by Hyper Rescue Unit of Tokyo Fire Department
19th 14:10 ～ 20th 03:40 Water spray by Hyper Rescue Unit of Tokyo Fire Department
20th 11:00 Pressure of PCV rose(320kPa).Afterward fell.
20th 21:36 ～ 21st 03:58 Water spray by Hyper Rescue Unit of Tokyo Fire Department
21st around 15:55 Grayish smoke generated and was confirmed to be died down at 17:55.
22nd 15:10 ～16:00 Water spray by Hyper Rescue Unit of Tokyo Fire Department and Osaka City Fire Bureau.
22nd 22:46 Lighting in the Central Control Room was recovered.
23rd 11:03 ～13:20 Injection of about 35 ton of sea water to the Spent Fuel Pool (SFP) via the Fuel Pool Cooling Line (FPC)
23rd around 16:20 Black smoke generated and was confirmed to died down at around 23:30 and 24th 04:50.
24th 05:35～16:05 Injection of around 120 ton of sea water to SFP via FPC
25th 13:28～16:00 Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department
25th 18:02 Started fresh water injection to the core.
27th 12:34～14:36 Water spray by Concrete Pump Truck
28th 17:40～31st around 8:40 Transferring the water from the Condensate Storage Tank (CST) to the Surge Tank of Suppression Pool Water (SPT)
28th 20:30 Switched to the water injection to the core using a temporary motor-driven pump.
<Water spray by Concrete Pump Truck (Fresh water)>
29th 14:17～18:18, 31st 16:30～19:33, 2nd 09:52～12:54, 4th 17:03～19:19, 7th 06:53 ～08:53, 8th 17:06～20:00
3rd 12:18 The power supply to the temporary motor-driven pump was switched from the temporary power supply to the external power supply.

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 4
(As of 13:00 April 11th, 2011)



*1 Residual Heat Removal System

*2 Emergency Diesel Generator

*3 Reactor Pressure Vessel

Major events after the earthquake

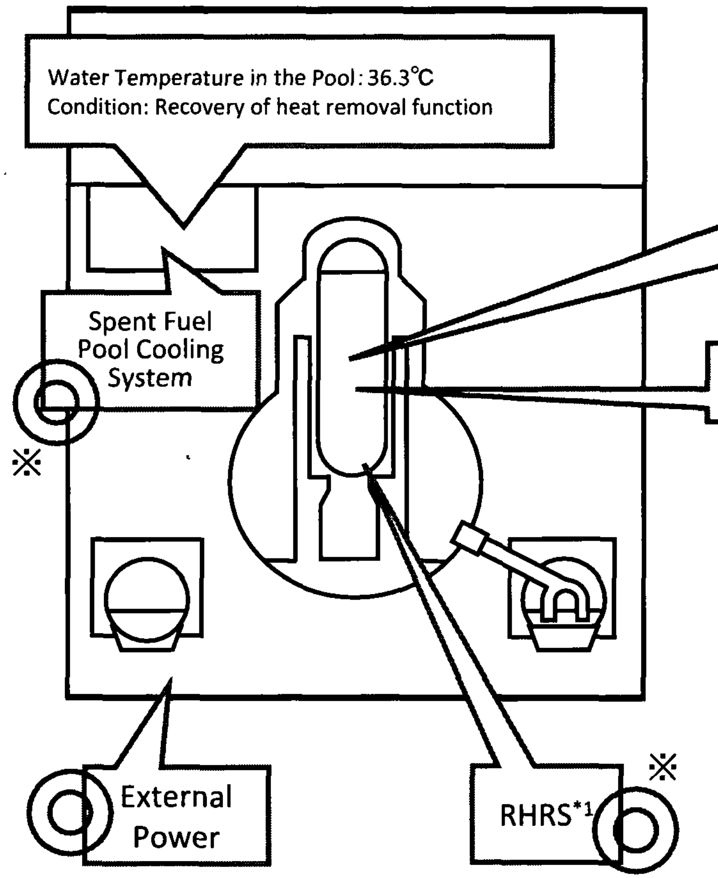
In periodic inspection outage when the earthquake occurred
14th 04:08 Water temperature in the Spent Fuel Pool (SFP), 84℃
15th 06:14 Confirmed the partial damage of wall in the 4th floor.
15th 09:38 Fire occurred in the 3rd floor. (12:25 extinguished)
16th 05:45 Fire occurred. TEPCO couldn't confirm any fire on the ground. (06:15)
20th 08:21～09:40 Water spray over SFP by Self-Defense Force
20th around 18:30～19:46 Water spray over SFP by Self-Defense Force
21st 06:37～08:41 Water spray over SFP by Self-Defense Force
21st around 15:00 Work for laying cable to Power Center was completed.
22nd 10:35 Power Center received electricity.
<Water spray by Concrete Pump Truck>
22nd 17:17～20:32, 23rd 10:00～13:02, 24th 14:36～17:30, 25th 19:05～22:07, 27th 16:55～19:25
5th 06:05～10:20 Sea water injection to SFP via the Fuel Pool Cooling Line (FPC)
29th 11:50 Lighting in the Central Control Room was recovered.
< Water spray by Concrete Pump Truck (Fresh water)>
30th 14:04～18:33, 1st 08:28～14:14, 3rd 17:14～22:16, 5th 17:35～18:22, 7th 18:23～19:40, 9th 17:07～19:24

Current Conditions: No fuel is in RPV*3.
Fresh water is being injected to the Spent Fuel Pool.

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 5
(As of 13:00 April 11th, 2011)

In periodic inspection outage



*1 Residual Heat Removal System

※Heat removal was carried out alternately with the water in the Reactor Core and in the Spent Fuel Pool.

Current Conditions:

20th 14:30 Cold shutdown

21st 11:36 Receiving electricity from external power supply

23rd 17:24 Pump for Residual Heat Removal Seawater System (RHRS) was automatically stopped when the power supply was switched from the temporary to the permanent.

24th 16:14 Repair of the RHRS pump was completed.

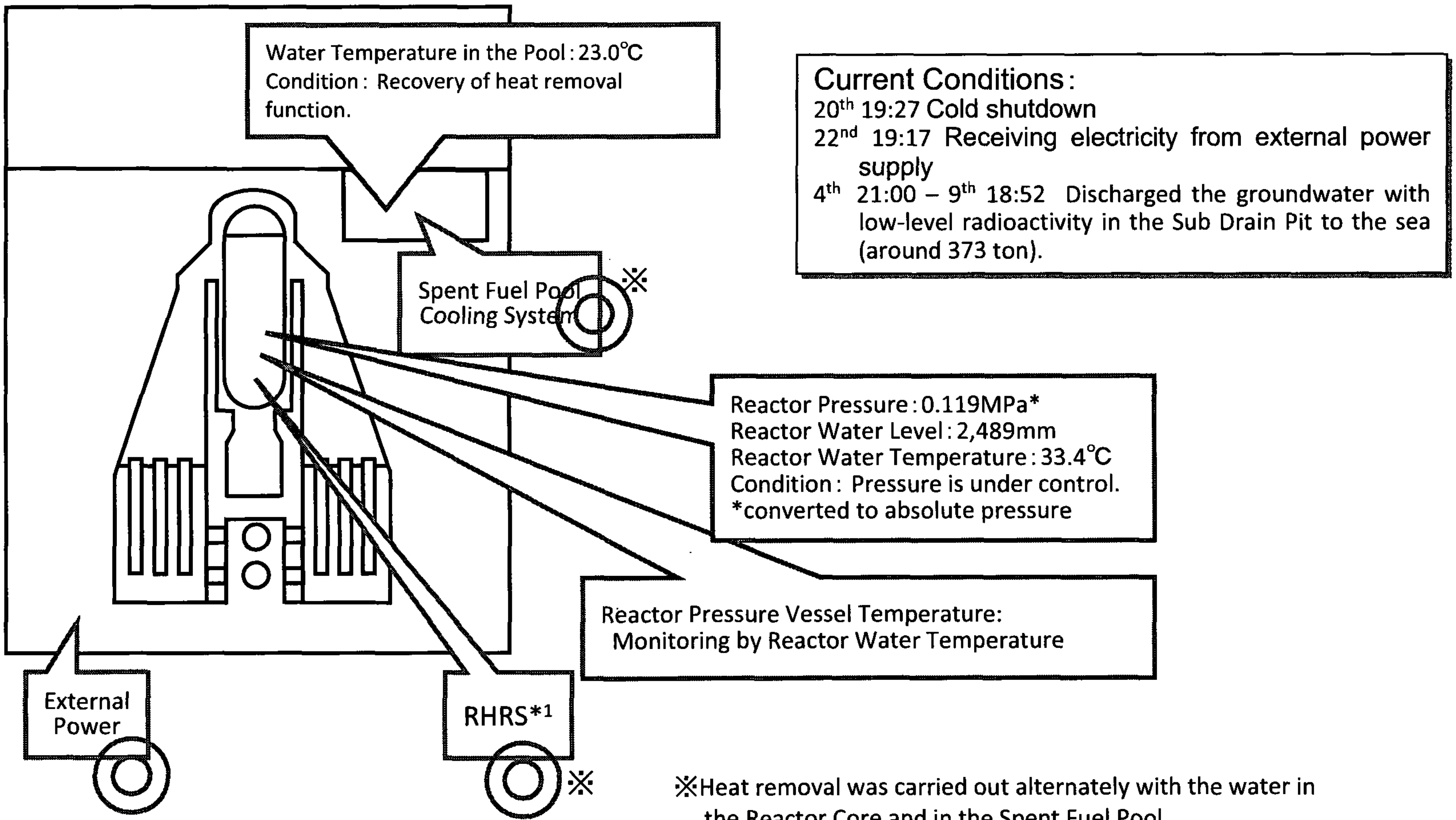
24th 16:35 Started to cooling.

4th 21:00 – 8th 12:14 Discharged the groundwater with low-level radioactivity in the Sub Drain Pit to the sea (around 950 ton).

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

Conditions of Fukushima Dai-ichi Nuclear Power Station Unit 6
(As of 13:00 April 11th, 2011)

In periodic inspection outage



※Heat removal was carried out alternately with the water in the Reactor Core and in the Spent Fuel Pool.

*1 Residual Heat Removal System

(Editorial committee for Nuclear Energy Handbook, Nuclear Energy Handbook)

From: RST01 Hoc
Sent: Saturday, April 16, 2011 2:41 PM
To: Garchow, Steve; RST01 Hoc
Cc: FOIA Response.hoc Resource
Subject: RE: Questions for Site Team

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Steve,

FYI, Alice Caponiti of DOE/NE has responses to #2 and #3 below that she is trying to send us (her e-mail keeps bouncing back because of NRC's mail size limitation). Once we get that, we will forward the answers to you too.

Thanks,
Tina/RST

From: RST01 Hoc
Sent: Saturday, April 16, 2011 2:43 AM
To: Garchow, Steve
Cc: FOIA Response.hoc Resource; RST08 Hoc; RST09 Hoc
Subject: RE: Questions for Site Team

Steve,

I think that we are simply looking for a confirmation that responses will be available for the 11:00 EDT Consortium call. However should you want to discuss, we're available.

Thanks.

Eva Brown, BWR Ops and System Analyst
Reactor Safety Team
(301) 816-5100

From: Garchow, Steve
Sent: Saturday, April 16, 2011 2:21 AM
To: RST01 Hoc
Subject: RE: Questions for Site Team

Did you want to talk about these today?

From: RST01 Hoc
Sent: Saturday, April 16, 2011 2:09 AM
To: Garchow, Steve

QQQ/318

Cc: Reynolds, Steven; Mitman, Jeffrey
Subject: FW: Questions for Site Team

Steve,

Please look at these questions and send your responses to the RST. The consortium call will be held 11:00 EDT.

Thanks,
RST

From: RST09 Hoc
Sent: Friday, April 15, 2011 10:18 PM
To: RST01 Hoc
Subject: Questions for Site Team

1100 Call Notes

Decision made to change the format of the meeting from being run by INPO to being run by the RST. Call changing from discussing RST Assessment to discussing plant conditions and items of concern among consortium members.

On Tuesdays and Thursday s, call will also address changes to the RST Assessment document.

INPO and EPRI indicated that they will still support the Tuesday and Thursday calls but will not listen in on the other calls.

Questions/Comments from the 1100 Call

1. What size Tsunami was the plant designed to withstand?
a. What size earthquake was the plant designed to withstand.
b. GEH indicated that design of earthquake was in ground motion and not on Richter scale
2. Does anybody have a copy of the paper that was previously generated on potential interactions between boron and seawater?
3. Any thoughts on how high radiation levels should be in SFP with water level 2.5 m above TAF? Currently reading 8 rem/hr
4. Any thoughts on having TEPCO getting a better flow path that could handle higher pressures? Recommendations
5. Any word on when they might stop inerting Unit 1?
6. Any concerns that may have more instrument failures due to operating in a high radiation / high temperature environment?
7. Received report today that TEPCO thinks they have 4' of water in DW, I thought we believed they had 10-12' any effort to reconcile differences?

Comments

1. Concern about Alternate Vent methods of venting Unit 1 RPV
a. Method of venting all RPV's
b. Concern about covering up the SRV's if they flood up DW
i. Do we have that concern?
ii. SRV may close and lose all injection and vent capability

From: Hoc, PMT12
Sent: Sunday, April 17, 2011 9:13 PM
To: PMT10 Hoc
Subject: FW: Final Slides - NRC INTERIM COMPREHENSIVE ASSESSMENT OF FUKUSHIMA EVENT
Attachments: JapenGlobalAssessmentFinalApril15.pptx

I think these are the final slides

From: OST01 HOC
Sent: Sunday, April 17, 2011 2:05 AM
To: Weber, Michael; Virgilio, Martin; Castleman, Patrick; Orders, William; Franovich, Mike; Hipschman, Thomas; Snodderly, Michael
Cc: Tracy, Glenn; Zimmerman, Roy; LIA08 Hoc; RST01 Hoc; Hoc, PMT12; Moore, Scott; Reynolds, Steven
Subject: Final Slides - NRC INTERIM COMPREHENSIVE ASSESSMENT OF FUKUSHIMA EVENT

These are the final slides that were provided by the site team for the SoS briefing package.

The attachments are OUO.

From: Casto, Chuck
Sent: Saturday, April 16, 2011 10:57 PM
To: ET07 Hoc; HOO Hoc
Cc: Moore, Scott; Zimmerman, Roy; Virgilio, Martin; Reynolds, Steven
Subject: Final slides for the ET - please pass along

Attached are the final slides I sent to the Ambassador's secretary. They will have them for the on-site briefing package. If SoS wants a few minutes we will give quick verbal. Otherwise Ast. Sec. Donohue (DOE) is traveling with her and will have these details. We've briefed him and his staff previously so he is up to speed. It is expected that she will at least say something to the NRC folks......The ambassador recommended to her that she discuss the NRC.

Thanks
chuck

aaQ | 319

NRC INTERIM COMPREHENSIVE ASSESSMENT of FUKUSHIMA EVENT

~~Official Use Only - Sensitive Internal Information~~

Background

- Consortium of U.S. nuclear organizations completed assessment
  - NRC; Department of Energy; Naval Reactors; Institute of Nuclear Power Operations; Electric Power Research Institute; General Electric
- Collaborated to complete technical assessments for safety issues for reactors and spent fuel pools
- Finishing major technical assessments
- Provided results to TEPCO and NISA

Assessment Conclusions

- U.S. Protective Action decisions remain conservative through all scenarios
  - Tokyo is not seriously threatened
- Unknown Ocean impacts
- Active radiation releases ongoing
- Accident conditions static but fragile
- Mitigating features temporary and highly unconventional

~~Official Use Only - Sensitive Internal Information~~

Assessment of Conditions

- Fuel Damage estimates: U-1 70%; U-2 30%; U-3 25% (est.)
- Reliance on steam cooling for reactors
- Time to react on a loss of injection is short – less than 10 hours for Unit 1
- Current situation results in a 1-10 to 1-100 <u>probability</u> of future energetic release
- Probability driven by seismic events without diversity or redundancy of injection system
- Can get 1-100,000 probability with training & preplanning of fire equipment and diverse & redundant injection system
- Containment flooding remains primary suggestion – especially for Units 1 & 3
- Flooding reduces <u>consequences</u> by one-to-two orders of magnitude

Next Steps

- Steam cooling assessment recommends more actions to mitigate additional events
  - Diversity and redundancy in feeding system
  - Automation of Giraffes and feeding systems
  - Additional feeding system injection points
  - Additional venting system

- Stability requires more actions
  - Completing actions to Phase 1 and Phase 2 stability
    - For example - decay heat removal system

From:	PMT10 Hoc
Sent:	Sunday, April 17, 2011 7:10 PM
To:	skeith@cdc.gov
Subject:	Tepco release today
Attachments:	TEPCO RoadMap (4-17-11).pdf

QQQ/320

Roadmap towards Restoration from the Accident
at Fukushima Daiichi Nuclear Power Station

April 17th, 2011
Tokyo Electric Power Company

With regard to the accident at Fukushima Daiichi Nuclear Power Station due to the Tohoku-Chihou-Taiheiyo-Oki Earthquake occurred on Friday, March 11th, 2011, we are currently making our utmost effort to bring the situation under control. This announcement is to notify the roadmap that we have put together towards restoration from the accident.

1. Basic Policy

By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

2. Targets

Based on the basic policy, the following two steps are set as targets: "Radiation dose is in steady decline" as "Step 1" and "Release of radioactive materials is under control and radiation dose is being significantly held down" as "Step 2." Target achievement dates are tentatively set as follows: "Step 1" is set at around 3 months and "Step 2" is set at around 3 to 6 months after achieving Step 1.

3. Immediate Actions

Immediate actions were divided into three groups, namely, "I. Cooling", "II. Mitigation", "III. Monitoring and Decontamination." For the following five issues—"Cooling the Reactors," "Cooling the Spent Fuel Pools," "Containment, Storage, Processing, and Reuse of Water Contaminated by Radioactive Materials (Accumulated Water)," "Mitigation of Release of Radioactive Materials to Atmosphere and from Soil," and "Measurement, Reduction and Announcement of Radiation Dose in Evacuation Order/Planned Evacuation/ Emergency Evacuation Preparation Areas"—targets are set for each of the five issues and various countermeasures will be implemented simultaneously.

Please see the attachment for detailed actions.

We would like to deeply apologize again for the grave inconvenience and anxiety that the broad public has been suffering due to the accident at the Fukushima Daiichi Nuclear Power Station. We will continue to make every endeavor to bring the situation under control.

April 17, 2011

Tokyo Electric Power Company

Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station

1. Basic Policy

By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

2. Targets

- Based on the basic policy, the following two steps are set as targets:
  - Step 1: Radiation dose is in steady decline.
  - Step 2: Release of radioactive materials is under control and radiation dose is being significantly held down.
  - (Note) Issues after Step 2 will be categorized as "Mid-term issues"
- Target achievement dates are tentatively set as follows, although there will still be various uncertainties and risks:
  - Step 1: around 3 months
  - Step 2: around 3 to 6 months (after achieving Step 1)
  - (Note) Announcements will be made as soon as timing of step-wise target achievement or quantitative prospects are determined, as well as if revisions to the targets or achievement dates become necessary.

3. Immediate Actions

- In order to achieve the above targets, immediate actions were divided into 3 groups with targets set for each of the 5 issues. Various countermeasures will be implemented simultaneously (see the table in right.)
- In order to achieve Step 1, overcoming the following two issues that are currently being addressed will be critical:

① Prevention of hydrogen explosion inside the primary containment vessel (hereafter, PCV) (Units 1 to 3.)

- Cooling the reactor by injecting fresh water into the reactor increases the chance of steam condensation, leading to a concern of potentially triggering a hydrogen explosion.

→Nitrogen gas will be injected into the PCV of each unit to keep the concentration of hydrogen and oxygen below flammability limit.

② Prevention of release of contaminated water with high radiation level outside of the site boundary (Unit 2.)

- While cooling the reactor by injecting fresh water, accumulation of contaminated water with high radiation level in the turbine building is increasing (possible release to outside of the site boundary.)

→Actions will be taken against accumulated water to (1) secure several storage places and (2) install facilities to process the contaminated water and reduce the radiation dose, among others.

Roadmap for Immediate Actions

Areas	Issues	Targets and Countermeasures	
		Step 1	Step 2
I. Cooling	(1) Cooling the Reactors	① **Maintain stable cooling** ・Nitrogen gas injection ・Flooding up to top of active fuel ・Examination and implementation of heat exchange function ② **(Unit 2) Cool the reactor while controlling the increase of accumulated water until the PCV is sealed**	③ **Achieve cold shutdown condition (sufficient cooling is achieved depending on the status of each unit.)** ・Maintain and reinforce various countermeasures in Step 1.
	(2) Cooling the Spent Fuel Pools	④ **Maintain stable cooling** ・Enhance reliability of water injection ・Restore coolant circulation system ・(Unit 4) Install supporting structure	⑤ **Maintain more stable cooling function by keeping a certain level of water.** ・Remote control of coolant injection operation ・Examination and implementation of heat exchange function
II. Mitigation	(3) Containment, Storage, Processing, and Reuse of Water Contaminated by Radioactive Materials (Accumulated Water)	⑥ **Secure sufficient storage place to prevent water with high radiation level from being released out of the site boundary.** ・Installation of storage / processing facilities. ⑦ **Store and process water with low radiation level** ・Installation of storage facilities/decontamination processing.	⑧ **Decrease the total amount of contaminated water.** ・Expansion of storage/processing facilities. ・Decontamination/Desalt processing (reuse), etc.
	(4) Mitigation of Release of Radioactive Materials to Atmosphere and from Soil	⑨ **Prevent scattering of radioactive materials on buildings and ground** ・Dispersion of inhibitor ・Removal of debris ・Installing reactor building cover	⑩ **Cover the entire buildings (as temporary measure).**
III. Monitoring/ Decontamination	(5) Measurement, Reduction and Announcement of Radiation Dose in Evacuation Order/Planned Evacuation/ Emergency Evacuation Preparation Areas	⑪ **Expand/enhance monitoring and inform of results fast and accurately** ・Examination and implementation of monitoring methods.	⑫ **Sufficiently reduce radiation dose in evacuation order / planned evacuation / emergency evacuation preparation areas** ・Decontamination/monitoring of homecoming residences.
		(Note) With regard to radiation dose monitoring and reduction measures in evacuation order/planned evacuation/emergency evacuation preparation areas, we will take every measure through thorough coordination with the national government and by consultation with the prefectural and municipal governments.	

Attachment ①

Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station

Basic Policy: By bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials, we will make every effort to enable evacuees to return to their homes and for all citizens to be able to secure a sound life.

Areas	Issues	Current Status (as of April 16th)	Targets, Countermeasures and Risks: <Step 1 (around 3 months)> Radiation dose is in steady decline.	Targets, Countermeasures and Risks: <Step 2 (around 3 to 6 months*)> Release of radioactive materials is under control and radiation dose is being significantly held down. * After achieving Step 1	Mid-term Issues
I. Cooling	(1) Cooling the Reactors	**Current Status [1] (Units 1 to 3) Cooling achieved by water injection while there is partial damage to fuel pellets.** ⇒Continued injection of fresh water and further cooling measures are required. Countermeasure [1]: Injecting fresh water into the RPV by pumps. Risk [1]: Possibility of hydrogen explosion due to condensation of steam in the PCV when cooled, leading to increased hydrogen concentration. Countermeasure [2]: Injecting nitrogen gas into the PCV (start from Unit 1.) Countermeasure [3]: Consideration of flooding the PCV up to the top of active fuel. **Current Status [2] (Units 1 to 3) High likelihood of small leakage of steam containing radioactive materials through the gap of PCV caused by high temperature.** ⇒Lowering the amount of steam through cooling and implementation of leakage prevention are required. Countermeasure [4]: Lower the amount of steam generated by sufficiently cooling the reactor (to be achieved by measures in Steps 1 and 2.) Countermeasure [5]: Consideration of shielding the leakage by covering the reactor building (coordinate with issue [4].) **Current Status [3] (Unit 2) Large amount of water leakage, indicating high likelihood of PCV damage.** ⇒Repairing the damaged location is required. ⇒Need to control the amount of water injection since leakage increases as injection increases. Countermeasure [6]: Consideration of sealing the damaged location (e.g., filling with grout (glutinous cement)) Countermeasure [7]: Cooling at minimum water injection rate (control the leakage of contaminated water.) Risk[2]: Possibility of prolonged work of sealing the damaged location (→countermeasures [12] and [14]) **Current Status [4] Secured multiple off-site power (1 system each from TEPCO and Tohoku EPCO) and deployed backup power (generator cars / emergency generators)** Risk [3]: Possibility of (partial) loss of power from the grid caused by ensuring aftershocks and lightning in summer. Countermeasure [8]: Install interconnecting lines of offsite power soon.	**Target [1] (Unit 1 to 3) Maintain stable cooling.** Countermeasure [9]: Flood the PCV up to the top of active fuel. Countermeasure [10]: Reduce the amount of radioactive materials (utilization of standby gas treatment system (filter), etc.) when PCV venting (release of steam containing radioactive materials into the atmosphere). Countermeasure [11]:Continue preventing hydrogen explosion by injecting nitrogen into the PCV. Risk [4]: Increase in water leakage into the turbine building in the process of flooding the PCV. Countermeasure [12]: Consideration and implementation of measures to hold down water inflow (e.g., circulating the water back into the RPV by storing and processing the accumulated water in the turbine building.) Countermeasure [13]: Consideration of recovering heat exchange function for the reactor (installing heat exchangers). Risk [5]: Possibility of prolonged work in high dose level area (→keep countermeasures [9] and [12]) **Target [2] (Unit 2) Cool the reactor while controlling the increase of accumulated water until PCV is sealed.** Countermeasure [14]: Continue cooling by current minimum injection rate. Countermeasure [15]: Continue prevention of hydrogen explosion by nitrogen injection into the PCV. Countermeasure [16]: Continue consideration and implementation of sealing measure at damaged location. Implement cooling measures similar to those for Units 1 and 3 once the dameged location is sealed. Risk[2]: Possibility of prolonged work of sealing the damaged location (→continue countermeasures [12] and [14])	**Target [3] Achieve cold shutdown condition (sufficient cooling is achieved depending on the status of each unit.)** Countermeasure [17]: Maintain and enhance countermeasures in Step 1 if needed.	**Issue [1] Prevention of breakage, clogging and water leakage of structural materials (reactor and pipes, etc.) due to corrosion caused by salt.**

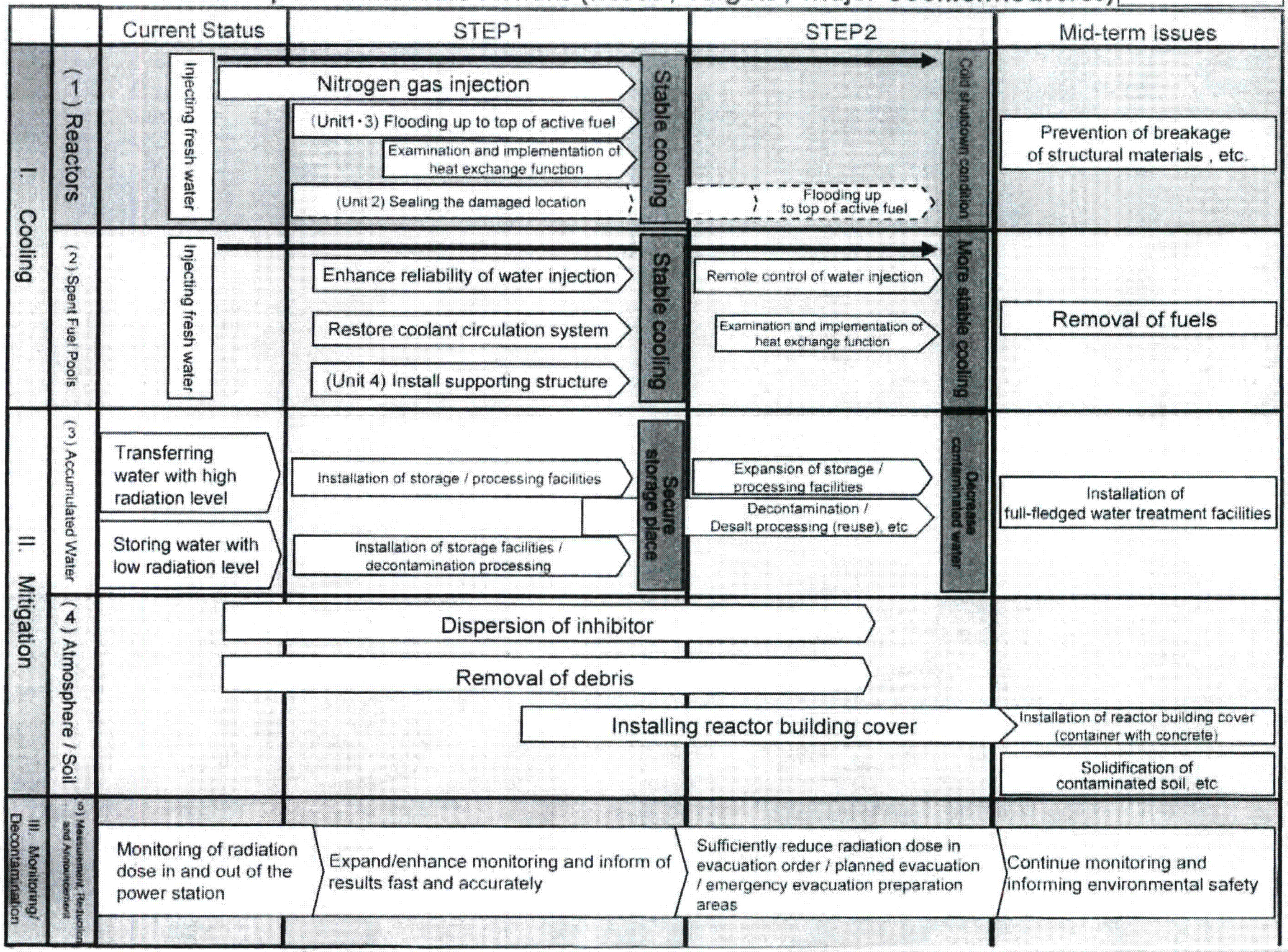
Note: Reactor pressure vessel is denoted as "RPV" and primary containment vessel is denoted as "PCV."

Areas	Issues	Current Status (as of April 16th)	Targets, Countermeasures and Risks		Mid-term Issues
			<Step 1 (around 3 months)> Radiation dose is in steady decline.	<Step 2 (around 3 to 6 months*)> Release of radioactive materials is under control and radiation dose is being significantly held down. * After achieving Step 1	
I. Cooling	(2) Cooling the Spent Fuel Pools	**Current Status [5] Fresh water is injected from outside for Units 1, 3, 4 and through normal cooling line for Unit 2.** ⇒Reduction of worker exposure and countermeasures for aftershocks are required. Countermeasure [18]: Consideration/implementation of improving reliability of external water injection by concrete pumpers ("Giraffe", etc.)/switch to remote-controlled operation. **Current Status [6]: Confirmation of release of radioactive materials from the pool** Countermeasure [19]: Sampling and measurement of steam/pool water by "Giraffe", etc. ⇒Most fuels in Unit 4 have been confirmed intact according to the result of pool water analysis. **Current Status [7]: Walls of the building supporting the pool have been damaged.** ⇒Tolerance evaluation is especially needed for Unit 4. Countermeasure [20]: Seismic tolerance assessment of Unit 4. ⇒A certain level of seismic tolerance has been confirmed. Countermeasure [21]: Continue monitoring and examine necessary countermeasures (→ countermeasure [26].)	**Target [4]: Maintain stable cooling.** Countermeasure [22]: Continuation of water injection by "Giraffe", etc (reliability improvement (enhanced durability of hoses)/switch to remote-controlled operation.) Countermeasure [23]: Add cooling function to normal Fuel Pool Cooling system and continue injecting water for Unit 2. Countermeasure [24]: Examination and implementation of restoration of normal cooling system for Units 1, 3, and 4. Risk [6]: Possibility of inability to restore normal cooling line due to damages to the building. Countermeasure [25]: Examination and implementation of installing heat exchangers. Countermeasure [26]: (Unit 4) Installation of supporting structure under the bottom of the pool.	**Target [5]: Maintain more stable cooling function by keeping a certain level of water.** Countermeasure [27]: Cooling by installation of heat exchangers. Countermeasure [28]: Expansion of remote-controlled operation areas of "Giraffe", etc.	**Issue [2]: Removal of fuels (including Units 5 & 6.)**
II. Mitigation	(3) Containment, Storage, Processing, and Reuse of Water Contaminated by Radioactive Materials (Accumulated Water)	**Current Status [8]: Leakage of high radiation-level contaminated water assumed to have originated from Unit 2 reactor occurred, but was subsequently stopped.** Countermeasure [29]: Identify leakage path and examine and implement preventive measures. ・Placing sandbags with radioactive-material adsorption material (zeolite) in the bay. ・Installing fences in the bay to prevent contamination from spreading (silt fence.) ・Blockage between trenches and buildings, etc **Current Status [9]: Leakage and accumulation of high radiation level contaminated water at Unit 2's turbine building, vertical shafts and trenchs.** Countermeasure [30]: Transferring accumulated water to facilities that can store it (condenser and Centralized Waste Treatment Facility). Countermeasure [31]: Preparing decontamination and desalt of transferred accumulated water. (→Countermeasure [38]) Countermeasure [32]: Preparing to install tanks. **Current Status [10]: Increase of storage volume of water with low radiation level.** Countermeasure [33]: Preparing to store with tanks and barges. Countermeasure [34]: Preparing for decontamination and desalt of contaminated water (→Countermeasure [41]) Countermeasure [35]: Preparing to install a reservoir. **Current Status [11]: High likelihood of underground water around the building (sub-drainage water) to be contaminated.** Countermeasure [36]: Preparing to decontaminate sub-drainage water after being pumped up.	**Target [6]: Secure sufficient storage place to prevent water with high radiation level from being released out of the site boundary.** Countermeasure [37]: Utilization of "Centralized Waste Treatment Facility", etc. to store water. Countermeasure [38]: Install water processing facilities; decontaminate and desalt highly-contaminated water and store in tanks. Risk [7]: Possibility of delay in installing water processing facilities or poor operating performance of the facilities. Countermeasure [39]: Examination and implementation of backup measures (installment of additional tanks or pools or leakage prevention by coagulator, etc.) **Target [7]: Store and process water with low radiation level.** Countermeasure [40]: Increase storage capacity by adding tanks, barges, Megafloat, etc. Countermeasure [41]: Decontaminating contaminated water using decontaminants to below acceptable criteria.	**Target [8]: Decrease the total amount of contaminated water.** Countermeasure [42]: Expansion of additional tanks to store high radiation-level contaminated water. Countermeasure [43]: Continuation and reinforcement of decontamination and desalt of high radiation-level water. Countermeasure [44]: Continuation and reinforcement of decontamination and desalt of low radiation-level water. Countermeasure [45]: Reuse of processed water as reactor coolant. Countermeasure [46]: Decontamination to the level below criteria level.	**Issue [3] Installation of full-fledged water treatment facilities.**

Areas	Issues	Current Status (as of April 16th)	Targets, Countermeasures and Risks: <Step 1 (around 3 months)> Radiation dose is in steady decline.	Targets, Countermeasures and Risks: <Step 2 (around 3 to 6 months*)> Release of radioactive materials is under control and radiation dose is being significantly held down. * After achieving Step 1	Mid-term Issues
II. Mitigation	(4) Mitigation of Release of Radioactive Materials to Atmosphere and from Soil	**Current Status [12]: Debris are scattered outside the buildings and radioactive materials are being scattered.** Countermeasure [47]: Inhibit scattering of radioactive materials by full-scale dispersion of inhibitor after confirming its performance by test. Countermeasure [48]: Prevent rain water contamination by dispersion of inhibitor. Countermeasure [49]: Removal of debris. Countermeasure [50]: Examination and implementation of basic design for reactor building cover and full-fledged measure (container with concrete roof and wall, etc.) Countermeasure [51]: Consideration of solidification, substitution and cleansing of contaminated soil (med-term issues.)	**Target [9]: Prevent scattering of radioactive materials on buildings and ground.** Countermeasure [52]: Improvement of work condition by expanding application and dispersion of inhibitors to the ground and buildings. Countermeasure [53]: Continue removal of debris. Countermeasure [54]: Begin installing reactor building cover (with ventilator and filter.) Risk [8]: Considerable reduction of radiation dose is a prerequisite to launch construction (→continue countermeasure [52] and [53].)	**Target [10]: Cover the entire buildings (as temporary measure).** Countermeasure [55]: Complete installing reactor building covers (Units 1, 3, 4.) Risk [9]: Possibility of cover being damaged by a huge typhoon. Countermeasure [56]: Begin detailed design of full-fledged measure (container with concrete roof and wall, etc.)	**Issue [4]: Cover the entire building (as full-fledged measure)** Issue [5]: Solidification, substitution and cleansing of contaminated soil.
III. Monitoring/ Decontamination	(5) Measurement, Reduction and Announcement of Radiation Dose in Evacuation Order/Planned Evacuation/Emergency Evacuation Preparation Areas	**Current status [13]: Monitoring of radiation dose in and out of the power station is carried out.** Countermeasure [57]: Monitoring sea water, soil and atmosphere within the site boundary (25 locations.) Countermeasure [58]: Monitoring radiation dose at the site boundary (12 locations.) Countermeasure [59]: Consideration of monitoring methods in evacuation order/planned evacuation/emergency evacuation preparation areas. (→countermeasure [60] to [63])	**Target [11]: Expand/enhance monitoring and inform of results fast and accurately.** Countermeasure [60]: Consideration and implementation of monitoring methods in evacuation order / planned evacuation / emergency evacuation preparation areas (in cooperation and consultation with national/prefectural/municipal governments.) Countermeasure [61]: Announce accurately monitoring results of long half-life residue radioactive materials such as cesium 137.	**Target [12]: Sufficiently reduce radiation dose in evacuation order / planned evacuation / emergency evacuation preparation areas.** Countermeasure [62]: Monitoring of homecoming residences 〈in cooperation and consultation with national / prefectural / municipal governments.〉 Countermeasure [63]: Examination and implementation of necessary measures to reduce radiation dose (decontamination of homecoming residences and soil surface) 〈in cooperation and consultation with national/prefectural/municipal governments.〉	Issue [6]:Continue monitoring and informing environmental safety.
		(Note) With regard to radiation dose monitoring and reduction measures in evacuation order/planned evacuation/emergency evacuation preparation areas, we will take every measure through thorough cooperation with the national government and by consultation with the prefectural and municipal governments.			

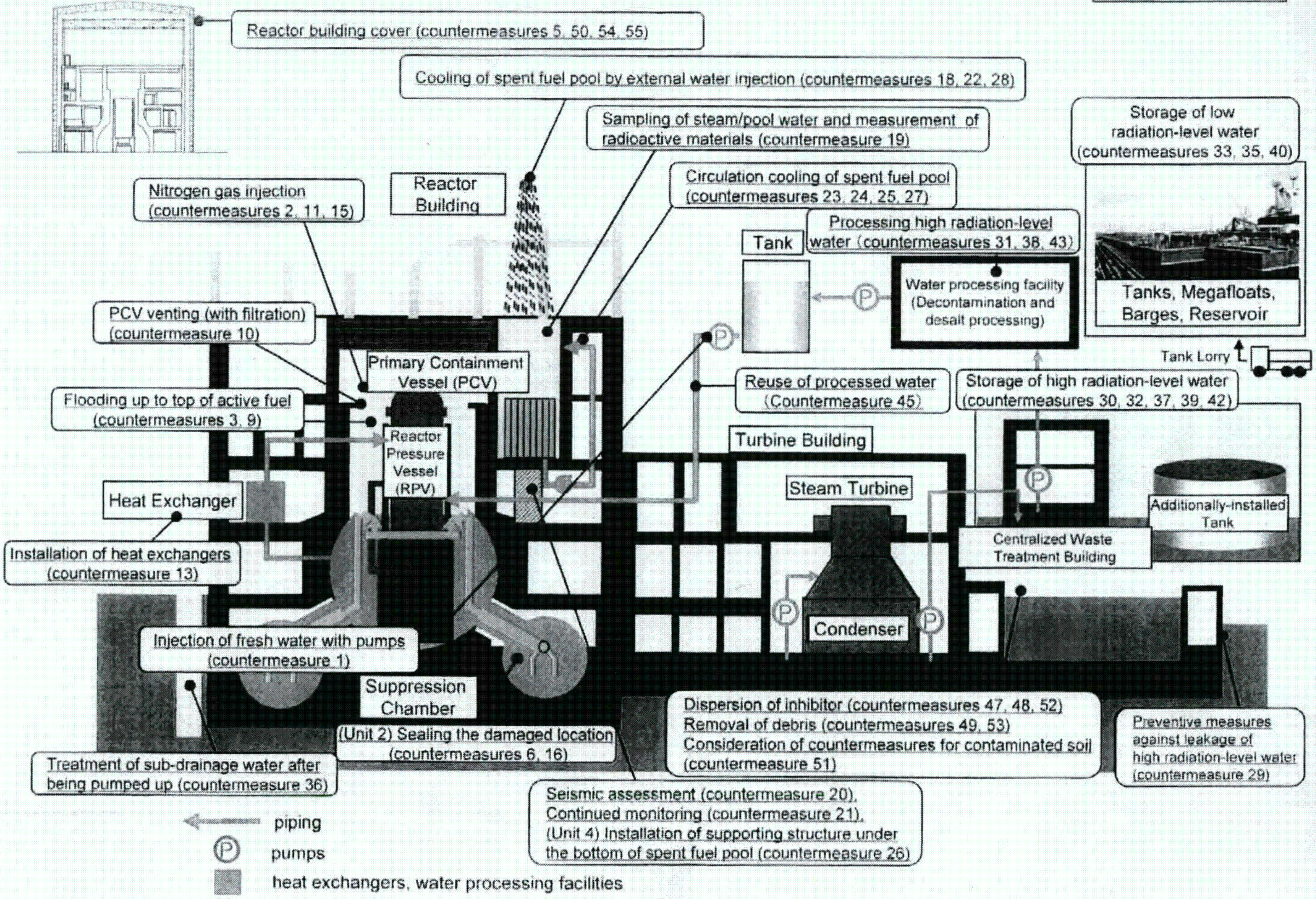
Reference 1

Roadmap for Immediate Actions (Issues / Targets / Major Countermeasures)



Reference 2

Overview of Major Countermeasures in the Power Station



From: LIA03 Hoc
Sent: Sunday, April 17, 2011 12:25 PM
To: LIA08 Hoc; LIA02 Hoc; LIA10 Hoc
Subject: FW: USNRC Emergency Operations Center Status Update
Attachments: USNRC Earthquake-Tsunami Update 041711 1200EDT.pdf

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From: LIA08 Hoc
Sent: Sunday, April 17, 2011 12:25 PM
Subject: USNRC Emergency Operations Center Status Update

Liaison Team Coordinator
US Nuclear Regulatory Commission
email: lia08.hoc@nrc.gov
Desk Ph: 301-816-5185

aaa/321

From: Hoc, PMT12
Sent: Sunday, April 17, 2011 9:53 AM
To: Zimmerman, Roy
Cc: PMT10 Hoc
Subject: FW: TEPCO "Roadmap towards Restoration"
Attachments: TEPCO.zip; kaieda.zip; Kaieda(correction).pdf

From: LIA08 Hoc
Sent: Sunday, April 17, 2011 9:40 AM
To: Aaron Leong; Al Hochevar; Aleshia Duncan; Alice Caponiti; Armando Aviles; Blake Crowe; Blamey, Alan; Boger, Bruce; Bruce Howard; CAPT Kenneth Spurlock, USN; Casto, Chuck; Christensen, Harold; Christopher Green; Claire Berger; Craig Gaddis; Daniel Piccuta; Daniel Piccuta; Daniel Russel; Daryn Moorman; DORLCAL Resource; Dorman, Dan; DprNrrCal Resource; Emche, Danielle; ET05 Hoc; ET07 Hoc; FOIA Response.hoc Resource; Geoffrey Wiggin; Giitter, Joseph; Glenn Southern; Heather Dresser; Holahan, Vincent; HOO Hoc; INPO; INPO; INPO; INPO; INPO; INPO; INPO; James McKenna; James White; James Zumwalt; Jay Tilden; Jeffrey Bader; Jeffrey Miller; Jeremy Mears; John Peters; Joseph Donovan; Joseph Young; Julie Spencer; Justin Cooper; Kenneth R. Spurlock; Kenneth Worthy; Lee Gard; LIA08 Hoc; Marc M Wall; McDermott, Brian; McGinty, Tim; Michael Schiffer; Miller, Chris; Monninger, John; Morris, Scott; NRC Liaison at USAID; OST02 HOC; PACOM Watch Officer; Pentagon Japan Crisis Team J-4 Desk; Peter Lyons; Hoc, PMT12; Raymond Greene; Richard Webb; Rick Nielsen; Robert Gambone; Robert Luke; Robert Mercer; Ron Cherry; Ross-Lee, MaryJane; RST01 Hoc; RST01B Hoc; Russell Morales; Rust Deming; Sal Golub; Sal Golub; Samuel Young; Simon Schuchat; Stahl, Eric; Stephen Town; Steve Aoki; Suzanne Basalla; Tim Cipullo; Tom Vavoso; Trevor Conger; US Forces Japan J4; Virgilio, Martin; Weber, Michael; Wiggins, Jim; William Berger; William Webster; Wittick, Brian; Zimmerman, Roy
Cc: RST01 Hoc; RST12 Hoc; Zimmerman, Roy
Subject: FW: TEPCO "Roadmap towards Restoration"

Good Morning,

Please find attached TEPCO's "Roadmap Toward Restoration" documents. The Executive Team director has asked that you review these documents because we'll be discussing them at our 11:00 am. We would like your views on this document within a reasonable timeframe.

Thank you,

Liaison Team Coordinator
US Nuclear Regulatory Commission
email: lia08.hoc@nrc.gov
Desk Ph: 301-816-5185

Q00/322

Attachment TEPCO.zip(1255903 bytes) cannot be converted to PDF format.

Statement of Mr. Banri Kaieda, Minister of Economy, Trade and Industry at the press conference following the announcement of Roadmap by Tokyo Electric Power Company (TEPCO)

1. Presentation at the earliest possible date of a roadmap towards settling the situation at Fukushima Daiichi Nuclear Power Station has been requested by people home and abroad, especially the residents around Fukushima Daiichi Nuclear Power Station.
   TEPCO has just released this roadmap, which is an important step forward. Taking this opportunity, we would like to move from the "emergency response phase" up until now to the "planned & stabilizing action phase" in which the settlement of the situation will be aimed under the solid roadmap.
2. In response to the release of the roadmap,
   (1) The Government will request TEPCO to ensure the implementation of this roadmap steadily and as early as possible. To this end, the Nuclear and Industrial Safety Agency and others will make regular follow-up monitoring of the progress of the works and necessary safety checks;
   (2) The Government will request TEPCO to ensure the mobilization and deployment of workers, the procurement and preparation of equipment and materials, and the arrangement of accommodation and other facilities, which are necessary to ensure implementation of the roadmap;
   (3) At the end of Step 2, the release of radioactive materials will be under control. At this stage, the Government will , following advices of the Nuclear Safety Commission of Japan, review the "Deliberate Evacuation Area" and the "Evacuation Prepared Area". Up until that time, we will consider the details of review criteria, and will decontaminate the widest possible area.
   By implementing this, we would like to announce, within 6 to 9 months as our target, to the residents of some of the areas whether they will be able to come home.

(Division in Charge)
Nuclear and Industrial Safety Agency
Nuclear Safety Public Relations and Training Division

Attachment kaieda.zip(44197 bytes) cannot be converted to PDF format.

From: PMT10 Hoc
Sent: Sunday, April 17, 2011 9:34 AM
To: pmt12.hoc@nrc.gov; RST01 Hoc
Attachments: ICRP 2011 Pub 111.pdf

Free copy of newly released ICRP Publication No. 111 for your information and use.

QQQ/323

ICRP

INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

April 4, 2011

The International Commission on Radiological Protection (ICRP) in cooperation with Elsevier, the publishers of the Annals of the ICRP, present this special cost-free release of ICRP *Publication 111* Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency.

ICRP is a registered charity that relies on the sale of publications to help support its ongoing work. However, the cost-free release of this publication is a gesture to aid the Japanese people in recovering from the recent earthquake, tsunami, and accident at the Fukushima Daiichi nuclear power plant. Our thoughts are with those in Japan dealing with the aftermath of these tragic events, and we regret that the recommendations of ICRP *Publication 111* need to be put into active use so soon after having been published.

This special free release of ICRP *Publication 111* is dedicated to those in Japan who have lost so very much.

With deep sympathy, on behalf of ICRP,

Claire Cousins

Claire Cousins
ICRP Chair

Christopher Clement
ICRP Scientific Secretary

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ICRP

Annals of the ICRP

ICRP Publication 111

Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency

This special free release of ICRP Publication 111 is dedicated to those in Japan who have lost so very much

ELSEVIER

Annals of the ICRP

Published on behalf of the International Commission on Radiological Protection

Aims and Scope

The International Commission on Radiological Protection (ICRP) is the primary body in protection against ionising radiation. ICRP is a registered charity and is thus an independent non-governmental organisation created by the 1928 International Congress of Radiology to advance for the public benefit the science of radiological protection. The ICRP provides recommendations and guidance on protection against the risks associated with ionising radiation, from artificial sources widely used in medicine, general industry and nuclear enterprises, and from naturally occurring sources. These reports and recommendations are published approximately four times each year on behalf of the ICRP as the journal *Annals of the ICRP*. Each issue provides in-depth coverage of a specific subject area.

Subscribers to the journal receive each new report as soon as it appears so that they are kept up to date on the latest developments in this important field. While many subscribers prefer to acquire a complete set of ICRP reports and recommendations, single issues of the journal are also available separately for those individuals and organizations needing a single report covering their own field of interest. Please order through your bookseller, subscription agent, or direct from the publisher.

ICRP is composed of a Main Commission, a Scientific Secretariat, and five standing Committees on: radiation effects, doses from radiation exposure, protection in medicine, the application of ICRP recommendations, and protection of the environment. The Main Commission consists of a Chair and twelve other members. Committees typically comprise 10–15 members. Biologists and medical doctors dominate the current membership; physicists are also well represented.

ICRP uses Working Parties to develop ideas and Task Groups to prepare its reports. A Task Group is usually chaired by an ICRP Committee member and usually contains a number of specialists from outside ICRP. Thus, ICRP is an independent international network of specialists in various fields of radiological protection. At any one time, about one hundred eminent scientists and policy makers are actively involved in the work of ICRP. The Task Groups are assigned the responsibility for drafting documents on various subjects, which are reviewed and finally approved by the Main Commission. These documents are then published as the *Annals of the ICRP*.

The membership of the Task Group during the period of preparation of this report was:

J. Lochard (Chair)	I. Bogdevitch	E. Gallego
P. Hedemann-Jensen	A. McEwan	A. Nisbet
A. Oudiz (2006–2007)	T. Schneider	P. Strand

The corresponding members were:

A. Janssens	T. Lazo	Z. Carr

Annals of the ICRP

ICRP PUBLICATION 111

Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency

Editor
C.H. CLEMENT

Authors
J. Lochard, I. Bogdevitch, E. Gallego, P. Hedemann-Jensen, A. McEwan, A. Nisbet, A. Oudiz, T. Schneider, P. Strand, Z. Carr, A. Janssens, T. Lazo

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ELSEVIER ICRP Publication 111 Annals of the ICRP

Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency

ICRP Publication 111

Approved by the Commission in October 2008

Abstract–In this report, the Commission provides guidance for the protection of people living in long-term contaminated areas resulting from either a nuclear accident or a radiation emergency. The report considers the effects of such events on the affected population. This includes the pathways of human exposure, the types of exposed populations, and the characteristics of exposures. Although the focus is on radiation protection considerations, the report also recognises the complexity of post-accident situations, which cannot be managed without addressing all the affected domains of daily life, i.e. environmental, health, economic, social, psychological, cultural, ethical, political, etc. The report explains how the 2007 Recommendations apply to this type of existing exposure situation, including consideration of the justification and optimisation of protection strategies, and the introduction and application of a reference level to drive the optimisation process. The report also considers practical aspects of the implementation of protection strategies, both by authorities and the affected population. It emphasises the effectiveness of directly involving the affected population and local professionals in the management of the situation, and the responsibility of authorities at both national and local levels to create the conditions and provide the means favouring the involvement and empowerment of the population. The role of radiation monitoring, health surveillance, and the management of contaminated foodstuffs and other commodities is described in this perspective. The Annex summarises past experience of long-term contaminated areas resulting from radiation emergencies and nuclear accidents, including radiological criteria followed in carrying out remediation measures.

Keywords: Post-accident; Rehabilitation; Optimisation; Reference level; Stakeholder involvement; Radiation monitoring; Health surveillance; Contaminated foodstuffs

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Annals of the ICRP

Editorial

AFTER THE EMERGENCY...

This issue of the Annals provides advice on the application of the Commission's 2007 Recommendations (ICRP, 2008) with respect to existing exposure situations. Specifically, it deals with people living in long-term contaminated areas after a nuclear accident or radiation emergency, although many aspects of this advice also apply to other instances of existing exposure situations (e.g. radon in dwellings or workplaces, naturally occurring radioactive material, or contaminated sites resulting from past activities).

In some ways, this report picks up where *Publication 109* 'Application of the Commission's Recommendations for the protection of people in emergency exposure situations' (ICRP, 2009) leaves off, since the situations dealt with in this issue may well have evolved from an earlier emergency exposure situation.

The Task Groups working on these two documents have co-ordinated their efforts so that they give complementary advice of use to radiological protection professionals in the field of emergency and consequence management. This co-operation was vital given that an important aspect of the larger problem is the transition from an emergency exposure situation to an existing exposure situation. Strategies must change from those driven mainly by urgency, with potentially high levels of exposure and predominantly central decisions, to more decentralised strategies which aim to improve living conditions and reduce exposures to as low as reasonably achievable given the circumstances.

One general point that the reader should take from this report is that it emphasises the new approach of the Commission which reinforces that the principle of optimisation of protection (with some type of restriction on individual doses) is absolutely central to the system of protection, and that it is to be applied in a similar way to all exposure situations. Optimisation, aided by the use of reference levels, is essential to the approaches described in this report.

Another important point is that the success of measures taken to control doses to members of the public in existing exposure situations relies heavily on the behaviour of those exposed. This should not be seen as a weakness, but rather a strength that can be exploited through the involvement of key stakeholders; provision of timely, understandable, and practical information; and encouragement of self-protection measures.

Worldwide experience following accidents (both nuclear and non-nuclear) has shown that individuals are often not particularly willing to leave affected areas. In addition, even if restrictions must be put on land uses and lifestyles, in the long term people wish to live life that is as normal as possible. Therefore, whenever possible, a long-term goal should be to rehabilitate areas to allow people to return to their normal habits.

After all, isn't it true that what most people really want is to continue living their lives, and that they are willing and able (sometimes with a little guidance) to help make that happen?

CHRISTOPHER H. CLEMENT
SCIENTIFIC SECRETARY, ICRP

References

ICRP, 2008. The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Ann. ICRP 37 (2–4).

ICRP, 2009. Application of the Commission's recommendations for the protection of people in emergency exposure situations. ICRP Publication 109. Ann. ICRP 39 (1).

CONTENTS

PREFACE

At its meeting in Paris in March 2005, the Main Commission of the International Commission on Radiological Protection (ICRP) approved the formation of a new Task Group, reporting to Committee 4, to develop guidance on the implementation of its new Recommendations (ICRP, 2007) for the protection of people living in long-term contaminated areas after a nuclear accident or a radiation emergency.

The terms of reference of the Task Group were to provide guidance on:

- setting reference levels for planning long-term protection strategies;
- implementing optimised protective actions;
- involving stakeholders in radiological protection;
- developing radiation monitoring and health surveillance; and
- managing contaminated commodities.

In developing its guidance, the Task Group was encouraged to co-ordinate with the concurrently approved Task Group in charge of elaborating recommendations on the application of the Commission's Recommendations for the protection of people in emergency exposure situations (ICRP, 2009).

The present report takes account of past experience of the protection of populations living in contaminated areas, particularly in the Commonwealth of Independent States countries affected by the Chernobyl accident, and to a lesser extent to other past accidents and events that resulted in the contamination of large areas. It takes also into account recent methodological and practical developments at international and national levels: the INEX programme of the Committee of Radiation Protection and Public Health of the Nuclear Energy Agency/Organisation for Economic Co-operation and Development (NEA/OECD), the EURANOS Project of the European Commission, the French CODIRPA exercise, the ETHOS Project, and the CORE Programme on post-Chernobyl rehabilitation in Belarus.

The guidance offered by the Task Group is generic, providing a basic framework that can be tailored for specific circumstances. The detailed implementation of the Commission's Recommendations is a matter for the relevant national authorities.

The membership of the Task Group during the period of preparation of this report was:

J. Lochard (Chair)	I. Bogdevitch	E. Gallego
P. Hedemann-Jensen	A. McEwan	A. Nisbet
A. Oudiz (2006–2007)	T. Schneider	P. Strand

The corresponding members were:

A. Janssens	T. Lazo	Z. Carr

The membership of Committee 4 during the period of preparation of this report was:

A. Sugier (Chair)	P. Burns	P. Carboneras
D. Cool	J. Cooper (Vice-Chair)	M. Kai
J-F. Lecomte (Secretary)	H. Liu	J. Lochard
G. Massera	A. McGarry	K. Mrabit
M. Savkin	K-L. Sjöblom	A. Tsela
W. Weiss		

The Task Group met four times:

13–15 February 2006, NEA/OECD, Issy-les-Moulineaux, France
2–4 October 2006, NEA/OECD, Issy-les-Moulineaux, France
16–18 April 2007, NEA/OECD, Paris, France
4–6 February 2008, World Health Organization (WHO), Geneva, Switzerland

The Task Group members wish to thank Peter Schmidt from Wismut GmbH who gave a useful presentation on management of the rehabilitation of areas contaminated by uranium mining and milling activities in the former East Germany, Mikhail Savkin from the Biophysics Institute of Russia for sharing his experience of the management of the long-term consequences of the Chernobyl accident, and Céline Bataille from CEPN-France for her scientific assistance.

The Task Group would also like to thank those organisations and staff that made facilities and support available for its meetings. These include NEA/OECD (Paris) and WHO (Geneva).

The report was adopted by the Commission at its meeting in Buenos Aires, Argentina on 25 October 2008.

References

ICRP, 2007. The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Ann. ICRP 37 (2–4).

ICRP, 2009. Application of the Commission's recommendations for the protection of people in emergency exposure situations. ICRP Publication 109. Ann. ICRP 39 (1).

EXECUTIVE SUMMARY

(a) The present report provides guidance on the application of the Commission's Recommendations for the protection of people living in long-term contaminated areas resulting from either a nuclear accident or a radiation emergency. This post-accident rehabilitation situation is considered by the Commission as an 'existing exposure situation'.

(b) The following recommendations are the first to deal with the management of existing exposure situations since publication of the 2007 Recommendations (ICRP, 2007). They complement those made in *Publication 82* (ICRP, 2000), and further develop the role of stakeholders, introduced for the first time by the Commission in this publication. They also take into account the evolution introduced by the 2007 Recommendations from the previous process-based approach of practices and interventions to an approach based on the characteristics of radiation exposure situations. They particularly emphasise the new approach of the Commission, which reinforces the principle of optimisation of protection to be applied in a similar way to all exposure situations with restrictions on individual doses.

(c) Although developed for managing a specific category of existing exposure situation, many recommendations developed in this report are broadly applicable with the necessary adaptations to other existing exposure situations like, for example, radon in dwellings and workplaces, naturally occurring radioactive material, or contaminated sites resulting from past nuclear and industrial activities. This particularly concerns the use of reference levels to plan protection strategies, the role of self-help protective actions complementing the protective actions implemented by authorities, and the accompanying measures to inform the affected individuals.

(d) The transition from an emergency exposure situation to an existing exposure situation is characterised by a change in management, from strategies mainly driven by urgency, with potentially high levels of exposure and predominantly central decisions, to more decentralised strategies aiming to improve living conditions and reduce exposure to as low as reasonably achievable given the circumstances. The decision to allow people who wish to live in contaminated areas to do so is taken by the authorities, and this indicates the beginning of the post-accident rehabilitation phase. Implicit with this decision is the ability to provide people with protection against the potential health consequences of the radiation, and sustainable living conditions, including respectable lifestyles and livelihoods.

(e) Past experience of existing exposure situations resulting from a nuclear accident or a radiological emergency has revealed that all dimensions of the daily life of the inhabitants within the contaminated areas, as well as the social and economic activities, are affected. These are complex situations which cannot be managed with radiation protection considerations alone, and must address all relevant dimensions such as health, environmental, economic, social, psychological, cultural, ethical, political, etc.

(f) In most existing exposure situations affecting the living place of the population, the level of exposure is mainly driven by individual behaviour and is difficult to control at the source. This generally results in a very heterogeneous distribution of exposures, which call for an individual approach for control of the situation. As a consequence, the use of the 'average individual' is not appropriate for the management of exposure in a contaminated area.

(g) Living or working in contaminated areas is considered to represent an existing exposure situation. For such situations, the fundamental protection principles include the justification of implementing protection strategies, and the optimisation of the protection achieved by these strategies. Reference levels are used during the optimisation process to plan protection strategies that would result in estimated residual doses lower than these levels. Dose limits do not apply because existing exposure situations cannot be managed in an a priori fashion.

(h) Protection strategies are made up of a series of protective actions directed at the relevant exposure pathways. The justification and optimisation of protection strategies are an evolution from previous Recommendations, which were focused on justification and optimisation of individual protection measures.

(i) In the case of an existing exposure situation following an emergency exposure situation, justification applies initially to the fundamental decision to be taken by the authorities at the end of the emergency exposure situation to allow people to live permanently in long-term contaminated areas. Such a decision may be accompanied by the setting of a radiation protection criterion above which it is mandatory to relocate the population, and below which inhabitants are allowed to stay subject to certain conditions. Several areas may be defined with relevant conditions according to a graded approach. Secondly, the justification principle applies at the level of decision related to the definition of the protection strategies to be implemented to maintain and possibly improve the radiological situation resulting from the emergency phase.

(j) The responsibility for ensuring an overall benefit to society as well as to individuals when populations are allowed to stay in contaminated areas lies with governments or national authorities. Worldwide experience following nuclear and non-nuclear accidents shows that neither nations nor individuals are very willing to leave affected areas. In general, while authorities may require individuals to leave the affected areas for health reasons in case of excessive residual levels of exposure, wherever possible, they will aim to rehabilitate these areas to allow further human activities.

(k) The principle of optimisation of protection with a restriction on individual dose is central to the system of protection recommended by the Commission for existing exposure situations. Due to its judgemental nature, there is a strong need for transparency of the process. This transparency assumes that all relevant information is provided to the involved parties, and that the traceability of the decision-making process is documented properly, aiming for an informed decision.

(l) Protection strategies have to be prepared by authorities as part of national planning arrangements. These plans should take into account self-help protective actions, including the conditions to allow such actions to be undertaken by the inhabitants, and their results in terms of prospective dose reduction.

Although it is difficult to ask the population to plan in advance for these actions, the Commission recommends authorities to involve key representative stakeholders to participate in the preparation of these plans.

(m) As in most cases in long-term contaminated areas, the level of exposure is driven by individual behaviour; the authorities should facilitate processes to allow inhabitants to define, optimise, and apply their own protective actions if required. A positive aspect is that individuals regain control of their own situation. However, self-help protective actions may be disturbing and their implementation supposes that affected individuals are fully aware of the situation and well informed. It is the government's responsibility to provide good guidance and to provide the means to implement it. Hence the government, or the responsible authority, will need to constantly evaluate the effectiveness of the protection strategy in place, including protective actions carried out at local or individual levels, in order to provide adequate support on how to further improve the situation.

(n) The Commission recommends that reference levels, set in terms of individual annual effective residual dose (mSv/year), should be used in conjunction with the planning and implementation of the optimisation process for exposures in existing exposure situations. The objective is to implement optimised protection strategies, or a progressive range of such strategies, which aim to reduce individual doses below the reference level. During the planning stage, the optimisation process should result in estimated residual doses that are below the reference level. During implementation of the optimisation process, particular attention should be given to reduce individual exposures that may remain above the reference level. However, exposures below the reference level should not be ignored; they should also be assessed to ascertain whether protection is optimised or further protective actions are needed.

(o) The reference level for the optimisation of protection of people living in contaminated areas should be selected in the lower part of the 1–20 mSv/year band recommended in *Publication 103* (ICRP, 2007) for the management of this category of exposure situations. Past experience has demonstrated that a typical value used for constraining the optimisation process in long-term post-accident situations is 1 mSv/year. National authorities may take into account the prevailing circumstances, and also take advantage of the timing of the overall rehabilitation programme to adopt intermediate reference levels to improve the situation progressively.

(p) Reference levels are used both prospectively, for planning of protection strategies (as well as, if necessary, defining derived reference levels for the implementation of some specific protective actions such as, for instance, trade of foodstuffs), and retrospectively as a benchmark for judging the effectiveness of implemented protection strategies.

(q) The fact that exposures have been reduced below the reference level is not a sufficient condition to discontinue protective actions as long as there is room to reduce exposures further in conformity with the optimisation process. The continuation of such actions would probably be a prime mechanism to maintain exposures close or similar to those in normal situations as recommended by the Commission.

(r) The management of an existing exposure situation following a nuclear accident or a radiological emergency relies on the implementation of a more or less complex rehabilitation programme coping with numerous dimensions (social, economic, health, environmental, etc.) according to the level of contamination and its space and time distribution. The implementation of protection strategies is a dynamic process which changes with the evolution of the radiological situation.

(s) It is the responsibility of the authorities, particularly at the regulatory level, to establish the conditions and to implement the means to allow effective engagement of the affected population in the protection strategies and more globally in the rehabilitation programme. Past experience of the management of contaminated areas has demonstrated that the involvement of local professionals and inhabitants in the implementation of protection strategies is important for sustainability of the rehabilitation programme. Mechanisms for engaging with stakeholders are driven by national and cultural characteristics, and should be adapted to the circumstances.

(t) The priority of protection strategies implemented by authorities is to protect people with the highest exposures, and in parallel to reduce all individual exposures associated with the event to as low as reasonably achievable. This implies assessment of the dose distribution, comparison of all doses with the reference level, and subsequent optimisation of protection. Typical strategies to be implemented by the authorities in a post-accident situation are clean-up of buildings, remediation of soils and vegetation, changes in animal husbandry, monitoring of the environment and produce, provision of clean foodstuffs, managing of waste (resulting from clean-up or from unmarketable contaminated goods), provision of information, guidance, instruction and equipment (e.g. for measurements), health surveillance, education of children, information for particular exposed groups and the public at large, etc. Experience has shown that the dissemination of a 'practical radiological protection culture' within all segments of the population, and especially within professionals in charge of the public health and education, is key to the success of protection strategies in the long term.

(u) Typical actions taken by the inhabitants in long-term contaminated areas, called 'self-help protective actions' by the Commission, are those aiming at the characterisation of their own radiological situation, notably their external and internal exposure. These mainly consist of monitoring the radiological quality of their direct environment (ambient dose rates in living areas and contamination of foodstuffs), their own external and internal exposure, and the exposure of the people for whom they have responsibility (e.g. children, elderly), and in adapting their way of life accordingly to reduce their exposure. Authorities should facilitate the setting-up of local forums involving representatives of the affected population and relevant experts (e.g. health, radiation protection, agriculture authorities, etc.). These forums will allow gathering and sharing of information, and favour common assessment of the effectiveness of strategies driven by the populations and the authorities.

(v) In recent years, stakeholder engagement has moved steadily to the forefront of policy decisions. Such engagement is considered by the Commission as key to the development and implementation of radiological protection strategies for most existing exposure situations. The control of radon in dwellings is another typical example. As experience in stakeholder engagement has grown, it has been possible to use many of the lessons learned as a basis for the development of best practice among the radiation protection community. Processes and tools are becoming established that can be generally applied to situations where the views and input of stakeholders are instrumental in improving the quality of protection.

(w) In the case of an existing exposure situation, the Commission recommends that the individuals concerned should receive general information on the exposure situation and the means of reducing their doses. In situations where individual lifestyles are key drivers of the exposure, individual monitoring is an important requirement, coupled with an information programme. Furthermore, given the uncertainties concerning future potential health effects of the exposures received by the population since the emergency phase, it is the responsibility of the authorities to implement a radiation and health surveillance programme.

(x) From the perspective of assessing the evolution of the exposure situation and the effectiveness of the protection strategies, the Commission recommends that a monitoring record system should be established under the responsibility of the relevant authorities. Such records are particularly important for determining potential groups at risk, in conjunction with health surveillance. Furthermore, to allow effective long-term health surveillance of the affected population, the Commission also recommends that health registries should be established for the population residing in the contaminated areas.

(y) The management of contaminated foodstuffs and other commodities produced in areas affected by a nuclear accident or a radiation emergency presents a particularly difficult problem because of issues of market acceptance. Furthermore, maintaining long-term restrictions on the production and consumption of foodstuffs may affect the sustainable development of the contaminated areas, and therefore call for appropriate implementation of the optimisation principle. Reconciling the interests of local farmers, producers, and the local population with those of consumers and the food distribution sector from outside the contaminated territory has to be considered carefully.

(z) The Commission considers that, despite the socio-economic complexity of the management of contaminated foodstuffs, in view of the interests of different stakeholders, protection strategies should be developed to meet the established reference level and optimised at all levels where it is possible to intervene: production, distribution, processing, as well as measures taken for informing consumers and allowing them to make appropriate choices. Derived reference levels expressed in Bq/kg or Bq/L play an important role in this process, in particular for the placing of foodstuffs on the market.

(aa) Commodities other than foodstuffs may be contaminated following a nuclear accident or other radiological emergency. These could include agricultural products such as wood, paper, and oil, or other products recycled from contaminated materials such as scrap metal. The objective again is to reduce exposure to as low as reasonably achievable, taking into account social and economic factors.

(bb) Past experience of long-term contaminated areas resulting from either nuclear tests (Bikini, Maralinga), nuclear accidents (Kyshtym, Palomares, Chernobyl), or a radiological source accident (Goiânia) illustrates the potential importance of ingestion of contaminated foodstuffs several decades after the event at the source of the problems when large rural areas are affected. Management of these foodstuffs to protect the local population against chronic internal exposure and to maintain the viability of local productions is essential. When urban and semi-urban environments are affected, irradiation and inhalation may remain significant exposure pathways for a long period of time. As far as the setting of reference levels for existing exposure situations resulting from nuclear accidents and radiation emergencies is concerned, past experience shows that typical dose values selected by authorities to manage such situations are close or equal to 1 mSv/year, corresponding to the desire to progressively reduce long-term exposure to levels that are close or similar to situations considered 'normal', i.e within the band of constraints set for public exposure in planned situations.

References

ICRP, 2000. Protection of the public in situations of prolonged exposure. ICRP Publication 82. Ann. ICRP 29 (1–2).

ICRP, 2007. The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Ann. ICRP 37 (2–4).

1. INTRODUCTION

1.1. Background

(1) In *Publication 103*, the International Commission on Radiological Protection (ICRP) described the general principles for the implementation of its system of protection in three different types of exposure situation – planned, emergency, and existing – which replace the previous distinction between practices and interventions (ICRP, 2007, Para. 176):

- planned exposure situations are situations involving the deliberate introduction and operation of sources;
- emergency exposure situations are situations that may occur during the operation of a planned situation, or from a malicious act, or from any other unexpected situation, and require urgent action in order to avoid or reduce undesirable consequences; and
- existing exposure situations are exposure situations that already exist when a decision on control has to be taken, including prolonged exposure situations after emergencies.

(2) The present report provides guidance on the application of the Commission's Recommendations for the protection of people living in long-term contaminated areas resulting from either a nuclear accident or a radiation emergency. This post-accident rehabilitation situation is considered by the Commission as an 'existing exposure situation' (ICRP, 2007, Para. 240).

(3) In the past, the Commission has set out general principles for planning protective actions after an accident. The first guidance was issued in *Publication 40* (ICRP, 1984) but this was confined to short- and medium-term actions. This guidance was then revised and complemented in *Publication 63* (ICRP, 1993) in the light of the 1990 Recommendations (ICRP, 1991). *Publication 82* (ICRP, 2000), on the protection of the public in situations of prolonged radiation exposure, was the first to deal explicitly with application of the Commission's system of radiological protection to controllable radiation exposure due to long-lived radioactive residues in the environment.

(4) The recommendations in this report complement those of *Publication 82* (ICRP, 2000). They further develop the role of stakeholders, recognising that those concerned with this type of situation should be involved and given the opportunity to participate directly in the implementation of protective actions to control their exposure. They also take into account the evolution introduced by the 2007 Recommendations from the previous process-based approach of practices and interventions to an approach based on the characteristics of radiation exposure situations. They particularly emphasise the new approach of the Commission, which reinforces the principle of optimisation of protection to be applied in a similar way to all exposure situations with restrictions on individual doses.

(5) The following recommendations are the first to deal with the management of existing exposure situations since publication of the 2007 Recommendations.

Although developed for managing a specific category of existing exposure situation, many recommendations developed in this report are broadly applicable with the necessary adaptations to other existing exposure situations, such as radon in dwellings or workplaces, naturally occurring radioactive material, or contaminated sites resulting from past nuclear and industrial activities. This particularly concerns the use of reference levels to plan and implement protective actions (Section 3.3), the role of self-help protective actions complementing the protective actions implemented by authorities, and the accompanying measures to inform the affected individuals (Section 4.2).

1.2. Scope

(6) Nuclear accidents and radiation emergencies are managed according to guidance covering short-, medium-, and long-term actions. The most recent guidance related to the management of short- and medium-term actions is provided by ICRP *Publication 109* (ICRP, 2009) on the Application of the Commission's Recommendations for the protection of people in emergency exposure situations. The post-accident rehabilitation situation covered by this report corresponds to the long-term actions that may need to be implemented in the case of a nuclear accident or radiological event resulting in long-term contamination of large inhabited areas.

(7) The transition from an emergency exposure situation to an existing exposure situation is characterised by a change in management from strategies mainly driven by urgency, with potentially high levels of exposure and predominantly central decisions, to more decentralised strategies aiming to improve living conditions and reduce exposures to as low as reasonably achievable given the circumstances. These strategies must take into account the long-term dimension of the situation, and exposed individuals should be directly involved in their own protection. The Commission recommends that this transition should be undertaken in a co-ordinated and fully transparent manner, and agreed and understood by all the affected parties.

(8) The decision to allow people to live in contaminated areas if they wish to do so is taken by the authorities, and this indicates the beginning of the post-accident rehabilitation phase. Implicit with this decision is the ability to provide individuals with protection against the potential health consequences of radiations, and the provision of sustainable living conditions, including respectable lifestyles and livelihoods.

(9) In the case of severe accidents affecting very large areas, the management of the response may need to deal simultaneously with actions relating to its different phases in different geographic areas. Thus, the transition from an emergency exposure situation to an existing exposure situation may occur at different times within the contaminated areas.

1.3. Structure of the report

(10) Chapter 2 considers the effects of a nuclear accident or a radiation emergency on the affected population. This includes the pathways of human exposure, the types

of exposed populations, the characteristics of exposures, and the experience from past events. Chapter 3 discusses the application of the Commission's Recommendations in this type of existing exposure situation, and includes consideration of justification and optimisation of protection strategies, and the introduction and application of reference levels to reduce inequity in individual dose distributions. Chapter 4 considers practical aspects of the implementation of protection strategies, both by authorities and the affected population. Chapter 5 covers radiation monitoring and health surveillance, and Chapter 6 deals with the management of contaminated foodstuffs and other commodities.

(11) Finally, Annex A summarises past experience of long-term contaminated areas resulting from radiation emergencies and nuclear accidents, including the radiological criteria followed in carrying out remediation measures.

1.4. References

ICRP, 1984. Statement from the 1984 Stockholm meeting of the International Commission on Radiological Protection. ICRP Publication 40. Ann. ICRP 14 (2).

ICRP, 1991. 1990 Recommendations of the International Commission on Radiological Protection. ICRP Publication 60. Ann. ICRP 21 (1–3).

ICRP, 1993. Principles for intervention for protection of the public in a radiological emergency. ICRP Publication 63. Ann. ICRP 22 (4).

ICRP, 2000. Protection of the public in situations of prolonged exposure. ICRP Publication 82. Ann. ICRP 29 (1–2).

ICRP, 2007. The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Ann. ICRP 37 (2–4).

ICRP, 2009. Application of the Commission's recommendations for the protection of people in emergency exposure situations. ICRP Publication 109. Ann. ICRP 39 (1).

2. LIVING IN CONTAMINATED AREAS

(12) Past experience of existing exposure situations resulting from a nuclear accident or a radiological emergency has revealed that all dimensions of daily life of the inhabitants, as well as social and economic activities, are affected within the contaminated areas. These are complex situations which cannot be managed with radiation protection considerations alone, and must address all relevant dimensions such as health, environmental, economic, social, psychological, cultural, ethical, political, etc. (UNDP, 2002). Although the present recommendations focus on the basic radiation protection principles to be applied to this type of exposure situation, they have been developed taking into account this complexity and the experience gained so far with its management.

2.1. Exposure pathways

(13) The types of existing exposure situation considered in this report are the result of dispersive events that lead to radioactive contamination over relatively extended areas. The pattern of deposition is dependent on the magnitude of the dispersive event, both in terms of activity and energy release, and on prevailing meteorological conditions at the time of the release, particularly the wind direction and any rainfall occurring during the passage of the plume. For an extended release, wind direction can be expected to vary over time. In the longer term, rainfall and weathering will allow penetration of deposited radionuclides into soil and some migration via water pathways or through resuspension. Uptake in plants from soils may vary seasonally. The levels of deposition may also vary greatly from one area to another. After the Chernobyl accident, surface contamination (activity per unit surface area) varied by factors of up to 10–100 within the same village. Generally in the longer term, one or a few radionuclides will dominate as the principal contributors to human exposure.

(14) Following contamination of the environment, several exposure pathways can be distinguished: external exposure due to deposited radionuclides and intake via consumption or inhalation of contaminated material. Radionuclide intake by humans may arise from consumption of vegetables, milk, meat and fish. The transfer to animals will depend on their intake and metabolism of the various radionuclides. Radionuclides deposited directly on plants or in soil may be bound to insoluble particles and be less available for intestinal absorption than radionuclides incorporated in foodstuffs. There may be considerable variation in intakes by the population with time, depending on the season of the year and resulting agricultural practices, and the types of soil and vegetation. Certain areas such as alpine pastures, forests, and upland areas may show longer retention in soils than agricultural areas, and high levels of transfer to particular foods, e.g. berries and mushrooms in forests, may give rise to elevated intakes.

2.2. Characteristics of exposures

(15) In most existing exposure situations affecting the living place of the population, the level of exposure is mainly driven by individual behaviour and is difficult to control at the source. This generally results in a very heterogeneous distribution of exposures. Day-to-day life or work in such a territory inevitably leads to some exposure.

(16) The exposure situation prevailing after the implementation of short- and medium-term actions following a nuclear accident or a radiation emergency will generally show a very broad range of individual exposures, both for the doses already received and for the projected residual doses. The range of individual exposures may be affected by many individually related factors. These include:

- location (of home and work) with respect to the contaminated areas (after clean-up);
- profession or occupation, and therefore time spent and work undertaken in particular areas affected by the contamination; and
- individual habits, particularly the diet of each individual, which could be dependent on her/his socio-economic situation.

Experience has shown that the use of an 'average individual' is not appropriate for the management of exposure in a contaminated area. Large differences may exist between neighbouring villages, within families inside the same village, or even within the same family according to diet, living habits, and occupation. These differences generally result in a highly skewed dose distribution among the affected population. Fig. 2.1 shows the individual dose distribution of children residing in a contaminated district around Chernobyl 20 years after the accident.

(17) Exposure from ingestion of contaminated foodstuffs may result from both chronic and episodic intakes according to the relative importance of locally produced foodstuffs in the diet. As an example, Fig. 2.2 presents the evolution of the whole-body activity associated with an episodic intake of 1000 Bq of ^{137}Cs and with a daily intake of respectively 1 and 10 Bq of ^{137}Cs over 1000 days. For the same total intake, the resulting whole-body activity at the end of the period is significantly different. This illustrates the intrinsically different burden between daily ingestion of contaminated foodstuffs and periodic ingestion. In practice, for people living in contaminated areas, the whole-body activity is resulting from a combination of daily and episodic intakes depending on the origin of foodstuffs and dietary habits.

(18) Twenty years after the Chernobyl accident, typical average daily intake due to ^{137}Cs for an adult in the contaminated areas around Chernobyl is in the range of 10–20 Bq, and additional higher episodic intakes in the range of a few hundred Bq are common due to, for example, the ingestion of wild mushrooms or berries. This results in annual effective doses in the range of 0.1 mSv. However, some poorly informed individuals or those with very particular dietary habits may present daily intakes in the range of 100 to a few hundred Bq. This corresponds to an annual effective dose in the range of 1 to a few mSv.

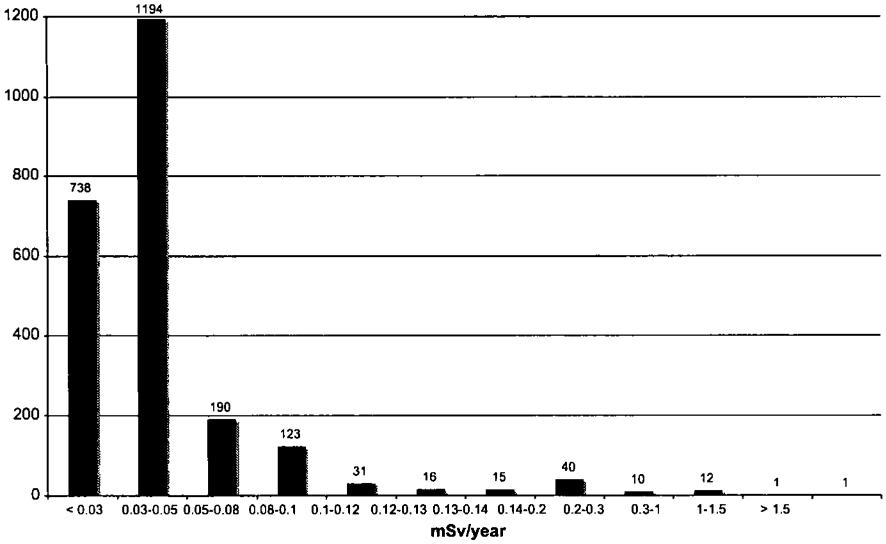

Fig. 2.1. Typical dose distribution from caesium intake of children in the contaminated area around Chernobyl 20 years after the accident.

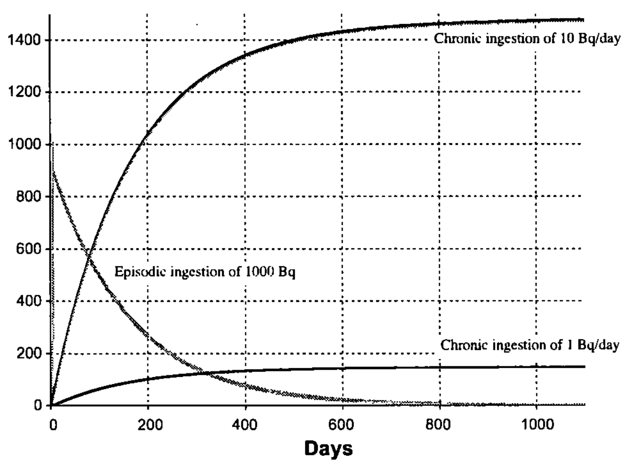

Fig. 2.2. Evolution over a pluri-annual period (1000 days) of whole-body activity (Bq) associated with an episodic intake of 1000 Bq and daily intake of 1 and 10 Bq of ^{137}Cs.

(19) For the sake of controlling exposure in long-term contaminated areas, different exposed groups of populations may need to be considered to assess the overall dose impact in people. The typical population groups generally considered are:

- the 'rural' population: farmers or families with small holdings who are assumed to reside and work in the affected area, and to derive part of their food from locally grown products; and
- the 'urban' population: people who inhabit houses constructed in an affected built-up area, and who may derive foodstuffs from outside the affected area.

In addition, various groups of exposed workers may need to be considered according to the economic activities affected, such as foresters and employees of sawmills in the case of a forest region being impacted. Members of these groups may reside in the contaminated area, or just stay in the area during working hours and reside outside the affected zone. In the latter situation, most of their food will come from non-contaminated areas. If the region attracts tourists, the transient resident population may also need to be considered with its peculiarities.

2.3. Experience from past events

(20) In the past, several nuclear tests (Bikini Island in the Pacific, Maralinga in South Australia, Semipalatinsk in Kazakhstan) and several nuclear accidents (Windscale in the UK, Kyshtym in Russia, Palomares in Spain) have resulted in the contamination of large areas. In addition, the more recent Goiânia radiological source accident in Brazil resulted in the contamination of a limited area. These events have provided significant experience that is of practical value in developing appropriate management approaches to address long-term post-accident radiological issues, and also social, economic, and political issues. However, the Chernobyl accident in Ukraine and other non-radiological emergencies that caused long-term social disruption (flooding, earthquakes, etc.) provided the most important lessons that have served as input for the Commission in its development of these recommendations. More details about the nuclear events can be found in Annex A.

(21) The complexity of the situations resulting from widespread and long-term contamination inevitably generates concerns and anxiety among the affected populations, who could feel helpless. If the experts and professionals in charge of managing the situations use scientific terms, measurement units, and technical procedures, which are difficult to understand by non-specialists, these could contribute to reinforce their feeling of loss of control of the situation.

(22) A commonly observed consequence is the progressive renouncement of individuals to involve themselves in the day-to-day management of such complex situations, and their confrontation with a multitude of questions, which usually remain unanswered. What are the long-term effects of radioactivity on health? Is it possible to protect oneself from the contamination? As a result, inhabitants of contaminated areas often face difficult personal choices concerning their future, and are particularly confronted by the dilemma of whether to leave the place or to stay. Experience shows that it is difficult to answer this dilemma solely on the basis of radiation protection considerations. Many personal aspects enter into the balance; people living in contaminated areas are generally very reluctant to leave their homes, and hope to improve their living conditions. This calls for authorities to not only develop protec-

tive actions but also to favour initiatives to enhance the quality of life of the residents of the areas.

(23) Past experience of long-term contamination has also shown that, in the absence of good knowledge of the radiological situation, affected populations tend to adopt a denial or fatalist attitude. This is a way to further support the situation, which generally results in basic radiation protection advice and actions being neglected, and in increasing exposures. Various projects implemented in the contaminated areas in Belarus (see Annex A) have demonstrated that the direct involvement of inhabitants and local professionals in management of the situation is an effective way to improve the rehabilitation process (Lochard, 2007). This requires regular information on the radiological situation, and the successes and difficulties with implementation of protection strategies. It is the responsibility of the authorities (both national and local) to create the conditions and provide the means favouring the involvement and empowerment of the population. This must be done taking local social and economic living conditions into account to provide individuals with information, thus allowing them to understand and assess their personal situation and to maintain vigilance with the objective to improve their daily life and to protect themselves and their offspring for the future. The aim of the authorities should be to help individuals to regain control of their lives, in which radiation protection against the existing contamination is a factor to add to several other factors affecting the rehabilitation of living conditions.

2.4. References

Lochard, J., 2007. Rehabilitation of living conditions in territories contaminated by the Chernobyl accident: the ETHOS Project. Health Phys. 93, 522–526.

UNDP, 2002. The Human Consequences of the Chernobyl Nuclear Accident: a Strategy for Recovery. Report of the United Nations Development Programme.

3. APPLICATION OF THE COMMISSION'S SYSTEM TO THE PROTECTION OF PEOPLE LIVING IN CONTAMINATED AREAS

(24) Living or working in a contaminated area is considered as an existing exposure situation. For such situations, the fundamental protection principles include the justification of implementing protection strategies and the optimisation of the protection achieved by these strategies. Reference levels are used during the optimisation process to plan protection strategies that would result in estimated residual doses lower than these levels. Dose limits do not apply because existing exposure situations cannot be managed in an a priori fashion.

(25) Protection strategies are made up of a series of protective actions directed at the relevant exposure pathways. The justification and optimisation of protection strategies are an evolution from previous ICRP recommendations, which were focused on justification and optimisation of individual protection measures.

3.1. Justification of protection strategies

(26) The principle of justification is a source-related principle, ensuring that any decision that alters the radiation exposure situation should do more good than harm. In the case of an existing exposure situation following an emergency exposure situation, justification applies initially to the fundamental decision to be taken by the authorities at the end of the emergency exposure situation, to allow people to live permanently in the long-term contaminated areas. Such a decision may be accompanied by the setting of a radiation protection criterion above which it is mandatory to relocate the population, and below which inhabitants are allowed to stay subject to certain conditions. Several areas may be defined with relevant conditions according to a graded approach. This is, for example, the approach adopted by the authorities in the Commonwealth of Independent States countries affected by the Chernobyl accident (see Annex A). Secondly, the justification principle applies at the level of decision related to the definition of the protection strategies to be implemented to maintain and possibly improve the radiological situation resulting from the emergency phase.

(27) For existing exposure situations, protection strategies carried out to reduce individual exposures should achieve sufficient individual or societal benefit to offset the detriment that is caused (ICRP, 2007, Para. 203). However, justification of protection strategies goes far beyond the scope of radiological protection as they may also have various economic, political, environmental, social, and psychological consequences. The social and political value of reducing exposure and limiting inequity in the exposure received by those living in the contaminated areas needs to be included when justification of protection strategies is being carried out. The proper consideration of many of these non-radiological factors may require expertise other than radiological protection, and could dominate decisions on protection strategies (NEA, 2006).

(28) Justification is concerned with the cumulative benefits and impacts of individual protective actions composing the protection strategy. A range of individually

justified actions may be available but may not provide a net benefit when considered as an overall strategy because, for example, collectively they bring too much social disruption for the considered exposed population as a whole, or they are too complex to manage. Conversely, a single protective action may not be justified alone, but may contribute to an overall net benefit when included as part of a protection strategy.

(29) The responsibility for ensuring an overall benefit to society as well as to individuals when populations are allowed to stay in contaminated areas lies with governments or national authorities. Worldwide experience following nuclear and non-nuclear accidents shows that neither nations nor individuals are very willing to leave affected areas. In general, while authorities may require individuals to leave the affected areas for health reasons in the case of excessive residual levels of exposure, they will aim to rehabilitate these areas wherever possible to allow further human activities.

(30) In existing exposure situations, justification should be considered for all protective actions that may be included in a protection strategy: those implemented centrally and locally by authorities, experts, and professionals; and those directly implemented by the exposed individuals as self-help protective actions with the support of the authorities. The protection strategy defined by the authorities should take into account both categories of protective actions, and should enable affected individuals to take self-help initiatives. However, as self-help protective actions are implemented – and thus largely decided – by the inhabitants themselves, they must be properly informed and, if relevant, trained (to use the means and equipment provided by the authorities) in order to take informed decisions concerning their own protection, with a net benefit. The balance to be considered by the individuals includes, on one side, their desire to improve the situation and, on the other side, the 'burden' induced by the implementation of protective actions.

(31) For the management of long term contaminated areas after an accident authorities may consider maintaining some of the protective actions implemented during the emergency exposure situation, and also introducing a whole set of new protective actions. The decision about whether to introduce these new actions will depend on several criteria including the residual individual levels of exposure of the residing population, the feasibility of implementing new actions, and the impact that these actions will have on the quality and sustainability of the living conditions in the territory.

3.2. Optimisation of protection strategies

(32) Implementation of the principle of optimisation of protection is a source-related process, which should ensure the selection of the best protection strategy under the prevailing circumstances, i.e. maximising the margin of good over harm. In order to avoid severely inequitable outcomes of this optimisation procedure, there should be restrictions on the doses or risks to people from a particular source through the application of dose or risk reference levels. Therefore, optimisation involves keeping

exposures as low as reasonably achievable, taking into account economic and societal factors as well as the distribution of doses and benefits resulting from the implementation of the protection strategies.

(33) The process of optimisation of protection is intended for application to those situations for which the implementation of protection strategies has been justified. The principle of optimisation of protection with a restriction on individual dose is central to the system of protection as it applies to existing exposure situations. Due to its judgemental nature, there is a strong need for transparency of the optimisation process. All the data, parameters, assumptions, and values that enter into the process should be presented and defined very clearly. This transparency assumes that all relevant information is provided to the involved parties, and that the traceability of the decision-making process is documented properly, aiming for an informed decision (ICRP, 2006b, Para. 34).

(34) Protection strategies have to be prepared by authorities as part of national planning arrangements. These plans should take self-help protective actions into account, including the conditions to allow such actions to be undertaken by the inhabitants, and their results in terms of prospective dose reduction. Although it is difficult to ask the population to plan in advance for these actions, the Commission recommends that authorities should involve key representative stakeholders to participate in the preparation of these plans.

(35) The case of an existing exposure situation following an emergency exposure situation comprises some specificities. The fact that the population will stay in a contaminated area is, per se, a compromise for them and their family and friends. The optimisation process in such a case faces many specific challenges, notably:

- consumer vs producer interest: to live in a contaminated area supposes that an economic activity is maintained on the spot with local production and trade of goods including foodstuffs. Optimisation strategies should balance the need to protect people against radioactivity and the need for the local economy to exist and to be integrated in the global market;
- local population vs national and international population: the conditions to restore a 'normal' life in the contaminated area suppose solidarity in sharing some disadvantages of the situation between local and non-local populations (mainly related to the movement of goods and people). Optimisation strategies should favour equity, taking into account national regulations and plans as well as international recommendations (e.g. on trade of foodstuffs); and
- the multiple decisions taken by the inhabitants in their day-to-day life: in most cases, the level of exposure is driven by individual behaviour. The authorities should facilitate processes to allow inhabitants to define, optimise, and apply their own protection strategies if required. A positive aspect is that individuals regain control of their own situation. However, self-help protective actions may be disturbing (e.g. pay constant attention to the food one eats, the places one goes, the material one uses... in order to avoid internal and external exposures as much as possible). This supposes that affected individuals are fully aware of the situation and well informed. To support this, various local individuals may also need to

be properly equipped and possibly trained (for the use of equipment provided by the authorities). Authorities should also be prepared to assist segments of the population with particular needs (elderly, mentally handicapped, etc.).

As mentioned previously, taking into account the fact that the predominant pathway in contaminated areas is generally ingestion, protection strategies should be based on controlling this pathway in relation to relevant groups of the population.

(36) Unlike in emergency exposure situations where there is a need to take urgent action, in a post-accident rehabilitation situation, the optimisation process can be implemented step by step, taking the prevailing circumstances into account. Experience has demonstrated that in long-term contaminated areas, it is generally possible to reduce exposures progressively to levels comparable with those in normal situations.

(37) The Commission has introduced the concept of constrained optimisation in order to reduce inequity in the distribution of individual doses. According to *Publication 103* (ICRP, 2007), in the case of existing exposure situations, as for emergency exposure situations, the dose criteria to serve as dose restriction is termed 'reference level' (see Section 3.3).

(38) Optimisation of protection strategies is the process of developing the strategy's form, scale, and duration. The aim is to obtain not only a positive net benefit, but also a maximised net benefit, and decision-aiding techniques can be used to guide the selection of protection strategies and their various elements. The recommendations of the Commission on how to apply these techniques have been provided in *Publication 37* (ICRP, 1983), *Publication 55* (ICRP, 1989), and *Publication 101* (ICRP, 2006), and these recommendations remain valid and are not repeated in detail here. In the process of selecting strategies for protecting people living in contaminated areas, the participation of relevant stakeholders is essential.

(39) The optimisation of protection is a forward-looking iterative process aimed at preventing or reducing future exposures. It takes into account both technical and socio-economic factors, and requires both qualitative and quantitative judgements. The process should be systematic and carefully structured to ensure that all relevant aspects are taken into account. Optimisation is a frame of mind, always questioning whether the best has been done in the prevailing circumstances, and if all that is reasonable has been done to reduce doses (ICRP, 2007, Para. 217). While initially the exposures may be rather high and priority should be given to reducing the highest exposures, continuous efforts need to be made to reduce all exposures with time.

(40) Comparison of justified protection strategies is a key feature of the optimisation process, which must entail careful consideration of the characteristics of the individual exposure distribution within the exposed population. Each group of an exposed population can be described by different attributes as well as by various exposure parameters. The Commission recommends that particular attention should be given to equity in the distribution of exposure among the groups of people concerned.

(41) The best option or strategy is always specific to the exposure situation and represents the best level of protection that can be achieved under the prevailing

circumstances. Therefore, it is not relevant to determine, a priori, a dose level below which the optimisation process should stop (ICRP, 2007, Para. 218). According to the characteristics of the situation, with the presence of relatively long-lived radionuclides in the environment affecting living places, protective actions are expected to be implemented for a long time (up to several tens of years). Optimisation of protection, however, is not minimisation of dose. Optimised protection is the result of an evaluation which carefully balances the detriment from the exposure with the relevant economic and social factors. Thus, the best option is not necessarily the one resulting in the lowest residual dose level for the individuals (ICRP, 2007, Para. 219).

(42) It is the government's responsibility to provide good guidance and the means for its implementation. Hence the government, or the responsible authority, will need to constantly evaluate the effectiveness of the protection strategy in place, including protective actions carried out at local or individual levels, in order to provide adequate support on how to improve the situation further.

3.3. Reference levels to restrict individual exposures

(43) The use of reference levels for the management of both emergency and existing exposure situations is a change for *Publication 103* (ICRP, 2007) compared with *Publication 60* (ICRP, 1991). Some other ICRP publications issued in between introduced the concept of reference level as appropriate to manage prolonged exposure situations, but *Publication 103* clarifies the concept.

(44) The source-related concept of reference level as defined by the Commission in *Publication 103* (ICRP, 2007, Para. 230) represents the level of dose or risk above which it is judged to be inappropriate to plan to allow exposures to occur, and below which optimisation of protection should be implemented. It means that protection strategies should be planned and optimised. The chosen value for the reference level will depend upon the prevailing circumstances of the exposure under consideration. The Commission proposed the term 'reference level' for emergency and existing situations (while the term 'dose constraint' is retained for planned exposure situations) to express the fact that a wide range of exposures may characterise the situation, and the optimisation process may apply to initial levels of individual doses above the reference level.

(45) The Commission recommends that reference levels, set in terms of individual annual effective residual dose (mSv/year), should be used in conjunction with the planning and implementation of the optimisation process for exposures in existing exposure situations. The objective is to implement optimised protection strategies, or a progressive range of such strategies, which aim to reduce individual doses below the reference level. During the planning stage, the optimisation process should result in estimated residual doses that are below the reference level. During implementation of the optimisation process, particular attention should be given to reduce individual exposures that may remain above the reference level. Specific groups such as children and pregnant women should also be given particular attention. However, exposures below the reference level should not be ignored; they should also be assessed to

ascertain whether protection is optimised or if further protective actions are needed (ICRP, 2007, Para. 286).

(46) In the case of an existing exposure situation following an emergency exposure situation, the reference level is set at the end of the emergency exposure situation phase, when the decision is taken to allow people to live in the contaminated area. The selected reference level represents a level of dose which is intended not to be exceeded, and to strive to move all individual exposures below this level as low as reasonably achievable, with social and economic factors being taken into account.

(47) The Commission proposed a framework presenting the factors influencing the choice of source-related dose constraints and reference levels (ICRP, 2007, Table 5). In this framework, the Commission introduced three bands of constraints or reference levels according to the characteristics of the exposure situation, taking into account the controllability of the exposure, the benefit from the situation to individuals or society, and the radiological protection measures that would need to be implemented. These measures include the need or not to establish protection strategies as well as to provide information, training, and/or monitoring to exposed individuals. It is the responsibility of regulatory authorities to decide on the legal status of the reference level set to control a given situation.

(48) In the case of an existing exposure situation following an emergency exposure situation, the radiation source is under control but the controllability of the situation may remain difficult and require constant vigilance by the inhabitants in their day-to-day life. This constitutes a burden for the individuals living in contaminated areas and for society as a whole. However, both may find a benefit of continuing to live in the affected areas. Countries generally cannot afford to lose a part of their territory, and most inhabitants generally prefer to stay in their homes rather than to be relocated (voluntarily or not) to non-contaminated areas. As a consequence, when the level of contamination is not too high to prevent sustainable human activities, authorities will preferably implement all the necessary protective measures to allow people to continue to live in contaminated areas instead of abandoning them. These considerations suggest that appropriate reference levels should preferably be chosen in the 1–20 mSv band proposed by the Commission.

(49) The value of the reference level should result from a careful balance of many inter-related factors, including the sustainability of social, economic, and environmental life, and the overall health (WHO, 1948) of the affected populations. The process of selecting the value of the reference level should also be carefully balanced to appropriately include the views of all relevant stakeholders.

(50) As the long-term objective for existing exposure situations is 'to reduce exposures to levels that are close or similar to situations considered as normal' (ICRP, 2007, Para. 288), the Commission recommends that the reference level for the optimisation of protection of people living in contaminated areas should be selected from the lower part of the 1–20 mSv/year band recommended in *Publication 103* for the management of this category of exposure situation. Past experience has demonstrated that a typical value used for constraining the optimisation process in long-term post-accident situations is 1 mSv/year (see Annex A). National authorities may

take into account the prevailing circumstances and also take advantage of the timing of the overall rehabilitation programme to adopt intermediate reference levels to improve the situation progressively .

(51) Reference levels are used both prospectively, for planning of protection strategies (as well as, if necessary, defining derived reference levels for the implementation of some specific protective actions, such as trade of foodstuffs), and retrospectively as a benchmark for judging the effectiveness of implemented protection strategies. A key focus of protective actions should be on exposures above the reference level, whose existence may indicate that the distribution of exposures is not equitable, and will generally suggest that greater weight should be put on the protection of the most exposed groups of people rather than that of the general population.

(52) The use of reference levels in an existing situation is illustrated in Fig. 3.1, which shows the evolution of the distribution of individual doses with time as a result of the implementation of protection strategies. The evolution of the distributions indicates that the number of people in the contaminated areas exceeding the reference level decreases with time as a consequence of the step-by-step optimisation process.

(53) The fact that exposures have been reduced below the reference level is not a sufficient condition to discontinue protective actions as long as there is room for further reduction in exposure in conformity with the optimisation process. The continuation of such actions would probably be a prime mechanism to maintain exposures close or similar to those in normal situations as recommended by the Commission.

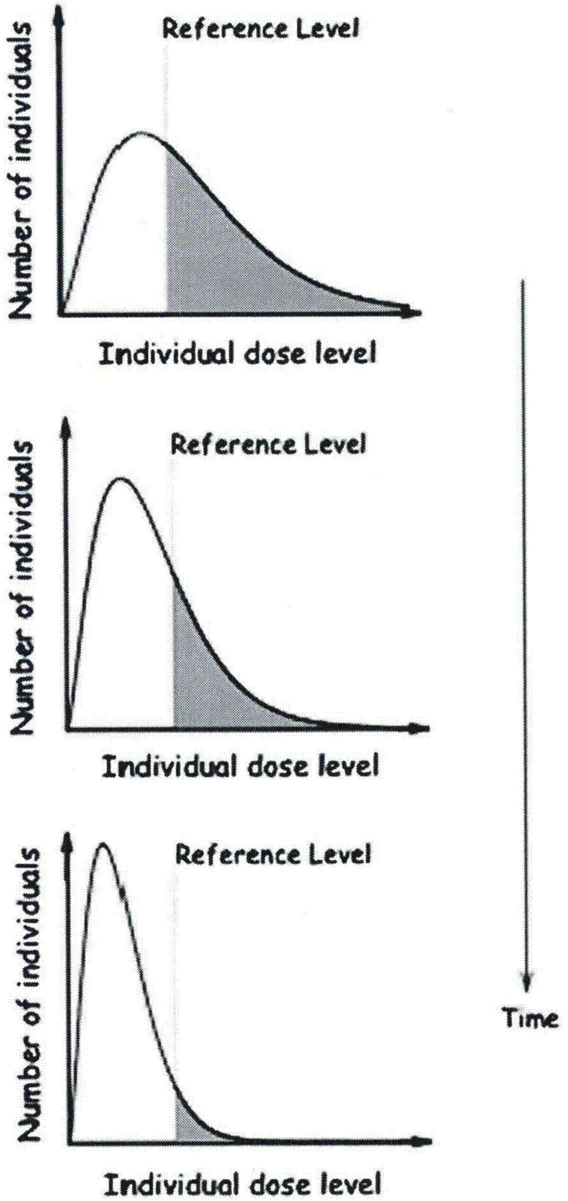

Fig. 3.1. Use of a reference level in an existing exposure situation and evolution of the distribution of individual doses with time as a result of step-by-step implementation of the optimisation process.

3.4. References

ICRP, 1983. Cost–benefit analysis in the optimisation of radiation protection. ICRP Publication 37. Ann. ICRP 10 (2–3).

ICRP, 1989. Optimisation and decision-making in radiological protection. ICRP Publication 55. Ann. ICRP 20 (1).

ICRP, 1991. 1990 Recommendations of the International Commission on Radiological Protection. ICRP Publication 60. Ann. ICRP 21 (1–3).

ICRP, 2006. The optimisation of radiological protection: broadening the process. ICRP Publication 101 – Part 2. Ann. ICRP 36 (2).

ICRP, 2007. The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Ann. ICRP 37 (2–4).

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WHO, 1948. Preamble to the Constitution of the World Health Organisation as adopted by the International Health Conference, New York, 19–22 June 1946; signed in 22 July 1946 by the representatives of 61 States and entered into force on 7 April 1948.

4. IMPLEMENTATION OF PROTECTION STRATEGIES

(54) The management of an existing exposure situation following a nuclear accident or a radiological emergency relies on the implementation of a more or less complex rehabilitation programme coping with numerous dimensions (social, economic, health, environmental, etc.) according to the level of contamination and its space and time distribution. The radiation protection part of this programme is characterised by radiation protection strategies that include actions driven by authorities at national and local levels, and self-help protective actions implemented by the affected population within the framework provided by the authorities. For these strategies to be successful, authorities should provide the necessary infrastructure as well as practical guidance for their implementation. The implementation of protection strategies is a dynamic process, which changes with the evolution of the radiological situation.

(55) It is the responsibility of the authorities, particularly at the regulatory level, to establish the conditions and to implement the means to allow the effective engagement of the affected population in the protection strategies and more globally in the rehabilitation programme. Past experience of the management of contaminated areas has demonstrated that the involvement of local professionals and inhabitants in the implementation of protection strategies is important for the sustainability of the rehabilitation programme (Lochard, 2004). Mechanisms for engaging with stakeholders are driven by national and cultural characteristics and should be adapted to the circumstances.

4.1. Protective actions implemented by authorities

(56) The priority of protection strategies implemented by authorities is to protect people with the highest exposures, and in parallel to reduce all individual exposures associated with the event to as low as reasonably achievable. This implies assessment of the dose distribution, comparison of all doses with the reference level, and subsequent optimisation of protection.

(57) This assessment can often be most effectively supported by radiation monitoring. If measurements are not feasible or sufficiently comprehensive, it is possible to estimate doses likely to be received by the individuals based on local information. In such a situation, the concept of 'representative person' as described in *Publication 101* (ICRP, 2006) may be used, bearing in mind that this concept is most useful for the purpose of prospective assessments of continuing exposure. However, in cases where it is used, the Commission recommends that doses related to the 95–100% percentile should not be discarded.

(58) Once the individual dose distribution is characterised, it is necessary to further investigate the main exposure pathways for the affected population (ambient dose rates, soil contamination, foodstuff contamination, etc.). This will help authorities, in co-operation with the affected population, to decide if they need to pursue protection strategies (decontamination works, foodstuff restrictions, etc.), to modify them

according to the evolution of the radiological situation, or to establish new strategies.

(59) Typical strategies to be implemented by the authorities in a post-accident situation are clean-up of buildings, remediation of soil and vegetation, changes in animal husbandry, monitoring of the environment and produce, provision of clean foodstuffs, waste management (resulting from clean-up or from unmarketable contaminated goods), provision of information, guidance, instruction and equipment (e.g. for measurements), health surveillance, education of children, information for particular exposed groups and the public at large, etc.

(60) Radiological contamination of the environment will evolve with time due to radioactive decay of the radionuclides present, the effect of physical and chemical processes on the distribution of the radionuclides in the environment, and the impact of human activities that may further concentrate or dilute the contamination present in the environment. The long-term dimension of an existing exposure situation therefore calls for step-by-step implementation of protection strategies.

(61) Identification of the highest doses of the distribution should prompt investigation of whether further collective protection strategies can be implemented to protect specific groups of people, or whether the high doses are related to individual habits such that the individuals can be informed and empowered to implement their own strategies.

(62) From this perspective, authorities will have to set up infrastructures to support the implementation of all protection strategies, including self-help strategies implemented by the affected population. The dissemination of a 'practical radiological protection culture' within all segments of the population, and especially within professionals in charge of public health and education, is also an important element of the strategy. Experience has shown that the development of such an infrastructure is based on three key pillars:

- a radiation monitoring system, by which the radiological quality of the environment can be evaluated, levels of internal and external exposure of people assessed, and allowing the affected individuals direct access to this information (see Section 5.1);
- a health surveillance strategy to follow the health status of the affected population. This calls for a system based on regular clinical investigations as well as the development of registries to monitor important indices in public health in relation to the level of individual exposure. Such a system should allow the identification of any changes in the health status of the population that could occur, and investigate whether these changes could be related to radiation or other factors (in relation with the early phase or long-term exposure) – see Section 5.2; and
- the transmission of practical knowledge within the population about the control of the radiological situation to current and future generations based on the dissemination of monitoring results, for example through the education system.

4.2. Protective actions implemented by the affected population

(63) In the case of a radiological accident, the affected population will be confronted with new problems and new preoccupations. Each individual will have questions regarding radioactivity and its effects: how is the environment contaminated, how is one exposed, and at what time, particularly, is one contaminated? Individuals will also wonder how to face this new situation, and what to do to reduce their current and future exposure to as low as reasonably achievable.

(64) The engagement of the affected population in the development and implementation of actions defined by authorities will be key to their effectiveness. In addition, however, many actions to manage exposures will be driven by individual behaviour. These will also require a framework of support from the authorities in order to be effective and sustainable.

(65) Typical actions taken by the inhabitants in this framework, called 'self-help protective actions' by the Commission, are those aiming to characterise their own radiological situation, notably their external and internal exposure. These mainly consist of monitoring the radiological quality of their direct environment (ambient dose rates in living places and contamination of foodstuffs), their own external and internal exposure, and the exposure of the people for whom they have responsibility (e.g. children, elderly), and adapting their way of life accordingly to reduce their exposure.

(66) As far as the evaluation of external exposure is concerned, inhabitants may better manage the situation by establishing local mapping of their living places (e.g. house, garden, working place, leisure areas). They can then identify places where the higher ambient dose rates are registered and/or those contributing significantly to the external dose according to the time spent in these places. In both cases, it is possible to try to minimise, as far as possible, time spent in these places.

(67) As far as the evaluation of internal exposure is concerned, inhabitants can act according to the radiological quality of the foodstuffs consumed each day. This supposes that they have access to the measurements of local products. Based on the results of these measurements, they can classify foodstuffs according to their sensitivity to radioactivity, and identify products that are usually more contaminated than others (e.g. mushrooms are much more sensitive to radioactive contamination than vegetables and fruits). In this context, they can adapt their dietary habits to reduce the ingested fraction of contaminated foodstuffs.

(68) In rural zones, a significant part of the affected population may own a private garden. As above, the first step may involve the measurement of radiological quality of the grown foodstuffs. According to the results, they will have to identify how to reduce the contamination of their products by selection of those which are less sensitive to radioactivity, identification of the less contaminated areas in the garden, use of agricultural techniques to limit transfer of radionuclides from soil to plants, etc.

(69) Beyond their contribution to individual exposure, self-help protective actions can also concern management of the radioactive contamination of the environment.

From that perspective, the affected population should take care to adopt protective actions that would avoid reconcentration of radioactivity in their local areas; particular attention may have to be paid to the management of radioactive house waste, such as ashes from fireplaces in rural areas.

(70) As mentioned above, authorities should facilitate the implementation of protection strategies by the inhabitants. They should provide existing results of measurements, information and training to help people to understand and manage their radiological situation, and monitoring equipment (e.g. making the equipment available through local authority offices or doctors or pharmacies who are trained to take measurements). Furthermore, they should ensure regular whole-body measurements of the affected population so that people can evaluate the efficiency of changes in their diet.

(71) Authorities should facilitate the setting-up of local forums involving representatives of the affected population and relevant experts (e.g. health, radiation protection, agriculture authorities, etc). These forums will allow gathering and sharing of information, and favour a common assessment of the effectiveness of strategies driven by the population, and the authorities.

(72) In recent years, stakeholder engagement has moved steadily to the forefront of policy decisions. Such engagement is considered by the Commission to be key to the development and implementation of radiological protection strategies for most existing exposure situations. The control of radon in dwellings is another typical example. As experience in stakeholder engagement has grown, it has been possible to use many of the lessons learned as a basis for the development of best practice among the radiation protection community. Processes and tools are becoming established that can be generally applied to situations where the views and input of stakeholders are instrumental to improving the quality of protection.

4.3. References

ICRP, 2006. Assessing dose of the representative person for the purpose of radiation protection of the public. ICRP Publication 101 – Part 1. Ann. ICRP 36 (2).

Lochard, J., 2004. Living in contaminated territories: a lesson in stakeholder involvement. In: Current Trends in Radiation Protection. EDP Sciences, pp. 211–220.

5. RADIATION MONITORING AND HEALTH SURVEILLANCE

(73) As recommended by the Commission in the case of an existing exposure situation, the individuals concerned should receive general information on the exposure situation and the means of reducing their doses (ICRP, 2007, Table 5). In situations where individual lifestyles are key drivers of the exposure, individual monitoring is an important requirement, coupled with an information programme. Furthermore, given the uncertainties concerning future potential health effects of the exposures received by the population since the emergency phase, it is the responsibility of the authorities to implement a radiation and health surveillance programme.

5.1. Radiation monitoring

(74) In a situation of long-term contamination, it is essential to establish a radiation monitoring system allowing follow-up of the radiological situation and the implementation of adequate protection strategies. The key objective of monitoring systems is to assess current levels of human exposure (both external and internal) and environmental levels of contamination, and to allow the prediction of their evolution in the future. In practice, this supposes a radiation monitoring system providing measurements of ambient dose rates, concentrations of radionuclides in foodstuffs and the environment, and whole-body contamination of individuals.

(75) The effectiveness of the monitoring system relies on its ability to cope with the specificities of the local affected territory. This allows identification of population groups receiving elevated doses and better orientation of radiation protection strategies. For this purpose, a key issue is to take advantage of radiological competence at the local level in combination with the national system. Furthermore, the existence of validated measurements from different origins – authorities, expert bodies, local and national laboratories (non-governmental organisations, private institutes, universities, local stakeholders, nuclear installations, etc.) – allows a better understanding of the local radiological situation and favours confidence in the measurements among the affected population. In this regard, all parties providing measurements should be subject to appropriate quality assurance requirements.

(76) The monitoring system should be designed to provide regularly updated information to authorities and other concerned parties, and to allow extended coverage of the affected territory over the long term. From the perspective of assessing evolution of the exposure situation and the effectiveness of the protection strategies, the Commission recommends that a monitoring record system should be established by the relevant authorities having responsibility. Such records are particularly important for determining potential groups at risk, in conjunction with health surveillance. The sustainability of such a system will require the establishment of continued maintenance and training programmes by national and local authorities.

5.2. Health surveillance

(77) Following a nuclear accident or a radiation emergency, the exposed population should have had an initial medical evaluation. The first step of this evaluation is a census of the affected individuals, possibly with an early dose assessment. In addition, regardless of the level of dose, the affected population should also have been supplied with accurate and appropriate information regarding their level of exposure and potential type of risk.

(78) Taking this background into account, long-term health surveillance programmes will have to cover the following objectives (WHO, 2006):

- the follow-up of persons who have received exposures that have resulted in clinically significant deterministic effects (e.g. skin burns, cataracts, etc.) or sufficiently high levels of exposure to justify preventive surveillance;
- the 'medical monitoring' of the general population, which consists of investigating for potential adverse effects (mainly incidence of radiation-induced cancers). A subcategory of medical monitoring is the follow-up of potentially 'sensitive subgroups' (e.g. children, pregnant women); and
- 'epidemiological' studies.

(79) Medical monitoring refers to screening of the entire affected population in order to detect specific preclinical disease with the purpose of delaying or preventing the development of disease in those individuals. The first step is to justify and delineate the extent of the programme based on consideration of a number of factors. For instance, the following characteristics are of prime importance: the exposure of concern (e.g. its certainty, dose, and temporal relationship of exposure to observation); the disease of interest (e.g. its natural history and prevalence in the population); the characteristics of available screening tests (e.g. their effectiveness, sensitivity, and specificity); the potential for the tests used to cause harm themselves; the potential for action when test results are positive (e.g. the availability of and risks from follow-up evaluation); whether there is evidence that an intervention can improve clinical outcome; and the latency period between radiation exposure and the development of a clinically detectable effect. Beyond the responsibility of public health authorities to preventively monitor the affected population, another important role of medical surveillance is the reassurance given to the population in response to its concerns regarding the potential health impacts of the situation.

(80) According to WHO definitions (WHO, 2006), the aims of epidemiological studies from a long-term perspective are to:

- identify adverse health effects in an at-risk group and determine whether the risk of such effects is greater than that for a comparable non-exposed group of individuals;
- determine whether the increased risks that may be identified are statistically associated with the exposure;
- determine whether the increased observed risk is related to or influenced by other factors associated with or independent of the exposure, such as tobacco smoking and radon; and

- add to the scientific knowledge base, which can then be used to derive and refine risk estimates, and evaluate the efficiency of protective actions that have been implemented or develop new actions.

(81) In practice, epidemiological studies will be adjusted and implemented according to the following considerations: size and composition of the studied population, magnitude and distribution of radiation exposure, accuracy of exposure measurements, disease identification and associated background rate, and availability of information on other risk factors that might affect the outcome. To allow effective long-term health surveillance of the affected population, the Commission recommends that health registries should be established for the population residing in the contaminated areas.

5.3. References

ICRP, 2007. The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Ann. ICRP 37 (2–4).

WHO, 2006. Health Effects of the Chernobyl Accident and Special Health Care Programmes. In: Bennett, B., Repacholi, M., Carr, Z. (Eds.), Report of the UN Chernobyl Forum, Expert Group 'Health'. WHO Press, Geneva, p. 160.

6. MANAGEMENT OF CONTAMINATED FOODSTUFFS AND OTHER COMMODITIES

(82) The management of contaminated foodstuffs and other commodities produced in areas affected by a nuclear accident or a radiation emergency has been addressed previously by the Commission. In *Publication 104* (ICRP, 2007), the Commission recognised that 'this type of situation presents a particularly difficult problem' because of 'issues of market acceptance'. Furthermore, maintaining long-term restrictions on the production and consumption of foodstuffs may affect the sustainable development of the affected areas, and therefore calls for appropriate implementation of the optimisation principle. Reconciling the interests of local farmers, producers, and the local population with those of consumers and the food distribution sector from outside the contaminated territory has to be considered carefully. Determining optimal protection strategies for contaminated foodstuffs may be perceived differently for the population living inside the contaminated territory than for those living outside.

(83) Reducing exposure from the ingestion of foodstuffs produced in long-term contaminated areas to levels as low as reasonably achievable, taking economic and social conditions into account, may involve the implementation of complex protection strategies. The radiological quality of foodstuffs can be managed by many protective actions aimed at reducing the transfer of radionuclides in the foodchain from farm to fork (Nisbet et al., 2006). These protective actions include, for example, the physical and chemical treatment of soils, changes in husbandry practices, provision of feed additives to livestock, selection of alternative land uses, and industrial-scale food processing to remove contamination. The actions selected will depend on the physical and chemical properties of the radionuclides released, season of the year, and the types of land use affected. Whenever possible, protective actions should be implemented so that restrictions on local produce can be avoided. There may be situations where a sustainable agricultural economy is not possible without placing contaminated food on the market. As such foods will be subject to market forces, this will necessitate an effective communication strategy to overcome the negative reactions from consumers outside the contaminated areas.

(84) For management of the radiological quality of foodstuffs in a country with a contaminated territory, relevant stakeholders (authorities, farmers' unions, food industry, food distribution, consumer non-governmental organisations, etc.) and representatives of the general population should be involved in deciding whether individual preferences of the consumers should outweigh the need to maintain agricultural production, rehabilitation of rural areas, and a decent living for the affected local community. A thorough debate at national level is necessary to achieve a certain degree of solidarity within the country.

6.1. Management inside the contaminated areas

(85) A fraction of the diet of the local population may include local agricultural produce, food from private gardens, and food gathered from the wild (e.g. berries,

mushrooms, game). The relative importance of local produce depends on the characteristics of the region, as well as on traditions or habits. To some extent, such habits may be influenced by a preference for food that is less contaminated, or as a result of the availability of food from non-contaminated areas. The local population may also be in a position to manage its intake of radionuclides by avoiding or reducing consumption of products with higher levels of contamination. Furthermore, more sensitive groups of the population or those perceived to deserve special protection (e.g. children, pregnant or breastfeeding women, people with poor health) may be advised to avoid or reduce consumption of certain types of food with higher levels of contamination.

(86) In order to help the local population to control foodstuffs, authorities should provide relevant information and set contamination criteria based on directly measurable levels of contamination (expressed in Bq/kg or Bq/L), taking into account the proportion of locally produced food in the diet. Guideline levels have been developed by the Codex Alimentarius Commission for use in international trade (FAO/WHO, 2006). These levels are based on a dose level of 1 mSv/year assuming that a maximum of 10% of the diet consists of contaminated food. The assumption that 10% of the diet is contaminated may not be valid for some local communities, hence the contamination criteria for foodstuffs may be set below the Codex guideline levels. Conversely, if the contamination only affects a few categories of foodstuffs, the contamination criteria may be set to higher values. Higher contamination criteria may also be set to preserve local production, which may be deeply embedded in traditions or which may be essential to the economy of the entire community.

(87) Disruption to the local economy through the placement of restrictions on the sale of contaminated foodstuffs, the loss of market share as a result of consumer preferences, or through the provision of uncontaminated food may not be warranted in terms of a benefit in dose reduction. Such decisions must be taken in close cooperation with the local stakeholders, as was the case in Norway with reindeer meat produced by the Sami population after the Chernobyl accident (Skuterud et al., 2005). The contamination criteria for foodstuffs finally selected indirectly represents a level of individual dose which is not intended to be exceeded, and the long-term objective should be to reduce this level to as low as reasonably achievable, with social and economic factors taken into account. From this perspective, contamination criteria may be reduced step by step to take the progressive improvement of the situation into account.

6.2. Management of exportations outside the contaminated areas

(88) Protection of populations living outside contaminated areas is mainly driven by the control of trade. Consumers from non-affected areas generally expect uncontaminated foodstuffs to be placed on the market. However, this situation may not always be achievable. First, the interests of the affected population living in the contaminated areas need to be considered, as it may be important to maintain some form of agricultural production there. Furthermore, there is also an intrinsic difficulty in ensuring that radiological control will cover all foodstuffs everywhere

and at all points in time. For these reasons, foodstuffs coming from outside the contaminated areas may contain some contamination, even though it is well below the contamination criteria.

(89) The placement of contaminated foodstuffs on the market may be governed by the Codex guideline levels for use in international trade, which apply to food contaminated following a nuclear or radiation emergency (including both accidents and malevolent actions) for an indefinite period. According to the Codex Alimentarius Commission, food should be considered as safe for human consumption when its levels of radionuclides do not exceed the corresponding guideline levels. When the guideline levels are exceeded, national governments decide whether, and under what circumstances, the foodstuffs should be distributed within their own territory or jurisdiction. The Commission recognises that once food is placed on the market, it is very difficult to manage doses and consequently to optimise them, since any action in the distribution process of food may merely shift contamination from one section of the population to another. This may promptly lead to situations which are regarded as unethical. Even the free supply of such food as humanitarian aid in regions affected by famine would be perceived as such by the beneficiaries. Bearing market forces in mind, these considerations call for investigating all possible actions to improve the radiological quality of foodstuffs before placement on the market.

(90) The restoration and maintenance of consumer confidence is of prime importance in the management of contaminated foodstuffs. Traceability of food is an important factor in consumer preferences. The Commission views the mention of the region of origin on foodstuff labels as a sufficient indicator for marketing purposes. However, the management of market mechanisms is beyond the scope of the Commission's recommendations.

(91) The Commission considers that, despite the socio-economic complexity of the management of contaminated foodstuffs in view of the interests of different stakeholders, protection strategies should be developed to meet the established reference level, and the strategy should be further optimised at all levels where it is possible to intervene, e.g. production, distribution, processing, as well as measures taken for informing consumers and allowing them to make appropriate choices. Derived reference levels expressed in Bq/kg or Bq/L play an important role in this process, in particular for the placement of foodstuffs on the market.

6.3. Management of other commodities

(92) Commodities other than foodstuffs may be contaminated following a nuclear accident or other radiation emergency. These could include agricultural products such as wood, paper, and oil, or other products recycled from contaminated materials such as scrap metal. The objective again is to reduce exposure to as low as reasonably achievable, taking social and economic factors into account.

(93) The Commission recommends the development of optimisation strategies, including the prevention of contamination (e.g. by substitutes whenever possible and relevant, taking into account that agriculture in contaminated areas may be deliberately reoriented towards non-food products), and management of contami-

nated commodities. Such contaminated commodities can be traded and used with or without conditions. Relevant contamination criteria for foodstuffs should be determined depending on the intended use of the commodities and the conditions for trade or use.

(94) The contamination levels for the use of contaminated commodities inside the contaminated areas should be derived from the annual dose reference level on the basis of realistic exposure scenarios. Authorities may fix binding or recommended conditions for use.

(95) Trade of contaminated commodities or consumer products manufactured with contaminated material outside the contaminated territory should be in accordance with the rules or recommendations for international trade. Nevertheless, there could be situations in which provision is made for trading contaminated commodities subject to explicit provisions negotiated with the recipient, and agreed with the relevant stakeholders, in particular the regulatory bodies of the exporting and importing countries. International bodies have recommended numerical values for the use or trade of contaminated commodities (e.g. after the dismantling of a nuclear facility); these can be used as benchmarks by the national authorities to set relevant contamination criteria (IAEA, 2005).

6.4. References

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ANNEX A. HISTORICAL EXPERIENCE OF LONG-TERM CONTAMINATED AREAS

A.1. Introduction

(A 1) This annex briefly describes a series of past experiences with long-term contaminated areas resulting from either nuclear tests (Bikini, Maralinga), nuclear accidents (Kyshtym, Palomares, Chernobyl), or a radiological source accident (Goiânia). These experiences are presented in chronological order. Beyond the long-term feature of the contamination, which is common to all, each event illustrates different aspects developed in the present report.

(A 2) The Bikini and Maralinga experiences are not, strictly speaking, prolonged exposure situations since the inhabitants were evacuated prior to the events that led to long-term contamination of their habitat, and no individual now lives permanently in these places although a few people came back for a few years. The options envisaged or effectively implemented to restore the contaminated sites illustrate the predominant exposure pathways and the type of protective actions that may be necessary to maintain exposure to as low as reasonably achievable. It is interesting to note the importance of ingestion of contaminated foodstuffs several decades after the events, particularly in the case of Bikini.

(A 3) The long-term existing exposure situations resulting from the Kyshtym and Chernobyl accidents are, without doubt, the most representative of the types of situation aimed at by the present recommendations. The information concerning management of the Kyshtym accident is relatively poor, but the spread of contamination in space and time is fairly representative of potential large-scale nuclear accidents. The long-term consequences of the Chernobyl accident, both in the Commonwealth of Independent States countries and in Western Europe, have deeply affected the living conditions of millions of inhabitants of the contaminated areas. In all countries, the main concern has been with the management of foodstuffs to protect the local population against chronic internal exposure and to maintain the viability of local productions.

(A 4) Neither the Palomares nor the Goiânia accident can be considered as very representative of the existing exposure situations dealt with in this report because of the relatively limited size of the affected areas and the number of individuals directly concerned. However, they illustrate the type of protective actions to be implemented to control exposure in an urban and semi-urban environment when external irradiation and inhalation are significant exposure pathways.

(A 5) As far as the setting of reference levels for existing exposure situations resulting from nuclear accidents and radiation emergencies is concerned, past experience demonstrates that typical dose values selected by authorities to manage such situations are close or equal to 1 mSv/year, corresponding to the desire to progressively reduce long-term exposure to levels that are close or similar to situations considered 'normal', i.e within the band of constraints set for public exposure in planned situations.

A.2. Bikini

(A 6) Between 1946 and 1958, Bikini Atoll was used for atmospheric tests of nuclear weapons. It was the site of 23 of the 66 underwater, ground-level, and above-ground tests conducted in the Marshall Islands by the USA. As a result of the above-ground tests, the land surfaces and the lagoon became extensively contaminated with radionuclides, of which ^{137}Cs subsequently proved to be the most radiologically important.

(A 7) Prior to the first nuclear test in 1946, the 167 Bikinians were evacuated to neighbouring islands; however, some of them returned in the late 1960s and early 1970s after a preliminary radiological survey of the atoll. Measurements carried out between 1975 and 1978, however, revealed that the ^{137}Cs body contents of the resettled people had increased by factors of approximately 10 since their return. This increase was attributed to high caesium uptake from the soil by coconut trees, producing high caesium concentrations in the coconut milk and flesh consumed by the Bikini islanders; as such, in 1978, the population was relocated again. Scientific studies of the radiological conditions at Bikini Atoll have continued, but the population has not been able to return to date.

(A 8) It is considered that, without remedial action or restrictions on their behaviour, returnees to Bikini Atoll would, on average, receive an annual dose of 4 mSv from the remaining contamination. The highest plausible dose to people who might consume only locally grown foods rather than the more typical mix of local and imported foods is estimated to be approximately 15 mSv/year. The projected doses are largely from ^{137}Cs in foods and the soil. With regard to the other radionuclides still present at significant levels, ^{90}Sr uptake in foods is low because of strong competition from high levels of (chemically similar) calcium, while plutonium and americium isotopes are largely 'trapped' in lagoon sediments, with uptake into fish and other forms of seafood being extremely low.

(A 9) In radiological protection terms, the contamination of Bikini Atoll represents a potential existing exposure situation in the sense that the population was allowed to return to live permanently on the island. A possible protective action to allow this return is soil removal in residential areas and potassium treatment of the existing soil in crop-growing areas. Soil removal would reduce doses from external exposure, and from inhalation and inadvertent ingestion of soil in the areas where islanders spend most time.

(A 10) Potassium treatment would reduce doses from intakes of caesium in food; the main contributor to the overall projected doses. On the basis of extensive trials, it has been estimated that a programme of potassium treatment, repeated every 4–5 years, would reduce the concentration of ^{137}Cs in typical Bikini foods to well below the FAO/WHO Codex Alimentarius guidelines for international trade in foodstuffs. Projected doses would be reduced to approximately 0.4 mSv/year from the normal mix of local and imported foods, or 1.2 mSv/year from a diet of exclusively local produce.

(A 11) An alternative option would be to remove the topsoil from the crop-growing areas as well as the residential areas. This would undoubtedly be effective in reducing exposures, perhaps even more than the potassium treatment. However, it would generate very large volumes of soil requiring safe disposal. Furthermore, replacement soil would need to be imported. The financial, environmental, and social costs of this option would probably be much greater than the first option, and deserve to be evaluated in a proper optimisation process.

A.3. Maralinga

(A 12) British nuclear tests occurred between 1955 and 1963 at the Maralinga site in South Australia. A total of seven major nuclear tests were performed. Prior to selection, the Maralinga site was inhabited by Aboriginal people. Many were relocated to a new settlement at Yulata, and attempts were made to curtail access to the Maralinga site. These were often unsuccessful.

(A 13) Australian authorities established criteria in 1990 for the rehabilitation of former British nuclear test sites in Australia. At two of these sites, Emu and the Monte Bello Islands, there was little need for remediation. However, at Maralinga, several locations were contaminated with plutonium that had been dispersed locally by the explosions.

(A 14) Following extensive experimental studies, it was established that the inhalation of plutonium-contaminated dust by a critical group of Aborigines, living a semi-traditional lifestyle, was the dominant pathway for exposure in most cases. A second important pathway was the incorporation of plutonium, by way of wound contamination, in areas where many plutonium-contaminated fragments or particles were found. The general criterion for the clean-up was to undertake remedial measures to ensure that annual effective doses to the critical group under conditions of full-time occupancy should not exceed 5 mSv, which was the international individual dose limit for practices at that time. The Maralinga clean-up began with site preparations at the beginning of 1996, and took approximately 4 years.

(A 15) At the most extensively contaminated Taranaki site, soil from areas where ^{241}Am exceeded 40 kBq/m^2 was removed, with a restriction on land use which prohibited camping but allowed access for hunting or transit. This figure was based on observations of the likely proportion of time to be spent in the area on allowed activities. At three smaller contaminated sites, which remain outside the area of restricted land use, clean-up levels were required to be more stringent than for Taranaki. Approximately 2.3 km^2 of soil were removed from the most contaminated areas. The removed soil was buried in large excavated trenches adjacent to the soil-removal areas and covered with 5 m of uncontaminated rock and soil.

(A 16) An outer boundary, marked by heavy-duty galvanised steel posts at 50-m intervals, warns that camping is not permitted within the area. These warning signs generally follow the road system and contain all areas where continual occupancy could lead to doses in excess of 5 mSv/year.

A.4. Kyshtym

(A 17) In September 1957, a major accident occurred at the Chelyabinsk-40 military plutonium production facility near Kyshtym in the southern Ural mountains of the former Soviet Union. The facility, built in 1953, had a number of underground steel storage tanks equipped with cooling systems to store high-level waste so that it would not be dumped in the River Techa. These high-level wastes overheated when the cooling system failed. The heat build-up resulted in evaporation of the coolant water, which allowed the sediment to heat further and dry. The chemicals in the tank exploded on 29 September 1957 with an explosive power of 70–100 tons of TNT, which hurled the 2.5-m-thick concrete lid 25–30 m. The radioactive cloud from the explosion reached approximately 1 km. Due to calm wind conditions, approximately 90% of the materials deposited locally, while 100 PBq was dispersed away from the plant in an oblong fallout pattern approximately 300 km in length, including parts of Chelyabinsk, Sverdlovsk, and Tyumen counties. Almost all of the radioactive fallout occurred within the first 11 h.

(A 18) The major contaminants released were ^{144}Ce, ^{95}Zr, ^{95}Nb, and ^{90}Sr. Most fission products deposited on the ground, allowing the strontium isotopes to enter the food chain. A ban on food containing ^{90}Sr at concentrations greater than 2.4 Bq/g resulted in the destruction of 10,000 tons of agricultural produce in the first 2 years. All stores in Kamensk-Uralskiy which sold milk, meat, and other foodstuffs were closed as a precaution against consuming radioactive material, and new supplies were brought in 2 days later by train and truck.

(A 19) Approximately 10,000 people were evacuated from the high contamination area, while approximately 260,000 people remained in less contaminated areas. There were 1154 people in areas with a ^{90}Sr deposition density greater than 40 MBq/m^2, 1500 in areas with a deposition greater than 4 MBq/m^2, and 100,000 in areas with a deposition greater than 70 kBq/m^2. The highest individual doses were experienced by those evacuated within a few days of the accident. These people received an average external dose of 170 mSv and an average internal (gastrointestinal) dose of 1500 mSv; the average effective dose equivalent was approximately 520 mSv. The collective effective dose received by the evacuated people amounted to approximately 1300 man Sv.

(A 20) In the case of those that were not evacuated, the average 30-year committed effective dose for a group of approximately 10,000 people living in areas with a ^{90}Sr surface contamination level of 40–70 kBq/m^2 was estimated to be 20 mSv, and 4 mSv for a group of approximately 2000 people living in areas with a deposition density of 4–40 kBq/m^2. The collective effective dose received by the non-evacuated population (approximately 260,000 people) has been assessed as 1200 man Sv over a 30-year period, with figures pointing to 5000 man Sv.

(A 21) In the 1990s, the criteria for radiation protection of the population in the contaminated areas of Russia were revised. Protective measures were supposed to be undertaken in the areas with a dose level above 1 mSv/year.

A.5. Palomares

(A 22) The Palomares accident occurred on 17 January 1966 when two US military planes, a B-52 bomber and a KC-135 tanker aircraft, collided in the process of a midair refuelling operation above the town of Palomares, in the south-east of Spain on the Mediterranean coast. Both aircrafts were destroyed in the air. Four thermonuclear weapons, 11 men (four survived), and hundreds of tons of debris fell to earth in and around the town. Parts of the aircraft were scattered over a wide area. Two weapons landed without incident, one in a dry river bed near the mouth of the Almanzora river and the other in the sea, and both were recovered undamaged. The parachutes of the other two weapons failed to deploy; one fell in low mountains west of the town, and the other on agricultural lands to the east. The high explosives in these last two weapons detonated and burned, causing some of the plutonium inside to also burn and to be spread throughout the area. $^{239,240}Pu$ particulate contamination was distributed in varying degrees over a 2.26-km^2 area, including the northern edge of the village, farmlands, and non-cultivated terrains.

(A 23) This resulted in a 3-month response effort to identify, characterise, remove, and remediate the accident site. With a peak of approximately 680 personnel on 31 January 1966, the clean-up operation involved approximately 1600 individuals, the majority of whom were active duty US Air Force personnel (US Air Force Medical Services, 2001). Wherever the deposition density of alpha emitters was greater than 1.2 MBq/m^2, the contaminated vegetation and a surface layer of soil, approximately 10 cm depth, were collected, separated, and disposed of as radioactive wastes. The removed soil was replaced by fertile earth from uncontaminated areas. Arable land with levels below 1.2 MBq/m^2 was irrigated, ploughed to a depth of 30 cm, harrowed, and mixed. On rocky hillsides where ploughing was not possible, soil with a plutonium level greater than 0.12 MBq/m^2 was removed to some extent with hand tools. Bushes and trees with contamination levels above 3.7×10^{-2} Bq/m^2 were removed or pressure washed. Contaminated roofs and walls of houses were pressure washed until complete clean-up. In cases where complete decontamination was not possible, removal by mechanical procedures was carried out. The final amount of wastes produced from removed soil of approximately 1000 m^3 were placed in approximately 5000 metallic drums of 200 L each and sent to Savannah River Plant in the USA. Approximately 310 m^3 of vegetation wastes with levels above 7 kBq/m^2 were buried in a disposal trench; the other vegetation removed was burned and the ashes mixed and placed in drums with the most contaminated soil (Gutiérrez et al., 1994).

(A 24) Immediately after the decontamination operation, a radiological surveillance programme was established by the former Nuclear Energy Board and then continued indefinitely by the national research centre CIEMAT. Reports are presented periodically to the national regulatory body, the Nuclear Safety Council and the Spanish Council of Nuclear Safety (CSN). The radiological surveillance programme has included medical examinations and urine analyses to determine bioelimination of plutonium and americium for approximately 150 people per year. In the environment, sampling and analysis of soil, water, vegetation, crops, and livestock products, as well as marine water and sediments, have been performed since the accident.

(A 25) The medical controls for the population (total of 1043 people) have not shown any radiation-related findings. Of the urine analyses of local inhabitants undertaken since 1966, only 3.3% (153/628) have had a positive result. The percentage of people who have had their committed effective dose calculated is 5.5% (59/1066), with values that do not imply any significant radiological risk, as reported to CSN.

(A 26) The average annual concentration of plutonium in the air at Palomares (39 $\mu Bq/m^3$ in the rural area and 4 $\mu Bq/m^3$ in the urban area) since the accident implies an annual average dose to the population by inhalation that is 'significantly lower' than 1 mSv. The dose by ingestion of locally produced food, based on a large number of analyses and measurements of representative agricultural products, would also be much lower than 1 mSv/year (only 1% of the samples have shown contamination above 1 Bq/kg in the edible part of the food).

(A 27) In recent years, the socio-economic situation of the Palomares area has changed drastically, with continuous and growing economic development that involves high technical agricultural practices (with many greenhouses), intensive and extensive use of land, and a strong and stable development of tourism with a significant increase in new building. These changes in land use, involving the movement of large amounts of soil, could lead to higher availability of the remnant radioactive contamination, and therefore motivated the implementation of a programme for the adequate management of the most affected zones. In July 2000, CIEMAT communicated to the CSN that, in the so-called 'zone 2', the plutonium inventory within the top 45-cm layer of soil was 2.85 TBq. In 2003, the CSN established specific criteria for the use of soil in Palomares, which were ratified in 2007. The criteria refer to the top 15-cm layer of soil. Unrestricted use of soil is allowed if the assessed residual doses are lower than 1 mSv/year; partial restriction in land use and additional characterisation is necessary when the assessed residual doses are of the order of 1 mSv/year. Finally, a complete interdiction on the use of soil is adopted when the assessed residual doses could be above 5 mSv/year. Based on these criteria, the Government determined an occupation of the affected areas as the most appropriate way to proceed with an in-depth study of the situation that could lead to a definitive solution to the problem.

(A 28) A research plan on radiological surveillance of the area was approved with the objective of performing a detailed characterisation of the remnant contamination. Surface ^{241}Am contamination has been measured in the top 15-cm layer of soil in an area of 660 hectares (6.6 km^2), resulting in more than 63,000 records. Beyond the previously known existence of residual contamination in 20 Ha in the proximity of the impact points of the two weapons, this characterisation showed significant residual contamination levels in approximately another 20 Ha out of the 'zero contamination line' initially marked after the accident. This has justified the occupation of 40 Ha of terrain by the Public Administration. Once closed to the public, the most affected 40 Ha have been characterised with more than 255,000 records of surface ^{241}Am contamination in the upper 15-cm layer of soil. Static measurements of 'in-situ' gamma spectrometry and external dose levels have been performed in 581 points, from which 1698 unaltered samples of soil have been taken and analysed. Also, boreholes have been created in 310 places (280 up to a depth between 2 and 5 m; 30 between 0.5 and 1 m) in order to evaluate the deeper migration of the residual contamination. This detailed information will allow elaboration of the recommendations leading to the final rehabilitation of the affected terrains (Barrigós, 2008).

(A 29) Close interaction and fluid communication has been maintained with the affected communities, including frequent meetings with regional and local authorities, as well as with other stakeholders such as individual citizens, environmental organisations, local media, etc. (Barrigós, 2008). This has contributed to generate and maintain confidence in the experts' assessments and the authorities' recommendations.

A.6. Chernobyl/Commonwealth of Independent States countries

(A 30) The Chernobyl accident that occurred in April 1986 resulted in widespread contamination of inhabited areas in the republics of Belarus, Russia, and Ukraine of the former Soviet Union. Immediately after the accident, the inhabitants of the city of Prypiat close to the power plant were evacuated, followed by the entire population living in settlements located within a 30-km radius around the plant. Restrictions on access and consumption of foodstuffs were also adopted rapidly, as well as decontamination, hydrological, and agricultural countermeasures to minimise the impact of the contamination. During the months following the emergency phase, concern increased progressively regarding whether or not further relocation of populations and supplementary countermeasures were needed. The long-term rehabilitation issue emerged progressively during the late 1980s when it became more and more evident that the protection strategies adopted after the emergency phase, basically aiming at moving the inhabitants away from the most contaminated areas and reducing and controlling the contamination in the environment whenever possible, were insufficient to durably protect the population still residing in large, less-contaminated areas.

(A 31) The long-term contamination in these areas was a permanent worry for the population as far as health was concerned because of the remaining uncertainty concerning protracted exposure, particularly due to internal contamination. It was also a very serious handicap for the long-term preservation of the quality of life of the inhabitants and the sustainable maintenance of the socio-economic infrastructure. This led the Governments of Belarus, Russia, and Ukraine to elaborate and adopt ambitious national laws in the early 1990s in an attempt to organise radiation monitoring and health surveillance, and to improve the social and economic living conditions of the population residing in the contaminated areas. The objective of these laws was mainly to address long-term issues through a series of national countermeasures and compensation mechanisms, designed mainly according to radiological protection criteria.

(A 32) In Belarus, for instance, two laws were published to define the principles governing the social protection of the affected population and the status of contaminated areas. The first law, voted in February 1991, concerned 'the social protection of citizens affected by the disaster at the nuclear power plant of Chernobyl' and clarified the status of those affected by the accident: liquidators, populations, and workers in the contaminated areas, as well as the compensation allocated in each case. The second law, voted in November 1991, which concerned 'the legal status of the contaminated areas following the disaster at the nuclear power plant of Chernobyl' defined the conditions and means for organising the social and economic activities in the areas, as well as the scientific accompanying programme. It also stipulated the zoning organisation of the Belarus regions (Table A.1). Both laws applied to approximately 2 million Belarusian people and recognised that 20% of the Belarusian territory (approximately 40,000 km^2) were significantly contaminated.

(A 33) Schematically, the rehabilitation programmes adopted in the early 1990s relied on further restriction of human presence in the contaminated areas (mandatory or voluntary relocation), and on strictly controlling the level of contamination in foodstuffs and the whole-body contamination of individuals. Many countermeasures were focused on the control and improvement of the radiological quality of agricultural products in collective farms; private production was restricted as much as possible because of difficulty in controlling and monitoring its quality.

(A 34) In 2001, the law on 'the social protection of citizens affected by the disaster at the nuclear power plant of Chernobyl' was amended and clarified. It was then established that in areas where conditions of life and work are not subject to any restriction, the average total exposure (external and internal) of the population should not exceed 1 mSv/year (excluding background). This law stipulated that:

- if the average exposure of the population is more than 1 mSv/year, protective measures must be implemented;
- if the average exposure of the population is between 0.1 and 1 mSv/year, actions to reduce exposures should not be deleted but adapted to the situation; and
- if the average exposure of the population is less than 0.1 mSv/year, protective measures are not necessary.

Table A.1. Zoning criteria adopted in Belarus in 1991.

Zoning criteria	Official designation of zones
$37 < {}^{137}Cs < 185$ kBq/m^2	Periodic radiation monitoring
Individual dose < 1 mSv/year	
$185 < {}^{137}Cs < 555$ kBq/m^2	Zone with resettlement rights
$18.5 < {}^{90}Sr < 74$ kBq/m^2	
$0.37 < Pu < 1.85$ kBq/m^2	
Individual dose > 1 mSv/year	
$555 < {}^{137}Cs < 1480$ kBq/m^2	Zone of secondary resettlement
$74 < {}^{90}Sr < 111$ kBq/m^2	
$1.85 < Pu < 3.7$ kBq/m^2	
Individual dose < 5 mSv/year	
${}^{137}Cs > 1480$ kBq/m^2	Zone of priority resettlement
${}^{90}Sr > 111$ kBq/m^2	
$Pu > 3.7$ kBq/m^2	
Individual dose > 5 mSv/year	
Zone of evacuation (exclusion zone)	

(A 35) As far as the control of foodstuffs is concerned, authorities have adopted a pragmatic approach by reducing the concentration criteria as the situation improved. Table A.2 illustrates the evolution of food contamination criteria from 1986 to 1999 in Belarus.

(A 36) It should be noted that, with minor changes, this legal framework remained the basis of the successive rehabilitation programmes that were implemented until the late 2000s, i.e more than 20 years after the accident.

(A 37) Despite the huge amount of national resources dedicated to the rehabilitation programmes in the early 1990s, the protection strategies failed to properly consider the complexity of the situation created by the contamination. In particular, they did not succeed in mobilising the local communities and the individuals who felt progressively powerless in the face of the radiological situation. This situation contributed to generate a general feeling of loss of control of daily life, exclusion, and abandonment among the inhabitants.

(A 38) During the mid 1990s, the continuous degradation of the economic situation due to both the collapse of the Soviet Union and the financial burden of the rehabilitation programmes pushed the inhabitants of the areas to restart private production and to rely ever more on wild products to ensure their daily subsistence. In the absence of individual knowledge and adequate means to control the radiological quality of foodstuffs at the local level, the effect of this change was inevitably a significant increase in the level of exposure within the population, and particularly among children because of the importance of dairy products in their diet. This put strong pressure on the authorities and experts, and contributed to aggravate further the loss of confidence of the population in their ability to manage the situation.

(A 39) Faced with this difficult situation, the authorities tested new approaches, such as the ETHOS Project in the late 1990s and the CORE Programme in the early 2000s in Belarus, with the aim of involving the population directly in the management of the radiological situation. These new approaches demonstrated that the

Table A.2. Evolution of ^{137}Cs contamination limits in foodstuffs in Belarus from 1986 to 1999.

Years	^{137}Cs contamination (Bq/kg, Bq/L)			
	1986	1993	1996	1999
Foodstuffs				
Drinkable water	370	18.5	18.5	10
Milk	370	111	111	100
Butter	7400	-	185	100
Meat:				
Beef	3700	600	600	500
Lamb	3700	-	600	500
Pork, poultry	3700	370	370	180
Potatoes	3700	370	100	80
Fruits	-	-	100	40
Wild berries	-	185	185	185
Fresh mushrooms	-	-	370	370
Dried mushrooms	-	3700	3700	2500
Baby food	-	-	-	37

direct involvement of local stakeholders in the day-to-day management of a radiological situation is feasible, and evidenced the potential for implementing many protective actions in day-to-day life in addition to the collective actions taken by the authorities. These approaches also demonstrated that to be sustainable, management of a radiological situation by stakeholders must rely on a dynamic of economic development relying primarily on individual initiatives of the local actors in partnership with national and international institutions and organisations.

A.7. Chernobyl/Norway

(A 40) The Chernobyl fallout in Norway was significant and had serious agricultural consequences (Brynildsen et al., 1996; Tveten et al., 1998). As the geographical extent and the potential long-term consequences of the fallout emerged during the summer of 1986, the Government passed a resolution regarding compensation for all farmers and other producers for economic losses due to the mitigating actions. The most affected areas in Norway are rural. Breeding of cattle, sheep, goats, and reindeer is common in these areas, and summer grazing on rough forest and mountain pastures is part of traditional agricultural practices. High uptake of radiocaesium in plants growing in these poor soils has contributed to a persistent contamination problem in animal production. Twenty-two years after the accident, countermeasures are still needed in large areas of sheep and reindeer production, as well as smaller areas of dairy cow and goat production, for compliance with food intervention levels. The countermeasures are expected to be needed for at least another decade (e.g. Skuterud et al., 2005a).

(A 41) The Norwegian radiological protection criteria in the Chernobyl management was based on the recommendations of the ICRP concerning exposures of the public, with 5 mSv as the maximum dose during the first year after the accident, and 1 mSv/year in subsequent years. A range of measures were needed to comply with these criteria, including dietary advice to consumers of reindeer meat and freshwater fish (Strand et al., 1992). The measures reduced the average ingestion doses of reindeer herders approximately 10-fold. However, without measures, there is continued potential for doses exceeding 1 mSv/year among reindeer herders in central Norway (Skuterud et al., 2005b).

(A 42) The Chernobyl fallout management in Norway focused on maintaining domestic food production and consumer confidence in these products. Control of contamination levels in traded foods was applied, and intervention limits for radiocaesium were established (600 Bq/kg in basic foodstuffs). However, to avoid condemnation of 85% of the total national reindeer production, and to maintain a meaningful business base for reindeer herders (as well as Sami culture and lifestyle), the intervention limit for radiocaesium in reindeer meat was increased in the autumn of 1986 to 6000 Bq/kg (from 1987, this was also applicable to wild freshwater fish and game). This was justified by the low average consumption of these products by the general Norwegian population. As the situation improved, the intervention limit for reindeer meat was reduced to 3000 Bq/kg in 1994.

(A 43) During 1986, approximately 2850 tons of meat, worth nearly 18 million USD, was condemned. In recognition of the long-term perspective of the contamination problems, the authorities realised that measures were needed to reduce the high cost associated with monitoring and compensation for condemned meat and milk. In addition, condemnation produced waste. The procedures developed for monitoring live animals (sheep, cattle, and reindeer; Brynildsen and Strand, 1994) have been particularly appreciated, both by animal owners and the authorities, since they rapidly determine if animals can be slaughtered or should be given clean feed before slaughter (with compensation for extra labour, fodder, construction of enclosures, etc.). Caesium binders mixed in concentrates, added to salt licks, or applied as rumen boli have also been popular measures with no extra economic costs for the producers. Early slaughtering was applied as a measure in reindeer herding, with associated compensation for reduced weight of animals. Many of the measures were developed and tested in the field, with the involvement of local people, and this approach has been regarded as important for the success of the strategies adopted.

(A 44) Elevated contamination levels in wild products, combined with significant consumption of these products by the rural population, particularly reindeer herders, led to a need for advice on the level of consumption of various products and how to cook in order to reduce radiocaesium intake. In addition, the authorities monitored radiocaesium levels in reindeer herders for surveillance of doses to the most exposed population group. Maybe even more importantly, this monitoring made the contamination situation more tangible and controllable for the people (Mehli et al., 2000). More than 20 years after the accident, there is a continued request for this monitoring from the reindeer herders, motivated by their willingness to maintain control of the radiological situation but also because of the still open discussions on risks associated with long-term, low-dose exposure to radiation.

(A 45) To manage the extensive monitoring of various animals and products in rural areas, the authorities equipped nearly 60 local food control laboratories and veterinarians with detectors for radiocaesium measurement in 1986–1987 (Strand et al., 1987). These also freely served the people if they wanted to check contamination levels in their own products. This monitoring network helped to build significant local knowledge on contamination levels.

(A 46) It has been estimated that the various countermeasures in animal production during the first 10 years, costing some 70 million USD in total, reduced the condemnation of meat worth nearly 300 million USD (Tveten et al., 1998). Additionally, monitoring and controlling animals and foodstuffs probably contributes to maintaining the public's confidence in Norwegian products, thereby avoiding even more dramatic economic consequences associated with market drops.

(A 47) The focus on local competence and direct involvement of the affected population in countermeasure application and monitoring in Norway was a result of both the request from the population in the contaminated areas, and the recognition by the central authorities that the local food producers had detailed knowledge of importance for everyday management of the contamination problem. This local focus appears to be another success of the Chernobyl fallout management in Norway.

A.8. Chernobyl/UK

(A 48) Radiocaesium originating from the accident at the Chernobyl nuclear power plant in the Ukraine was deposited across the UK on 2–4 May 1986. The highest levels of radiocaesium deposition, in the range of 20–40 kBq/m^2, occurred in the uplands of western Britain, where sheep farming is an important agricultural activity. A countrywide programme of sampling carried out after the accident identified sheep meat as the foodstuff of most concern. To protect consumers, a maximum limit of 1000 Bq/kg radiocaesium was applied to sheep meat affected by the accident. This limit was introduced in the UK in 1986, based on advice from the European Commission's Article 31. Under powers provided in the Food and Environment Protection Act 1985 (FEPA), emergency orders have been used since 1986 to impose restrictions on the movement and sale of sheep exceeding the limit in certain parts of Cumbria, North Wales, Scotland, and Northern Ireland. The orders define geographical areas, often termed 'restricted areas', within which the controls must be followed. Under the FEPA orders, sheep with levels of contamination above the limit are not allowed to enter the food chain. Due to the particular chemical and physical properties of the peaty soil types present in the upland areas of the UK, the radiocaesium is still able to pass easily from soil to grass and hence accumulate in sheep. Consequently, more than 20 years after the accident, areas exist where restrictions are still in place. Initially, these restricted areas were large, but they have reduced substantially as levels of radioactivity have fallen, with all restrictions lifted in Northern Ireland in 2000. Table A.3 gives a breakdown of the number of sheep and farms under restrictions for 1986, 1990, 2000, and 2007. The restrictions, which were implemented as a response to an emergency exposure situation, have become part of a protection strategy for what is now considered as an existing exposure situation.

(A 49) It was not possible to implement protective measures to reduce levels of radiocaesium in vegetation in the restricted areas due to the physical limitations of the terrain and the environmentally sensitive nature of these areas. Nevertheless, the development of a very well-designed monitoring programme following the Chernobyl accident did enable lamb production to be sustained and the livelihoods of sheep farmers to be protected. Furthermore, consumer confidence in lamb was maintained. The monitoring programme, known as the 'Mark and Release' scheme, has operated in the restricted areas since 1986. Under this scheme, a farmer wishing to move sheep out of a restricted area can have the animals monitored to determine their level of radiocaesium. A live monitoring technique is used which, to allow

Table A.3. Number of sheep and farms under restrictions in the UK for 1986, 1990, 2000, and 2007.

	Farms	Sheep
June 1986	8914	4,225,000
August 1990	757	647,000
May 2000	387	231,500
February 2007	369	196,500

for inherent variability in live monitoring results, applies a working action level of 645 Bq/kg (rather than 1000 Bq/kg). Any sheep which exceed the working action level are marked with a dye and are not released from restrictions. Those which pass are allowed to enter the food chain.

(A 50) Since 1986, sheep farmers in the restricted areas started to become aware that their lambs could pass the 'Mark and Release' test if they were brought down from the upland unimproved pastures to improved lowland pasture for a period of fattening prior to slaughter. Subsequently, these sheep farmers have adapted their husbandry practices to make use of their own improved land or rented land to fatten their lambs prior to slaughter. Live monitoring has become part of this routine and is generally accepted by farming communities as the new practice. The restrictions will remain in place for several years to come.

A.9. Goiânia, Brazil

(A 51) On 13 September 1987, two scavengers found an abandoned teletherapy device in a derelict medical clinic in Goiânia, Brazil. The machine contained a radioactive ^{137}Cs source with an activity of 50.9 TBq in the form of powdered and soluble $^{137}CsCl$. After removing the rotating assembly of the machine containing the source from its shield, they took it home and managed to rupture it and spread pieces about the property. Both became ill within hours. Five days later, they sold the pieces of the rotating assembly to a junk dealer in the neighbourhood. This dealer noticed a luminescence emanating from the unit and used tools to cut the unit apart to gain access to the material inside. The rupture allowed the $^{137}CsCl$ powder to disperse easily and be further distributed. Several land areas and 129 people were significantly contaminated, resulting in four deaths and one forearm amputation.

(A 52) ^{137}Cs contamination was spread by social contacts, the sale of contaminated material, the movement of pieces of the source, and wind and rain dispersal. Contamination was found on seven major properties; in 42 residences, including 22 homes of family and friends who were evacuated, and 20 others where radiation levels ranged from 1 to 10 mSv/h; and on 68 of more than 10 million bank notes tested. The population was internally exposed by inhalation and the ingestion of fruits and vegetables, and externally exposed to the penetrating ^{137}Cs gamma radiation, but the drinking water supply was found to be clean. More than 4000 urine and faecal samples from a total of 80 people were analysed between October 1987 and January 1988. The estimated collective doses were 56.3 man Sv from external exposures and 3.7 man Sv from internal exposures, including 14.9 man Sv (external) and 2.3 man Sv (internal) for the four people who died.

(A 53) More than 550 decontamination workers were mobilised. Contaminated materials in the environment were removed from the various sites and loaded into containers, with liquids being immobilised in concrete. Decontamination limits for solids were set by the national standard. Anything contaminated below 74 kBq/kg was considered to be clean and unaffected by the accident. The contamination level was characterised by the contact radiation level, with values of 2 and 20 mSv/h being the respective limits for low- and medium-level contamination. An estimated activity of 44 TBq of ^{137}Cs (of the 50.9 TBq of the source) was recaptured during the decontamination effort, which left the area with no significant residual hazard. The total volume of waste generated was 3500 m^3.

(A 54) The initial media coverage of the accident raised a lot of concern for a community with recent memories of the Chernobyl reactor accident in the former Soviet Union. The situation improved when the news media focused their efforts on reporting the actions implemented and public education. However, beyond the direct cost in human lives and medical treatment and care of victims, monitoring of people and the contaminated area, and the countermeasures described above, the economic and social consequences of the accident were very significant. Even without any agricultural contamination, the wholesale value of the entire state's agricultural production fell by 50% within 2 weeks of the announcement of the accident. Manufactured goods from Goiânia state experienced a drop of 40% in their sale prices for approximately 30–45 days. There was a very definite impact on the number of homes sold, home sale prices, rental prices, and land prices, and this was more acute nearer to the contaminated areas. The negative impact on hotel reservations and tourism was approximately 40%, even in areas more than 1 hour's drive away. Some residents of Goiânia were not allowed to register in hotels, to fly on aeroplanes, or to travel on buses. Official certificates of non-contamination were requested for people and goods everywhere.

(A 55) In the long term, due to heavy rains, the material was easily transported through the streets in addition to in-depth soil migration. Therefore, an additional decontamination was necessary for long-term recovery, mainly dealing with contaminated houses, gardens, and streets. At the time, Brazilian regulations did not cover remediation, and the only number that people understood and accepted was the dose limits for practices. Therefore, it was decided to use an approach which leads to 5 mSv for the first year but an average of 1 mSv/year considering the weathering and physical decay of caesium over 70 years. As a conceptual model, it considered indoor and outdoor external exposures in addition to inhalation of resuspended material and ingestion of food available from private gardens (such as vegetables, chicken, eggs, fruits). The criteria adopted for external exposure was 1 mSv for indoors and 3 mSv for outdoors, and the criteria for internal doses was 1 mSv/year. The authorities had to use a similar approach to that established in the national regulation for practices.

(A 56) Follow-up of all recovered areas has been performed over the years. However, in 1996, the environmental monitoring programme was stopped because of public stress, which caused behaviours such as TLDs disappearing from monitored houses, people not allowing workers to go into monitored places, etc. A new survey was requested in 2004 by the District Attorney in which some 'hot spots' of contamination, with levels higher than the operational level, were found on the streets and were removed in spite of not being of primary concern considering their location. The worst-case dose scenario indicated an effective dose of 3.2 mSv/year.

(A 57) A lesson learnt from the Goiânia accident is that the post-accident phase also requires planning and co-ordination with different stakeholders, particularly with the local population. Many resources were used to implement actions that could have been avoided with better planning of management of the situation, and better awareness of all involved entities on how to deal with this type of situation.

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Erratum

Erratum to the References in Publication 98, (Volume 35, Issue 3)

The Publisher would like to point out that the last page of the references were omitted from the PDF and printed versions of the above publication. They are reproduced in full below:

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Corrigendum

Corrigendum to 'The History of ICRP and the Evolution of its Policies' [Ann. ICRP 39(1)]

R.H. Clarke, J. Valentin

The authors would like to point out that there were errors present in Table 1.3, on page 84, under 'Committee 1 Chair'.

The error as present is:

1985–2001	Warren K Sinclair, USA
2001–2009	Roger Cox, UK
2009–	Ohtshura Niwa, Japan

The corrected form is:

1985–1997	Warren K Sinclair, USA
1997–2005	Roger Cox, UK
2005–	Julian Preston, USA

The Publisher and Authors apologize for this error.

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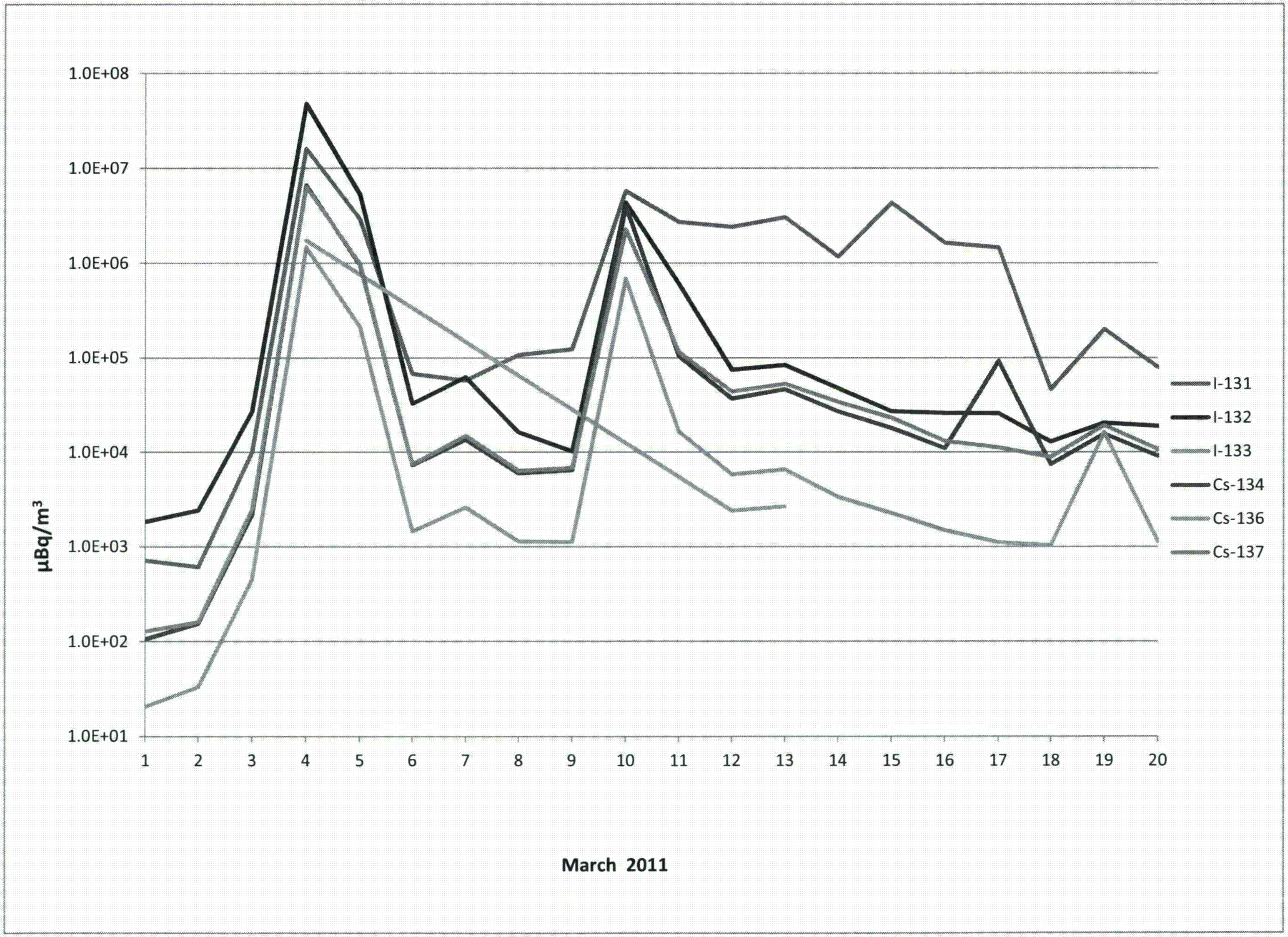
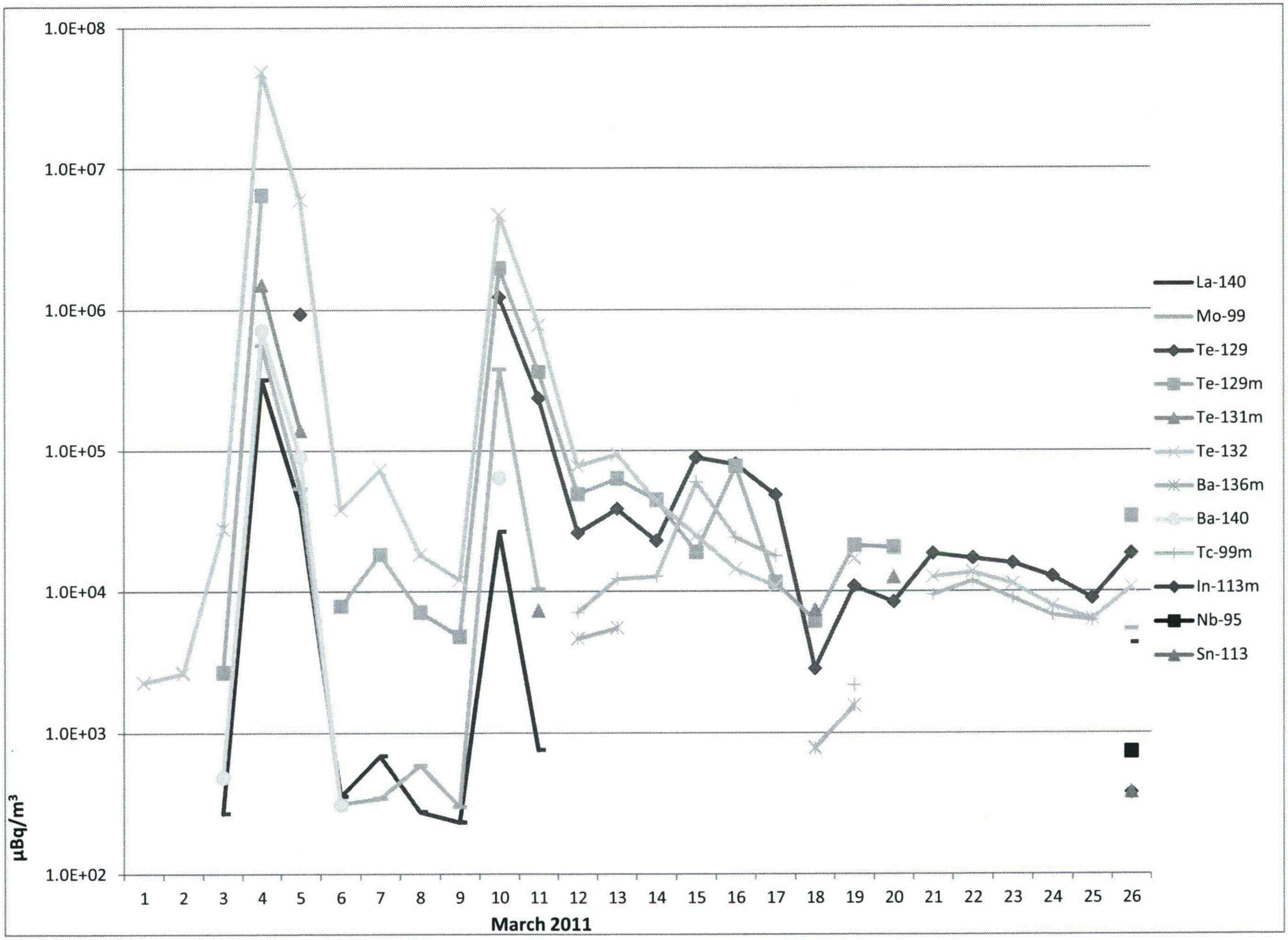
From: PMT10 Hoc
Sent: Thursday, April 07, 2011 10:07 AM
To: patricia.milligan@nrc.gov
Subject: Japan AFB gamma spec air samples update to 04 03 2011.xlsx
Attachments: Japan AFB gamma spec air samples update to 04 03 2011.xlsx



1.0E+08
1.0E+07
1.0E+06
1.0E+05
1.0E+04
1.0E+03
1.0E+02
1.0E+01
μBq/m3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
March 2011
I-131
I-132
I-133
Cs-134
Cs-136
Cs-137



1.0E+08
1.0E+07
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1.0E+04
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μBq/m³
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
March 2011
La-140
Mo-99
Te-129
Te-129m
Te-131m
Te-132
Ba-136m
Ba-140
Tc-99m
In-113m
Nb-95
Sn-113

			12m	13	14	15	15	16	17	18	19	20	21	22	22	23	23	23	23	25	25	25	25	26	26	26	26	30
CEDE (inhalation) Sv/Bq	**half-life**	**Nuclide**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
8.89E-09	8.04d	**I-131**	715	612	1.00E+04	1.61E+07	2.91E+06	6.77E+04	5.75E+04	1.07E+05	1.23E+05	5.75E+06	2.71E+06	2.40E+06	3.04E+06	1.17E+06	4.31E+06	1.63E+06	1.45E+06	4.66E+04	2.00E+05	7.93E+04	5.79E+04	6.14E+04	4.33E+04	3.08E+04	2.15E+04	7.36E+04
1.03E-10	2.3h	**I-132**	1.83E+03	2.43E+03	2.69E+04	4.75E+07	5.27E+06	3.28E+04	6.27E+04	1.62E+04	1.02E+04	4.33E+06	6.06E+05	7.48E+04	8.37E+04	4.78E+04	2.70E+04	2.61E+04	2.58E+04	1.29E+04	2.04E+04	1.89E+04	1.88E+04	1.99E+04	1.85E+04	1.61E+04	1.20E+04	1.41E+04
1.58E-09	20.8h	**I-133**				1.73E+06								2410	2.67E+03													
1.25E-08	2.06y	**Cs-134**	106	155	2.18E+03	6.61E+06	9.61E+05	7.30E+03	1.36E+04	5.98E+03	6.47E+03	3.97E+06	1.04E+05	3.70E+04	4.64E+04	2.71E+04	1.80E+04	1.10E+04	9.24E+04	7.47E+03	1.56E+04	9.09E+03	2.11E+04	1.54E+04	1.91E+04	1.09E+04	9.22E+03	1.36E+05
1.98E-09	13.1d	**Cs-136**	20.5	33.3	4.50E+02	1.47E+06	2.12E+05	1.45E+03	2.62E+03	1.13E+03	1.12E+03	6.87E+05	1.65E+04	5.83E+03	6.57E+03	3.38E+03	2.27E+03	1.49E+03	1.11E+03	1.03E+03	1.62E+04	1.14E+03	2.59E+03	1.88E+04	2.44E+04	1.48E+03	1.14E+03	8.08E+03
8.63E-09	30y	**Cs-137**	128	160	2.47E+03	6.35E+06	9.84E+05	7.45E+03	1.49E+04	6.35E+03	6.82E+03	2.26E+06	1.15E+05	4.40E+04	5.31E+04	3.41E+04	2.31E+04	1.31E+04	1.12E+04	8.90E+03	1.92E+04	1.07E+04	2.63E+04	2.17E+04	2.37E+04	1.29E+04	1.18E+04	1.65E+05
1.31E-09	40.3h	**La-140**			2.68E+02	3.19E+05	4.03E+04	3.55E+02	6.87E+02	2.75E+02	2.32E+02	2.65E+04	7.57E+02															4.29E+03
1.07E-09	66h	**Mo-99**			492	5.63E+05	5.38E+04	3.13E+02	3.42E+02	5.88E+02	2.98E+02	3.77E+05	1.03E+04															5.36E+03
2.42E-11	69.6m	**Te-129**					9.33E+05					1.22E+06	2.35E+05	2.59E+04	3.83E+04	2.27E+04	8.89E+04	7.97E+04	4.80E+04	2.83E+03	1.08E+04	8.34E+03	1.85E+04	1.71E+04	1.58E+04	1.27E+04	8.87E+03	1.85E+04
6.47E-09	33.6d	**Te-129m**			2.67E+03	6.45E+06		7.82E+03	1.82E+04	7.10E+03	4.78E+03	1.96E+06	3.62E+05	4.89E+04	6.31E+04	4.43E+04	1.89E+04	7.70E+04	1.15E+04	6.13E+03	2.11E+04	2.04E+04						3.37E+04
6.73E-09	13h	**Te-131m**				1.50E+06	1.39E+05						7.28E+03							7.35E+03		1.25E+04						
2.55E-09	70.2h	**Te-132**	2.27E+03	2.63E+03	2.77E+04	4.84E+07	5.97E+06	3.77E+04	7.32E+04	1.82E+04	1.20E+04	4.67E+06	7.79E+05	7.73E+04	9.38E+04	4.33E+04	2.49E+04	1.43E+04	1.08E+04		1.70E+04		1.26E+04	1.36E+04	1.13E+04	7.87E+03	6.34E+03	1.06E+04
		Ba-136m												4610	5.48E+03					779	1553							
1.01E-09	12.7d	**Ba-140**			483	7.10E+05	9.02E+04	3.08E+02				6.37E+04																
8.80E-12	6h	**Tc-99m**												7050	1.22E+04	1.27E+04	5.92E+04	2.40E+04	1.77E+04		2.16E+03		9.40E+03	1.18E+04	8.89E+03	6.76E+03	6.22E+03	
1.11E-11	1.65h	**In-113m**																										3.76E+02
1.57E-09	35.2d	**Nb-95**																										7.29E+02
2.88E-09	115d	**Sn-113**																										3.80E+02
3.51E-07	29.1y	**Sr-90**				2.80E+04	3.22E+03					1.67E+03																
		TEDE (mrem/hr)	<1E-3	< 1E-3	< 1E-3	5.78E-02	7.86E-03							2.74E-03	3.47E-03													

highest values seen on 3/15 at sampling location (238 km SSW of Fukushima)

samples taken on date at ~3 hour intervals

M:\PMT\Fukushima\23 March files\Japan gamma spec air samples.xlsx
M:\PMT\Fukushima\23 March files\Japan gamma spec air samples update to 0327.xlsx
M:\PMT\Fukushima\1 April files\Japan AFB gamma spec air samples update to 040111.xlsx

News Release

経済産業省
Ministry of Economy, Trade and Industry

April 18, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 100th Release)
(As of 15:00 April 18th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)
   - Fukushima Dai-ichi NPS
     - Confirmation of situation, etc. Using an unmanned robot at the reactor building of Unit 2 was carried out. (From 13:42 till 14:33 April 18th)
     - Fresh water spray over the Spent Fuel Pool of Unit 3 using Concrete Pump Truck (62m class) was started. (From 14:17 April 18th)
     - In order to replace the hose used for water injection to the reactors of Units 1 to 3 with a new one, the pumps for water injection were stopped. (From 11:50 till 13;05 April 18th)
     - The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,200m^2 around the Radioactive Waste Treatment Facilities. (From 09:00 till 14:30 April 18th)

QQQ 324

(Attached sheet)

1. The state of operation at NPS (Number of automatic shutdown units: 10)

- Fukushima Dai-ichi NPS, TEPCO
  (Okuma Town and FutabaTown, Futaba County, Fukushima Prefecture)

(1) The state of operation

Unit 1 (460MWe):	automatic shutdown
Unit 2 (784MWe):	automatic shutdown
Unit 3 (784MWe):	automatic shutdown
Unit 4 (784MWe):	in periodic inspection outage
Unit 5 (784MWe):	in periodic inspection outage, cold shutdown at 14:30 March 20th
Unit 6 (1,100MWe):	in periodic inspection outage, cold shutdown at 19:27 March 20th

(2) Major Plant Parameters (As of 14:00 April 18th)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure*1 [MPa]	0.529(A) 1.136(B)	0.078(A) 0.069(D)	0.067(A) 0.020(C)	—	0.108	0.111
CV Pressure (D/W) [kPa]	170	85	104.7	—	—	—
Reactor Water Level*2 [mm]	-1,650(A) -1,650(B)	-1,500(A) -2,100 (B)	-1,800(A) -2,250(B)	—	1,852	2,018
Suppression Pool Water Temperature (S/C) [℃]	53.5(A) 53.3(B)	75.2(A) 75.5(B)	43.6(A) 43.6(B)	—	—	—
Suppression Pool Pressure (S/C) [kPa]	170	Indicator Failure	171.3	—	—	—
Spent Fuel Pool Water Temperature [℃]	Indicator Failure	71.0	Indicator Failure	Indicator Failure	35.9	34.0
Time of Measurement	13:00 April 18th	13:00 April 18th	13:45 April 18th	April 18th	14:00 April 18th	14:00 April 18th

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (10:17 March 12th)
- Seawater injection to the Reactor Pressure Vessel (RPV) via the Fire Extinguish Line was started. (20:20 March 12th)
  →Temporary interruption of the injection (01:10 March 14th)
- The sound of explosion in Unit 1 occurred. (15:36 March 12th)
- The amount of injected water to the Reactor Core was increased by utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$). (02:33 March 23rd) Later, it was switched to the Feedwater Line only (around $11m^3/h$). (09:00 March 23rd)
- Lighting in the Central Operation Room was recovered. (11:30 March 24th)
- Fresh water injection to RPV was started. (15:37 March 25)
- As the result of concentration measurement in the stagnant water on the basement floor of the turbine building, $2.1 \times 10^5 Bq/cm^3$ of ^{131}I (Iodine) and $1.8 \times 10^6 Bq/cm^3$ of ^{137}Cs (Caesium) were detected as major radioactive nuclides.
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (08:32 March 29th.)
- The Stagnant water on the basement floor of the turbine building was started to be transferred to the Condenser around 17:00 March 24. As the Condenser was confirmed to be almost filled with water, pumping out of the water to the Condenser was stopped. (07:30 March 29th) In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank started to be transferred to the Surge Tank of Suppression Pool Water (A) (12:00 March 31th), after switching the place where the water was to be transferred to the Surge Tank of Suppression Pool Water (B) (15:25 March 31th), the transfer was

resumed and finished. (15:26 April 2nd)

- Water spray of around 90t (fresh water) over the Spent Fuel Pool using Concrete Pump Truck (62m class) was carried out. (From 13:03 till 16:04 March 31st) A test water spray using Concrete Pump Truck (62m class) was carried out in order to confirm the appropriate position for water spray. (From 17:16 till 17:19 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (10:42 to 11:52 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:02 April 3rd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (13:55 April 3rd)
- Aiming at reducing the possibility of hydrogen combustion in the Primary Containment Vessel (PCV), the operations for the injection of nitrogen to PCV were started. (22:30 April 6th)
- The start of nitrogen injection to PCV was confirmed. (01:31 April 7th)
- The nitrogen injection to PCV was switched to the generator of high purity nitrogen. (04:10 April 9th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (09:30 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost and the fresh water injection to RPV and the nitrogen injection to PVC were suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The nitrogen injection to PCV was started. (23:34 April 11th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 16:00 till 17:30 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 11:50 till 12:12 April 18th)

- White smoke was not confirmed to generate. (As of 06:30 April 18th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 18th)

<Unit 2>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (11:00 March 13th)
- The Blow-out Panel of reactor building was opened due to the explosion in the reactor building of Unit 3. (After 11:00 March 14th)
- Reactor water level tended to decrease. (13:18 March 14th) TEPCO reported to NISA the event (Loss of reactor cooling functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:49 March 14th)
- Seawater injection to RPV via the Fire Extinguish line was started. (16:34 March 14th)
- Water level in RPV tended to decrease. (22:50 March 14th)
- Started to vent (0:02 March 15th)
- A sound of explosion was made in Unit 2. As the pressure in Suppression Pool (Suppression Chamber) decreased (06:10 March 15th), there was a possibility that an incident occurred in the Chamber. (About 06:20 March 15th)
- Electric power receiving at the emergency power source transformer from the external transmission line was completed. The work for laying the electric cable from the facility to the load side was carried out. (13:30 March 19th)
- Seawater injection of 40t to the Spent Fuel Pool was started. (From 15:05 till 17:20 March 20th)
- Power Center received electricity (15:46 March 20th)
- White smoke generated. (18:22 March 21st)
- White smoke was died down and almost invisible. (As of 07:11 March 22nd)
- Seawater injection of 18t to the Spent Fuel Pool was carried out. (From 16:07 till 17:01 March 22nd)

- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:30 till 12:19 March 25th)
- Fresh water injection to RPV was started. (10:10 March 26th)
- Lighting of Central Operation Room was recovered (16:46 March26th)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump.(18:31 March 27th)
- Regarding the result of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, TEPCO reported to NISA that as the result of analysis and evaluation through re-sampling, judging the measured value of ^{134}I (Iodine) was wrong, the concentrations of gamma nuclides including ^{134}I (Iodine) were less than the detection limit. (00:07 March 28).
- Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump. (From 16:30 till 18:25 March 29th)
- As the malfunction of the temporary motor-driven pump, which had been injecting to the Spent Fuel Pool since 09:25 March 30th, was confirmed at 09:45 March 30th, the injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. Fresh water injection was resumed. (From 19:05 till 23:50 March 30th)
- Fresh water injection of around 70t to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 14:56 till 17:05 April 1st)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank was transferred to the Surge Tank of Suppression Pool Water. (From 16:45 March 29th till 11:50 April 1st)
- The water, of which the dose rate was at the level of more than 1,000 mSv/h, was confirmed to be collected in the pit (a vertical portion of an underground structure) for laying electric cables, located near the Intake Channel. In addition, the outflow from the crack with a length of around 20 cm in the concrete portion of the lateral surface of the pit into the sea was confirmed. (Around 09:30 April 2nd) In order to stop the

outflow, concrete was poured into the pit. (16:25, 19:02 April 2nd)

- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (17:10 April 2nd)
- The cameras for monitoring the water levels in the vertical part of the trench outside of the turbine building and on the basement floor of the turbine building were installed. (April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:22 till 12:06 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- As the measure to prevent the outflow of the water accumulated in the Pits for Conduit in the area around the Inlet Bar Screen, the upper part of the Power Cable Trench for power source at Intake Channel was crushed and 20 bags of sawdust (3 kg/bag), 80 bags of high polymer absorbent (100 g/bag) and 3 bags of cutting-processed newspaper (Large garbage bag) were put inside. (From 13:47 till 14:30 April 3rd)
- Approximately 13kg of tracer (milk white bath agent) was put in from the Pit for the Duct for Seawater Pipe. (From 07:08 till 07:11 April 4th)
- Fresh water injection (Around 70t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 11:05 till 13:37 April 4th)
- The tracer solution was put in from the two holes dug around the Pit for the Conduit near the Inlet Bar Screen of Unit 2 and was confirmed to be flowed out from the crack to the sea. (14:15 April 5th) The coagulant (soluble glass) started to be injected from the holes around the Pit in order to prevent the outflow of the water. (15:07 April 5th) The outflow of the water was confirmed to stop. (Around 05:38 April 6th) In addition, it was confirmed that the water level in the turbine building did not rise. Furthermore, the measurements to stop water by means of rubber board and jig (prop) were implemented at the outflowing point. (Finished at 13: 15 April 6th)

- One more pump for the transfer of the water in the Condenser to the Condensate Storage Tank was installed. (Two pumps in total: 30 m^3/h) (Around 15:40 April 5th)
- Fresh water injection (Around 36t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 13:39 till 14:34 April 7th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (13:10 April 9th)
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:37 till 12:38 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The stagnant water in the trench of the turbine building was started to be transferred to the Hot Well of the Condenser using a submersible pump (19:35 April 12th) Thereafter it was confirmed that no leakage was found, the transfer of stagnant water resumed from 15:02 April 13th and was stopped 17:04 April 13th. The amount of transfer was about 660t.
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Cooling Line was carried out. (From 13:15 till 14:55 April 13th)
- Fresh water injection (Around 45t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:13 till 11:54 April 16th. Due to the occurrence of earthquake at around 11:19, the temporary motor-driven pump was stopped at 11:39. The Spent Fuel Pool was confirmed to be filled with water by the increase of Skimmer Level at 11:54.)
- <u>In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 12:13 till 12:37 April 18th)</u>
- <u>Confirmation of situations, etc. using an unmanned robot at the reactor building was carried out. (From 13:42 till 14:33 April 18th)</u>
- White smoke was confirmed to generate continuously. (As of 06:30 April 18th)

- Fresh water injection to RPV is being carried out. (As of 15:00 April 18th)

<Unit 3>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (05:10 March 13th)
- Started to vent (08:41 March 13th)
- Fresh water started to be injected to RPV via the Fire Extinguish Line. (11:55 March 13th)
- Seawater started to be injected to RPV via the Fire Extinguish Line. (13:12 March 13th)
- Seawater injection for Units 1 and 3 was suspended due to the lack of seawater in pit. (01:10 March 14th)
- Seawater injection to RPV for Unit 3 was resumed. (03:20 March 14th)
- Started to vent. (05:20 March 14th)
- PCV rose unusually. (07:44 March 14th) TEPCO reported to NISA on the event falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (7:52 March 14th)
- The explosion like Unit 1 occurred around the reactor building (11:01 March 14th)
- The white smoke like steam generated. (08:30 March 16th)
- Because of the possibility that PCV was damaged, the workers evacuated from the main control room (common control room). (10:45 March 16th) Thereafter the operators returned to the room and resumed the operation of water injection. (11:30 March 16th)
- Seawater was discharged 4 times to Unit 3 by the helicopters of the Self-Defence Force. (9:48, 9:52, 9:58 and 10:01 March 17th)
- The riot police arrived at the site for the water spray from the grand. (16:10 March 17th)
- The Self-Defence Force started the water spray using a fire engine. (19:35 March 17th)
- The water spray from the ground was carried out by the riot police. (From 19:05 till 19:13 March 17th)
- The water spray from the ground was carried out by the Self-Defense

Force using 5 fire engines. (19:35, 19:45, 19:53, 20:00 and 20:07 March 17th)

- The water spray from the ground using 6 fire engines (6 tons of water spray per engine) was carried out by the Self-Defence Force. (From before 14:00 till 14:38 March 18th)
- The water spray from the ground using a fire engine provided by the US Military was carried out. (Finished at 14:45 March 18th)
- Hyper Rescue Unit of Tokyo Fire Department carried out the water spray. (Finished at 03:40 March 20th)
- The pressure in PCV rose (320 kPa at 11:00 March 20th). Preparation to lower the pressure was carried out. Judging from the situation, immediate pressure relief was not required. Monitoring the pressure continues. (120 kPa at 12:15 March 21st)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool of Unit 3 by Hyper Rescue Unit of Tokyo Fire Department was carried out. (From 21:30 March 20th till 03:58 March 21st)
- Grayish smoke generated. (Around 15:55 March 21st)
- The smoke was confirmed to be died down. (17:55 March 21st)
- Grayish smoke changed to be whitish and seems to be ceasing. (As of 07:11 March 22nd)
- Water spray (Around 180t) by Tokyo Fire Department and Osaka City Fire Bureau was carried out. (From 15:10 till 16:00 March 22nd)
- Lighting was recovered in the Central Operation Room. (22:43 March 22nd)
- Seawater injection of 35t to the Spent Fuel Pool via the Fuel Pool Cooling Line was carried out. (From 11:03 till 13:20 March 23rd) Around 120t of seawater was injected. (From around 5:35 till around 16:05 March 24th)
- Slightly blackish smoke generated from the reactor building. (Around 16:20 March 23rd) Around 23:30 March 23rd and around 4:50 March 24th, it was reported that the smoke seemed to cease.
- As the results of the survey of the stagnant water, into which workers who were laying electric cable on the ground floor and the basement floor of the turbine building walked, the dose rate on the water surface

was around 400mSv/h, and as the result of gamma-ray analysis of the sampling water, the totaled concentration of each nuclide of the sampling water was around 3.9×10^6 Bq/cm^3.

- Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department was carried out. (From 13:28 till 16:00 March 25th)
- Fresh water injection to RPV was started. (18:02 March 25th)
- Seawater spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 12:34 till 14:36 March 27th)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water. (From 17:40 March 28th till around 8:40 March 31st)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (20:30 March 28th)
- Fresh water spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 14:17 till 18:18 March 29th)
- Fresh water spray of around 105t using Concrete Pump Truck (52m class) was carried out. (From 16:30 till 19:33 March 31st)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 09:52 till 12:54 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- The camera for monitoring the water level in the vertical part of the trench outside of the turbine building was installed. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:03 till 12:16 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:18 April 3rd)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 17:03 till 19:19 April 4th)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 06:53 till 08:53 April 7th)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 17:06 till 20:00 April 8th)

- Fresh water spray of around 80t using Concrete Pump Truck (52m class) was carried out. (From 17:15 till 19:15 April 10th)
- Due to the occurrence of earthquake, the external power supply for Units 1 and 2 was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- Because the external power supply for Units 1 and 2 was recovered (17:56 April 11th), fresh water injection to RPV was resumed. (18:04 April 11th)
- Fresh water spray of around 35t using Concrete Pump Truck (62m class) was carried out. (From 16:26 till 17:16 April 12th)
- Fresh water spray around 25t using Concrete Pump Truck (62m class) was started. (From 15:56 till 16:32 April 14th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 11:30 till 14:00 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (12:38 till 13:05 April 18th)
- Fresh water spray over the Spent Fuel Pool using Concrete Pump Truck (62m class) was started. (From 14:17 April 18th)
- White smoke was confirmed to generate continuously (As of 06:30 April 18th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 18th)

<Unit 4>

- Because of the replacement work of the Shroud of RPV, no fuel was inside the RPV.
- The temperature of water in the Spent Fuel Pool had increased. (84 ℃ at 04:08 March 14th)
- It was confirmed that a part of wall in the operation area was damaged. (06:14 March 15th)
- The fire occurred. (09:38 March 15th) TEPCO reported that the fire was extinguished spontaneously. (Around 11:00 March 15th)
- The fire occurred. (05:45 March 16th) TEPCO reported that no fire could be confirmed on the ground.(Around 06:15 March 16th)
- The Self-Defence Force started water spray over the Spent Fuel

Pool.(09:43 March 20th)

- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool by Self-Defense Force was started. (From around 18:30 till 19:46 March 20th).
- Water spray over the Spent Fuel Pool by Self-Defence Force using 13 fire engines was started (From 06:37 till 08:41 March 21st).
- Works for laying electric cable to the Power Center was completed. (Around 15:00 March 21st)
- Power Center received electricity. (10:35 March 22nd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 17:17 till 20:32 March 22nd)
- Seawater spray of around 130t using Concrete Pump Truck (58m class) was carried out. (From 10:00 till 13:02 March 23rd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 14:36 till 17:30 March 24th)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 19:05 till 22:07 March 25th)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 06:05 till 10:20 March 25th)
- Seawater spray of around 125t using Concrete Pump Truck (58m class) was carried out. (From 16:55 till 19:25 March 27th)
- Lighting of Central Operation Room was recovered. (11:50 March 29th)
- Fresh water spray of around 140t using Concrete Pump Truck (58m class) was carried out. (From 14:04 till 18:33 March 30th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 08:28 till 14:14 April 1st)
- Lighting in the turbine building was partially turned on. (April 2nd)
- From 2 April, the stagnant water in the Main Building of Radioactive Waste Treatment Facilities was being transferred to the turbine building of Unit 4. As the water level in the vertical portion of the trench for Unit 3 rose from 3 April, by way of precaution, the transfer was suspended notwithstanding that the path of the water was not clear. (09:22 April 4th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 17:14 till 22:16 April 3rd)

- Fresh water spray of around 20t using Concrete Pump Truck (58m class) was carried out. (From 17:35 till 18:22 April 5th)
- Fresh water spray of around 38t using Concrete Pump Truck (58m class) was carried out. (From 18:23 till 19:40 April 7th)
- Fresh water spray of around 90t using Concrete Pump Truck (58m class) was carried out. (From 17:07 till 19:24 April 9th)
- The work for sampling water in the Spent Fuel Pool was carried out in order to grasp the conditions of the fuels that are kept in the pool. (From 12:00 till 13:04 April 12th) Nuclide analysis of radio active materials was carried out regarding the sampled water of the Spent Fuel Pool. (April 13th) As a result of nuclide analysis, 2.2×10^{2}Bq/cm^{3} of ^{131}I (Iodine), 8.8×10^{1}Bq/cm^{3} of ^{134}Cs (Caesium), 9.3×10^{1}Bq/cm^{3} of ^{137}Cs (Caesium) were detected. (April 14th)
- Fresh water spray of around 195t using Concrete Pump Truck (62m class) was carried out. (From 0:30 till 6:57 April 13th)
- Fresh water spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 14:30 till 18:29 April 15th)
- Fresh waster spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 17:39 till 21:22 April 17th)
- White smoke was confirmed to generate. (As of 06:30 April 18th)

<Units 5 and 6>

- The first unit of Emergency Diesel Generator (D/G) (B) for Unit 6 is operating and supplying electricity. Water injection to RPV and the Spent Fuel Pool through the system of Make up Water Condensate (MUWC) is being carried out.
- The second unit of Emergency Diesel Generator (D/G) (A) for Unit 6 started up. (04:22 March 19th)
- The pumps for Residual Heat Removal (RHR) (C) for Unit 5 (05:00 March 19th) and RHR (B) for Unit 6 (22:14 March 19th) started up and recovered heat removal function. It cools Spent Fuel Pool with priority. (Power supply : Emergency Diesel Generator for Unit 6) (05:00 March 19th)
- Unit 5 under cold shut down (14:30 March 20th)
- Unit 6 under cold shut down (19:27 March 20th)
- Receiving electricity reached to the transformer of starter. (19:52 March

20th)

- Power supply to Unit 5 was switched from the Emergency Diesel Generator to external power supply. (11:36 March 21st)
- Power supply to Unit 6 was switched from the Emergency Diesel Generator to external power supply. (19:17 March 22nd)
- The temporary pump for RHR Seawater System (RHRS) of Unit 5 was automatically stopped when the power supply was switched from the temporary to the permanent. (17:24 March 23rd)
- Repair of the temporary pump for RHRS of Unit 5 was completed (16:14 March 24th) and cooling was started again. (16:35 March 24th)
- Power supply for the temporary pump for RHRS of Unit 6 was switched from the temporary to the permanent. (15:38 and 15:42 March 25th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was started to be discharged through the Water Discharge Canal to the sea. (21:00 April 4th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was discharged through the Water Discharge Canal to the sea. (Unit5 from 21:00 April 4th till 12:14 April 8th (Around 950t), Unit6 from 21:00 April 4th till 18:52 April 9th (Around 373t))

<Common Spent Fuel Pool>

- It was confirmed that the water level of Spent Fuel Pool was maintained almost full at after 06:00 March 18th.
- Water spray over the Common Spent Fuel Pool was started. (From 10:37 till 15:30 March 21st)
- The power was started to be supplied (15:37 March 24th) and cooling was also started.(18:05 March 24th)
- The power supply was stopped due to short-circuiting of the end of the power supply circuit. (14:34 April 17th) Thereafter the facility inspection was carried out and the power supply was recovered. (17:30 April 17th)
- As of <u>04:30</u> April <u>18th</u>, water temperature of the pool was around <u>33</u>℃.

<Seawater and Soil Monitoring>

- As the result of nuclide analysis at around the Southern Water Discharge Canal, 7.4×10^{1}Bq/cm^{3} of ^{131}I (Iodine) (1,850.5 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected. (14:30 March 26th)

  (As the result of measurement on 29 March, it was detected as 3,355.0 times higher than the limit in water (13:55 March 29th). On the other hand, as the result of the analysis at the northern side of the Water Discharge Canal of the NPS, 4.6×10^{1}Bq/cm^{3} of ^{131}I (Iodine) (1,262.5 times higher than the limit in water) was detected. (14:10 March 29th)
- In the samples of soil collected on 21 and 22 March on the site (at 5 points) of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (23:45 March 28th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- As the result of nuclide analysis at around the Southern Water Discharge Canal, 1.8 $\times10^{2}$ Bq/cm^{3} of ^{131}I (Iodine) (4,385.0 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected (13:55 March 30th).
- The permanent monitoring posts (No.1 to 8) installed near the Site Boundary were recovered. (March 31st) They are measuring once a day.
- In the samples of soil (7 samples in total) collected on 25 March (at 4 points) and 28 March (at 3 points) on the site of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (18:30 April 6th announced by TEPCO). The concentration of the detected plutonium was, in the same as the last one (Announced on 28 March), at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- In the 3 soil samples (6 samples in total) collected on 31 March and 4 April from the soil at the 3 points on the site of Fukushima Dai-ichi NPS where the regular sampling is to be carried out, ^{238}Pu (Plutonium), ^{239}Pu

(Plutonium) and ^{240}Pu (Plutonium) were detected. (18:30 April 14th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.

<Prevention of the Spread of Contaminated Water>

- In order to prevent the outflow of the contaminated water from the exclusive port, the work for stopping water by means of large-sized sandbags was implemented around the seawall on the south side of the NPS. (From 15:00 till 16:30 April 5th)
- The silt fences to prevent the spread of the contaminated water were completed to be doubly installed at the appropriate part of the seawall on the south side of the NPS.(10:45 April 11th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary board to stop water (one of the 7 steel plates) was installed. (From 12:00 till 13:00 April 12th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary boards to stop water (2 of the 7 steel plates) was installed. (From around 8:30 till around 10:00 April 13th)
- The silt fence to prevent the spread of the contaminated water was completed to be installed in front of the Screen of Units 3 and 4. (13:50 April 13th)
- The silt fences to prevent the spread of the contaminated water were installed at the Curtain Wall and in front of the Screen of Units 1 and 2. (12:20 April 14th)
- 3 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 3 and the Inlet Screen Pump Room of Unit 4. (From 14:30 till 15:45 April 15th)
- Temporary boards to stop water (4 steel plates out of 7) were installed on the ocean-side of the Inlet Bar Screen of Unit 2. (From 9:00 till 14:15 April 15th)
- 2 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 1 and the Inlet Screen Pump Room of Unit 2 and 5 sandbags filled with Zeolite were placed between the Inlet Screen Pump

Room of Unit 2 and the Inlet Screen Pump room of Unit 3. (From 9:00 till 11:15 April 17th)

<Spray of Anti-scattering Agent>

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (From 15:00 till 16:05 April 1st)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 600 m^2 on the mountain-side of the Common Pool. (From 13:00 till 16:30 April 5th, From 12:30 till 14:30 April 6th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 680 m^2 on the mountain-side of the Common Pool. (From 11:00 till 14:00 April 8th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 550 m^2 on the mountain-side of the Common Pool. (From 13:00 till 14:00 April 10th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,200 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 11th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 700 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 12th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 400 m^2 on the mountain-side of the Common Pool. (From 11:00 till 11:30 April 13th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,600 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:30 April 14th)

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 on the mountain-side of the Common Pool. (From 11:30 till 13:00 April 15th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,800 m^2 on the mountain-side of the Surge Tank of Suppression Pool Water. (From 11:00 till 13:00 April 16th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 around the Radioactive Waste Treatment Facilities.(From 10:00 till 13:30 April 17th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1200 m^2 around the Radioactive Waste Treatment Facilities. (From 09:00 till 14:30 April 18th)

<Situation of Removal of the Rubble>

- Removal of the rubble using remote-control heavy machineries was carried out. (April 10th)
- Removal of rubble (Amounts equivalent to 6 containers) using remote-control heavy machineries was carried out. (From 11:00 till 16:10 April 13th)
- Removal of rubble (Amount equivalent to a container) using remote-control heavy machineries was carried out. (From 09:00 till 15:45 April 15th)
- Removal of rubble (Amount equivalent to 8 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 16th)
- Removal of rubble (Amount equivalent to 2 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 17th)

<Other>

- The water was confirmed to be collected in the vertical parts of the trenches (an underground structure for laying pipes, shaped like a tunnel) outside of the turbine building of Units 1 to 3. The dose rates on the water surface were 0.4 mSv/h of the Unit 1's trench and 1,000 mSv/h of the Unit 2's trench. The rate of the Unit 3's trench could not measure because of the rubble. (Around 15:30 March 27th) The collected water in the vertical part of the trench outside of the turbine building of Unit 1 was transferred to the storage tank in the Main Building of Radioactive Waste Treatment Facilities by the temporary pump. Thereafter the water level from the top of the vertical part went down from approximately -0.14m to approximately -1.14m. (From 09:20 till 11:25 March 31st)

- When removing the flange of pipes of Residual Heat Removal Seawater System outside the building of Unit 3, three subcontractor's employees were wetted by the water remaining in the pipe. However, as the result of wiping the water off, no radioactive materials were attached to their bodies. (12:03 March 29th)
- On March 28th, the stagnant water was confirmed in the Main Building of Radioactive Waste Treatment Facilities. As the result of analysis of radioactivity, the total amount of the radioactivity 1.2×10^{1} Bq/cm^3 in the controlled area and that of 2.2×10^{1} Bq/cm^3 in the non-controlled area were detected in March 29th.
- The barge (the first ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (15:42 March 31st) The transfer of fresh water from the barge (the first ship) to the Filtrate Tank was started. (15:58 April 1st) Thereafter it was suspended due to the malfunction of the hose (16:25 April 1st), but was resumed on April 2nd. (From 10:20 till 16:40 April 2nd)
- The barge (the second ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (9:10 April 2nd)
- The freshwater was transferred from the barge (the second ship) of the US armed force to the barge (the first ship). (From 09:52 till 11:15 April 3rd)
- The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged

from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps in total was carried out (19:07 April 4th) and stopped discharging to the sea using submersible pumps at 17:40 April 10th. Confirmation of the remaining water is being carried out. (Total amount of discharged water is around 9,070t.)

- The stagnant water with low-level radioactivity in the Building of Miscellaneous Solid Waste Volume Reduction Processing was discharged from the southern side of the Water Discharge Canal to the sea using 5 pumps.(From 17:20 April 6th till 18:20 April 7th)
- In order to prepare to transfer the stagnant water in the turbine buildings to the Radioactive Waste Treatment Facilities, drilling the outer walls of the turbine buildings of Units 2 to 4 was carried out. (April 7th)
- The pumping out of the water in the Radioactive Waste Treatment Facilities, which was suspended by the earthquake off the coast of Miyagi Prefecture occurred at 11:32 April 7th, was resumed. (14:30 April 8th)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 15:59 till 16:28 April 10th)
- It was confirmed that a fire occurred at the Building for Water Discharge Canal Sampling for Units 1 to 4. (Around 6:38 April 12th) It was confirmed that there were no fire and smoke as a result of the initial activity of fire fighting. (Just before 07:00 on the same day) The fire was then confirmed to be completely under control. (09:12 on the same day)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 3 and 4. (From 10:17 till 12:25 April 14th)
- Videotaping using an unmanned helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 08:02 till 09:55 April 15th)
- As a countermeasure for tsunami, the distribution boards, etc. for the pumps injecting water to the reactors of Units 1 to 3 were transferred to a hill. (From 10:19 till 17:00 April 15)

● Fukushima Dai-ni NPS (TEPCO)
(Naraha Town / Tomioka Town, Futaba County, Fukushima Prefecture.)

(1) The state of operation

Unit1 (1,100MWe): automatic shutdown, cold shut down at 17:00, March 14th

Unit2 (1,100MWe): automatic shutdown, cold shut down at 18:00, March 14th

Unit3 (1,100MWe): automatic shutdown, cold shut down at 12:15, March 12th

Unit4 (1,100MWe): automatic shutdown, cold shut down at 07:15, March 15th

(2) Major plant parameters (As of 12:00 April 18th)

	Unit	Unit 1	Unit 2	Unit 3	Unit 4
Reactor Pressure*1	MPa	0.15	0.13	0.10	0.17
Reactor water temperature	℃	25.0	24.8	34.0	28.8
Reactor water level*2	mm	9,296	10,296	7,797	8,785
Suppression pool water temperature	℃	24	24	26	29
Suppression pool pressure	kPa (abs)	104	105	110	107
Remarks		cold shutdown	cold shutdown	cold shutdown	cold shutdown

*1: Converted from reading value to absolute pressure

*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- Around 17:56 March 30th, smoke was rising from the power distribution panel on the first floor of the turbine building of Unit 1. However, when the power supply was turned off, the smoke stopped to generate. It was judged by the fire station at 19:15 that this event was caused by the malfunction of the power distribution panel and was not a fire.
- The Residual Heat Removal System (B) to cool the reactor of Unit 1 became to be able to receive power from the emergency power supply as well as the external power supply. This resulted in securing the backup power supplies (emergency power supplies) of Residual Heat Removal System (B) for all Units. (14:30 March 30th)

(4) Report concerning other incidents

- TEPCO reported to NISA the event in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (18:08 March 11th)
- TEPCO reported to NISA the events in accordance with the Article 10 regarding Units 1, 2 and 4. (18:33 March 11th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (5:22 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 2. (5:32 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 4 of Fukushima Dai-ni NPS. (6:07 March 12th)

● Onagawa NPS (Tohoku Electric Power Co. Inc.)
(Onagawa Town, Oga County and Ishinomaki City, Miyagi Prefecture)

(1) The state of operation

Unit 1 (524MWe): automatic shutdown, cold shut down at 0:58, March 12th
Unit 2 (825MWe): automatic shutdown, cold shut down at earthquake
Unit 3 (825MWe): automatic shutdown, cold shut down at 1:17, March 12th

(2) Readings of monitoring post, etc.

MP2 (Monitoring at the Northern End of Site Boundary)
Approx. 0.30 μ SV/h (16:00 April 17th) (Approx. 0.31 μ SV/h (16:00 April 16th))

(3) Report concerning other incidents

- Fire Smoke on the first basement of the Turbine Building was confirmed to be extinguished. (22:55 on March 11th)

- Tohoku Electric Power Co. reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:09 March 13th)

2. Action taken by NISA

(March 11th)

14:46 Set up of the NISA Emergency Preparedness Headquarters (Tokyo) immediately after the earthquake

15:42 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

16:36 TEPCO recognized the event (Inability of water injection of the Emergency Core Cooling System) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Units 1 and 2 of Fukushima Dai-ichi NPS. (Reported to NISA at 16:45)

18:08 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

18:33 Regarding Units 1, 2 and 4 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of Act on Special Measures Concerning Nuclear Emergency Preparedness.

19:03 The Government declared the state of nuclear emergency. (Establishment of the Government Nuclear Emergency Response Headquarters and the Local Nuclear Emergency Response Headquarters)

20:50 Fukushima Prefecture's Emergency Response Headquarters issued a direction for the residents within 2 km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate. (The population of this area is 1,864.)

21:23 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayor of Okuma Town and the Mayor of Futaba Town were issued regarding the event occurred at Fukushima Dai-ichi NPS, TEPCO, in accordance with the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear

Emergency Preparedness as follows:
- Direction for the residents within 3km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate
- Direction for the residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS to stay in-house

24:00 Vice Minister of Economy, Trade and Industry, Ikeda arrived at the Local Nuclear Emergency Response Headquarters

(March12th)

0:49 Regarding Units 1 TEPCO Fukushima Dai-ichi NPS, TEPCO recognized the event (Unusual rise of the pressure in PCV) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 01:20)

05:22 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 06:27)

05:32 Regarding Unit 2 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

05:44 Residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS shall evacuate by the Prime Minister Directive.

06:07 Regarding of Unit 4 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

06:50 In accordance with the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to control the internal pressure of PCV of Units 1 and 2 of Fukushima Dai-ichi NPS.

07:45 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayors of Hirono Town, Naraha Town , Tomioka Town and Okuma Town were issued regarding the event occurred at Fukushima Dai-ni NPS, TEPCO, pursuant to the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear

Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Fukushima Dai-ni NPS to evacuate
- Direction for the residents within 10km radius from Fukushima Dai-ni NPS to stay in-house

17:00 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

17:39 The Prime Minister directed evacuation of the residents within the 10 km radius from Fukushima Dai-ni NPS.

18:25 The Prime Minister directed evacuation of the residents within the 20km radius from Fukushima Dai-ichi NPS.

19:55 Directives from the Prime Minister was issued regarding seawater injection to Unit 1 of Fukushima Dai-ichi NPS.

20:05 Considering the Directives from the Prime Minister and pursuant to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to inject seawater to Unit 1 of Fukushima Dai-ichi NPS and so on.

20:20 At Unit 1 of Fukushima Dai-ichi NPS, seawater injection was started.

(March 13th)

05:38 TEPCO reported to NISA the event (Total loss of coolant injection function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS. Recovering efforts by TEPCO of the power source and coolant injection function and the work on venting were under way.

09:01 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

09:08 Pressure suppression and fresh water injection was started for Unit 3 of Fukushima Dai-ichi NPS.

09:20 The Pressure Vent Valve of Unit 3 of Fukushima Dai-ichi NPS was opened.

09:30 Directive was issued for the Governor of Fukushima Prefecture, the Mayors of Okuma Town, Futaba Town, Tomioka Town and Namie Town in accordance with the Act on Special Measures Concerning Nuclear Emergency Preparedness on the contents of radioactivity decontamination screening.

13:09 Tohoku Electric Power Co. reported to NISA that Onagawa NPS reached a situation specified in the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

13:12 Fresh water injection was switched to seawater injection for Unit 3 of Fukushima Dai-ichi NPS.

14:36 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 14th)

01:10 Seawater injection for Units 1 and 3 of Fukushima Dai-ichi NPS were temporarily interrupted due to the lack of seawater in pit.

03:20 Seawater injection for Unit 3 of Fukushima Dai-ichi NPS was resumed.

04:40 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

05:38 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:52 TEPCO reported to NISA the event (Unusual rise of the pressure in PCV) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS.

13:25 Regarding Unit 2 of Fukushima Dai-ichi NPS, TEPCO recognised the event (Loss of reactor cooling function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

22:13 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ni NPS.

22:35 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 15th)

00:00: The acceptance of experts from International Atomic Energy Agency (IAEA) was decided. NISA agreed to accept the offer of dispatching of the expert on NPS damage from IAEA considering the intention by Mr. Amano, Director General of IAEA. Therefore, the schedule of expert acceptance will be planned from now on according to the situation.

00:00: NISA also decided the acceptance of experts dispatched from U.S. Nuclear Regulatory Commission (NRC).

07:21 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:24 Incorporated Administration Agency, Japan Atomic Energy Agency (JAEA) reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre.

07:44 JAEA reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Science Research Institute.

08:54 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

10:30 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the directions as follows.

For Unit 4: To extinguish fire and to prevent the occurrence of re-criticality

For Unit 2: To inject water to reactor vessel promptly and to vent Drywell.

10:59 Considering the possibility of lingering situation, it was decided that the function of the Local Nuclear Emergency Response Headquarters was moved to the Fukushima Prefectural Office.

11:00 The Prime Minister directed the in-house stay area.

In-house stay was additionally directed to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS considering in-reactor situation.

16:30 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

22:00 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the following direction.

For Unit 4: To implement the water injection to the Spent Fuel Pool.

23:46 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 18th)

13:00 Ministry of Education, Culture, Sports, Science and Technology decided to reinforce the nation-wide monitoring survey in the emergency of Fukushima Dai-ichi and Dai-ni NPS.

15:55 TEPCO reported to NISA on the accidents and failure at Units 1, 2, 3 and 4 of Fukushima Dai-ichi NPS (Leakage of the radioactive materials inside of the reactor buildings to non-controlled area of radiation) pursuant to the Article 62-3 of the Nuclear Regulation Act.

16:48 Japan Atomic Power Co. reported to NISA accidents and failures in Tokai NPS (Failure of the seawater pump motor of the Emergency Diesel Generator 2C) pursuant to the Article 62-3 of the Nuclear Regulation Act.

(March 19th)

07:44 The second unit of Emergency Diesel Generator (A) for Unit 6 started up.

TEPCO reported to NISA that the pump for RHR (C) for Unit 5 started up and started to cooling Spent Fuel Storage Pool. (Power supply: Emergency Diesel Generator for Unit 6)

08:58 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 20th)

23:30 Directive from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisoma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village) was issued regarding the change of the reference value for the screening level for decontamination of radioactivity.

(March 21st)

07:45 Directive titled as "Administration of the stable Iodine" was issued from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and the heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

16:45 Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" was issued from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

17:50 Directive from the Director-general of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Gunma was issued, which direct the above-mentioned governors to issue a request to relevant businesses and people to suspend shipment of spinach, *Kakina* (a green vegetable) and raw milk for the time being.

(March 22nd)

16:00 NISA received the response (Advice) from Nuclear Safety Commission Emergency Technical Advisory Body to the request for advice made by NISA, regarding the report from TEPCO titled as "The Results of Analysis of Seawater" dated March 22nd.

(March 25th)

NISA directed orally to the TEPCO regarding the exposure of workers at the turbine building of Unit 3 of Fukushima Dai-ichi Nuclear Power Station occurred on March 24th, to review immediately and to improve its radiation control measures from the viewpoint of preventing a recurrence.

(March 28th)

Regarding the mistake in the evaluation of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, NISA directed TEPCO orally to prevent the recurrence of such a mistake.

13:50 Receiving the suggestion by the special meeting of Nuclear Safety Commission (NSC) (Stagnant water on the underground floor of the turbine building at Fukushima Dai-ichi Plant Unit 2), NISA directed TEPCO orally to add the sea water monitoring points and carry out the groundwater monitoring.

Regarding the delay in the reporting of the water confirmed outside of the turbine buildings, NISA directed TEPCO to accomplish the communication in the company on significant information in a timely manner and to report it in a timely and appropriate manner.

(March 29th)

11:16 The report was received, regarding the accident and trouble etc. in Onagawa NPS of Tohoku Electric Power Co. Inc. (the trouble of pump of component cooling water system etc. in Unit 2 and the fall of heavy oil tank for auxiliary boiler of Unit 1 by tsunami), pursuant to the Article 62-3 of the Nuclear Regulation Act and the Article 3 of the Ministerial Ordinance for the Reports related to Electricity.

In order to strengthen the system to assist the nuclear accident sufferers, the "Team to Assist the Lives of the Nuclear Accident Sufferers" headed by the Minister of Economy, Trade and Industry was established and the visits, etc. by the team to relevant cities, towns and villages were carried out.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.1 for the residents within the area from 20 km to 30 km radius.

(March 30th)

Directions as to the implementation of the emergency safety measures for the other power stations considering the accident of Fukushima Dai-ichi and Dai-ni NPSs in 2011 was issued and handed to each electric power company and the relevant organization.

(March 31st)

Regarding the break-in of the propaganda vehicle to Fukushima Dai-ni NPS on 31 March, NISA directed TEPCO orally to take the carefully thought-out measures regarding physical protection, etc.

NISA alerted TEPCO to taking the carefully though-out measures regarding radiation control for workers.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.2 for the residents within the area from 20 km to 30 km radius.

(April 1st)

NISA strictly alerted TEPCO to taking appropriate measures concerning the following three matters regarding the mistake in the result of nuclide analysis.

- Regarding the past evaluation results on nuclide analysis, all the nuclides erroneously evaluated should be identified and the re-evaluation on them should be promptly carried out.
- The causes for the erroneous evaluation should be investigated and the thorough measures for preventing the recurrence should be taken.
- Immediate notification should be done in the stage when any erroneous evaluation results, etc. are identified.

(April 2nd)

Regarding the outflow of the liquid including radioactive materials from the area around the Intake Channel of Unit 2 of Fukushima Dai-ichi NPS, NISA directed TEPCO orally to carry out nuclide analysis of the liquid sampled, to confirm whether there are other outflows from the same parts of the facilities as the one, from which the outflow was confirmed around the Unit 2, and to strengthen monitoring through sampling water at more points around the facilities concerned.

(April 4th)

On the imperative execution of the discharge to the sea as an emergency measure, NISA requested the technical advice of NSC and directed TEPCO to survey and confirm the impact of the spread of radioactive materials caused by the discharge, by ensuring continuity of the sea monitoring currently underway and enhancing it (Increase of the frequency of measuring as well as the number of monitoring points), disclose required information, as well as to enhance the strategy to minimize the discharge amount.

(April 5th)

Directions as to the implementation of advance notification and contact to the local governments with regard to taking measures related to discharge of radioactive materials from Fukushima Dai-ichi NPS, which have a possible impact on the environment, was issued.

(April 6th)

On the implementation of the nitrogen injection to PCV of Unit 1, NISA directed TEPCO on the following three points. (12:40 April 6th) ① Properly control the plant parameters, and take measures appropriately to ensure safety in response to changes in the parameters. ②Establish and implement an organizational structure and so on that will ensure the safety of the workers who will engage in the operation. ③As the possibility of leakage of the air in PCV to the outside due to the nitrogen injection cannot be ruled out, through the judicious and further enhanced monitoring, TEPCO shall survey and confirm the impact of the release and spreading of radioactive materials due to the nitrogen injection, and strive to disclose information.

(April 7th)

The Local Nuclear Emergency Response Headquarters issued the News Letter No.3 for the residents within the area from 20km to 30km radius. (April 7th)

(April 9th)

Due to the earthquake off the coast of Miyagi Prefecture occurred around 23:32 April 7th, all the Emergency Diesel Generators for Unit 1 of the Higashidori NPS of Tohoku Electric Power Co., Inc. were not workable. Considering this event, NISA issued the letters of direction titled "Regarding the Treatment of Emergency Power Generating Facilities in Terms of Safety Regulations (Directions)" to each Electricity Utility and other organizations concerned.

In accordance with the Paragraph 1, the Article 67 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the evaluation of necessity and safety, and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 10th)

In accordance with Article 67, paragraph 1 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the necessity, the evaluation of safety and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 13th)

- In accordance with paragraph 1, Article 67 of the Nuclear Regulation Act, NISA directed TEPCO to report the result of implementation on seismic safety evaluation as well as the result of consideration on the measurement of effective seismic reinforcement work, etc., regarding the buildings of Fukushima Dai-ichi NPS.
- NISA directed TEPCO to implement detailed analysis and consideration regarding the tsunami caused by the 2011 Tohoku District - off the Pacific Ocean Earthquake.
- NISA directed Tohoku Electric Power Co. Inc. to report the analysis of seismic data observed when the 2011 Earthquake off the Coast of Miyagi Prefecture occurred around 23:32 on 7 April and the assessment on seismic impact on the facilities that are important from the seismic safety viewpoints.

(April 14th)

- NISA directed TEPCO orally to strengthen the monitoring of the Sub Drain (the groundwater collected and controlled in the facilities) of Units 1 and 2, because the radioactive concentration of the water sampled on 13 April rose one digit up in comparison with the preceding result.

(April 15th)

- NISA strictly alerted TEPCO and directed it orally to prepare the measures for preventing the recurrence regarding the delay in the notification of the dismissal of Nuclear Emergency Preparedness Manager, accompanied with the personnel changes dated on 1 April, in accordance with Article 9, paragraph 5 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.
- NISA directed General Electricity Utilities and other organizations concerned to consider the measures to ensure reliability on external power supply due to the temporary loss of external power supply at NPSs, etc., caused by ground faults in part of electric power system when the earthquake off the coast of Miyagi Prefecture occurred on April 7, 2011.

< Possibility on radiation exposure (As of 15:00 April 18th) >

1. Exposure of residents

(1) Including the about 60 evacuees from Futaba Public Welfare Hospital to Nihonmatsu City Fukushima Gender Equality Centre, as the result of measurement of 133 persons at the Centre, 23 persons counted more than 13,000 cpm were decontaminated.

(2) The 35 residents transferred from Futaba Public Welfare Hospital to Kawamata Town Saiseikai Kawamata Hospital by private bus arranged by Fukushima Prefecture were judged to be not contaminated by the Prefectural Response Centre.

(3) As for the about 100 residents in Futaba Town evacuated by bus, the results of measurement for 9 of the 100 residents were as follows. The evacuees, moving outside the Prefecture (Miyagi Prefecture), were divided into two groups, which joined later to Nihonmatsu City Fukushima Gender Equality Centre.

No. of Counts	No. of Persons
18,000 cpm	1
30,000-36,000 cpm	1
40,000 cpm	1
little less than 40,000 cpm*	1
very small counts	5

*(These results were measured without shoes, though the first measurement exceeded 100,000 cpm.)

(4) The screening was started at the Off site Centre in Okuma Town from March 12th to 15th. 162 people received examination until now. At the beginning, the reference value was set at 6,000 cpm. 110 people were at the level below 6,000 cpm and 41 people were at the level of 6,000 cpm or more. When the reference value was increased to 13,000 cpm afterward, 8 people were at the level below 13,000 cpm and 3 people are at the level of 13,000 cpm or more.

The 5 out of 162 people examined were transported to hospital after being decontaminated.

(5) The Fukushima Prefecture carried out the evacuation of patients and personnel of the hospitals located within 10km area. The screening of all the members showed that 3 persons have the high counting rate. These members were transported to the secondary medical institute of exposure. As a result of the screening on 60 fire fighting personnel involved in the transportation activities, the radioactivity higher than twice of the back ground was detected on 3 members. Therefore, all the 60 members were decontaminated.

(6) Fukushima Prefecture has started the screening from 13 March. It is carried out at the evacuation sites and the 11 places (set up permanently) such as health offices. Up until April 16th, the screening was done to 156,487 people. Among them, 102 people were above the 100,000 cpm, but when measured these people again without clothes, etc., the counts decreased to 100,000 cpm and below, and there was no case which affects health.

2. Exposure of workers

As for the workers conducting operations in Fukushima Dai-ichi NPS, the total number of people who were at the level of exposure more than 100 mSv becomes 28.

For two out of the three workers who were confirmed to be at the level of exposure more than 170 mSv on March 24, the attachment of radioactive material on the skin of both legs was confirmed. As the two workers were judged to have a possibility of beta ray burn, they were transferred to the Fukushima Medical University Hospital, and after that, on March 25th, all of the three workers arrived at the National Institute of Radiological Sciences in the Chiba Prefecture. As the result of examination, the level of exposure of their legs was estimated to be from 2 to 3 Sv. The level of exposure of both legs and internal did not require medical treatment, but they decided to monitor the progress of all three workers in the hospital. All the three workers have been discharged from the hospital around the noon on 28 March. The three workers had the second medical examination at the National Institute of Radiological Sciences on 11 April, as a result, there was no problem regarding the condition of their health. The two workers who had been partially exposed to radiation on their skin of both legs were judged that any conditions of burn or red spots were not found on their skin.

At around 11:35 April 1st, a worker fell into the sea when he went on board the barge of the US Armed forces in order to adjust the hose. He was rescued immediately by other workers around without any injury and external contamination. In order to make double sure, the measurement by a whole-body counter was implemented. As a result, it was evaluated that there was no internal radionuclide contaminant on April 12th.

3. Others

(1) 4 members of Self-Defence Force who worked in Fukushima Dai-ichi NPS were injured by explosion. One member was transferred to National Institute of Radiological Sciences. After the examination, judged that there were wounds but no risk for health from the exposure, the one was released from the hospital on March 17th. No other exposure of the Self-Defence Force member was confirmed at the Ministry of Defence.

(2) As for policeman, the decontaminations of two policemen were confirmed by the National Police Agency. Nothing unusual was reported.
(3) On March 24th, examinations of thyroid gland for 66 children aged from 1 to 15 years old were carried out at the Kawamata Town public health Center. The result was at not at the level of having harmful influence.
(4) From March 26th to 27th, examinations of thyroid gland for 137 children aged from 0 to 15 years old were carried out at the Iwaki City Public Health Center. The result was not at the level of having harmful influence.
(5) From March 28th to 30th, examinations of thyroid gland for 946 children aged from 0 to 15 years old were carried out at the Kawamata Town Community Center and the Iitate Village Office. The result was not at the level of having harmful influence.

<Directive of screening levels for decontamination of radioactivity>
(1) On March 20th, the Local Nuclear Emergency Response Headquarters issued the directive to change the reference value for the screening level for decontamination of radioactivity as the following to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).
Old: 40 Bq/cm^2 measured by a gamma-ray survey meter or 6,000 cpm
New: 1 μ Sv/hour (dose rate at 10cm distance) or 100,000cpm equivalent

<Directives of administrating stable Iodine during evacuation>
(1) On March 16th, the Local Nuclear Emergency Response Headquarters issued "Directive to administer the stable Iodine during evacuation from the evacuation area (20 km radius)" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).
(2) On March 21st, the Local Nuclear Emergency Response Headquarters issued Directive titled as "Administration of the stable Iodine" to the

Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

<Situation of the injured (As of 15:00 April 18th)>

1. Injury in Unit 1 of Fukushima Dai-ichi NPS due to earthquake on 11 March
   - Two employees (slightly, have already returned to work)
   - Two employees (a cut by a broken glass by earthquake and tsunami, have already returned to work)
   - One employee (a scratch when evacuating, has already returned to work)
   - One subcontract employee (fracture in both legs, be in hospital)
   - Two died (After the earthquake, two TEPCO's employees missed and had been searched continuously. In the afternoon of March 30th, the two employees were found on the basement floor of the turbine building of Unit 4 and were confirmed dead by April 2nd.)

2. Injury due to the explosion of Unit 1 of Fukushima Dai-ichi NPS on 12 March
   - Four employees (two TEPCO's employees and two subcontractor's employees) were injured at the explosion and smoke of Unit 1 around the turbine building (non-controlled area of radiation) and were examined by Kawauchi Clinic. Two TEPCO's employees return to work again and two subcontractors' employees are under home treatment.

3. Injury due to the explosion of Unit 3 of Fukushima Dai-ichi NPS on 14 March.
   - Four TEPCO's employees (They have already returned to work.)
   - Three subcontractor's employees (They have already returned to work.)
   - Four members of Self-Defence Force (one of them was transported to National Institute of Radiological Sciences considering internal possible

exposure. The examination resulted in no internal exposure. The member was discharged from the institute on March 17th.)

4. Other injuries
   - On the earthquake on 11 March, one subcontractor's employees (a crane operator) died in Fukushima Dai-ni NPS. (It seems that the tower crane broke and the operator room was crushed and the person was hit on the head.)
   - One subcontractor's employee was transported to the hospital on March 11th. (Later, turned out a cerebral infarction)
   - One emergency patient on 12 March. (a cerebral stroke, transported by the ambulance, be in hospital)
   - Ambulance was requested for one employee complaining the pain at left chest outside of control area on March 12. (Conscious, under home treatment)
   - One employee suffered lacerations on his left arm and was transported to the hospital for treatment on March 12th. (Has already returned to work)
   - Two employees complaining discomfort wearing full-face mask in the main control room were transported to Fukushima Dai-ni NPS for a consultation with an industrial doctor on 13 March. (One employee has already returned to work and the other is under home treatment.)
   - Two subcontractor's employees were injured during working at temporary control panel of power source in the Common Spent Fuel Pool, transported to where were industrial medical doctors the Fukushima Dai-ni NPS on 22 and 23 March. (One employee has already returned to work and the other is under home treatment.)
   - On the afternoon of 7 April, a worker who was making sandbags at the soil disposal yard (spoil bank) on the north side of Fukushima Dai-ichi NPS got sick and was transported to J-Village for the body survey of contamination of radioactive materials. Being confirmed to be free from contamination, the worker was taken to the Iwaki City Kyouritsu Hospital by ambulance. On 8 April, the worker was diagnosed as dehydration and transient unconsciousness.
   - At 09:19 April 9th, one subcontractor's employee was transported to a hospital as the worker wearing full-face mask felt discomfort during the

work for cable processing in the Building of Water Processing, stepped on the manhole outside the building, which lid was shifted, and injured. As a result of medical examination, the worker was diagnosed as a right knee contusion and suspect of right knee medial collateral ligament injury. Furthermore, as a result of the body survey, it was confirmed that the worker was free from contamination of radioactive materials.

- Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body

<Situation of resident evacuation (As of 15:00 April 18th)>

At 11:00 March 15th, the Prime Minister directed in-house stay to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS. The directive was conveyed to Fukushima Prefecture and related municipalities.

Regarding the evacuation as far as 20-km from Fukushima Dai-ichi NPS and 10-km from Fukushima Dai-ni NPS, necessary measures have already been taken.

- The in-house stay in the area from 20 km to 30 km from Fukushima Dai-ichi NPS is made fully known to the residents concerned.
- Cooperating with Fukushima Prefecture, livelihood support to the residents in the in-house stay area are implemented.
- On March 28th, Chief Cabinet Secretary mentioned the continuation of the limited-access within the area of 20 km from Fukushima Dai-ichi NPS. On the same day, the Local Nuclear Emergency Response Headquarters notified the related municipalities of forbidding entry to the evacuation area within the 20 km zone.

<Directives regarding foods and drinks>

Directive from the Director-General of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Chiba was issued, which directed above-mentioned governors to suspend shipment and so on of the following products for the time being.

The Government Nuclear Emergency Response Headquarters organized the thoughts of imposing and lifting restrictions on shipment as follows, considering the NSC's advice.

- The area where restrictions on shipment to be imposed or lifted could be decided in units of the area where a prefecture is divided into, such as cities, towns, villages and so on, considering the spread of the contamination affected area and the actual situation of produce collection, etc.
- The restriction on shipment of the item, of which the result of the sample test exceeded the provisional regulation limits, shall be decided by judging in a comprehensive manner considering the regional spread of the contamination impact.
- Lifting the restrictions on shipment shall be implemented when a series of three results of nearly weekly tests for the item or the area falls below the provisional regulation limits, considering the situation of the Fukushima Dai-ichi NPS.
- However, the tests shall be carried out nearly weekly after the lifting, while the release of the radioactive materials from the NPS continues.

(1) Items under the suspension of shipment and restriction of intake (As of 15:00 April 18th)

Prefectures	Suspension of shipment	Restriction of intake
Fukushima Prefecture	Non-head type leafy vegetables, head type leafy vegetables , flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna**, Rape, *Chijirena*, *Santouna**, *Kousaitai**, *Kakina**, *etc.*), Turnip, Raw milk (Except some areas**) and Shiitake (only ones grown on raw	Non-head type leafy vegetables, head type leafy vegetables, flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna*, Rape, *Chijirena*, *Santouna**, *Kousaitai**, *Kakina**, *etc.*) , Shiitake (only ones grown on raw lumber in an open field of Iitate-Village)

	lumber in an open field of Date-City, Souma-City, Minamisouma-City, Tamura-City, Iwaki-City, Sinchi-Town, Kawamata-Town, Namie-Town, Futaba-Town, Ookuma-Town, Tomioka-Town, Naraha-Town, Hirono-Town, Iitate-Village, Katsurao-Village and Kawauchi-Village)	
Ibaraki Pref.	Spinach (only ones produced in Kitaibaraki City and Takahagi City)	
Tochigi Pref.	Spinach	
Chiba Pref.	- Spinach from Katori-City and Tako-Town - Spinach, Qing-geng-cai, Garland chrysanthemum, Sanchu Asian lettuce, Celery and Parsley from Asahi City	

*a green vegetable

**Kitakata-City, Bandai-Town, Inawashiro-Town, Mishima-Town, Aizumisato-Town, Shimogo-Town, Minamiaizu-Town, Fukushima-City, Nihonmatsu-City, Date-City, Motomiya-City, Koriyama-City, Sukagawa-City, Tamura-City (except former Miyakoji-Village area), Shirakawa-City, Iwaki-City, Kunimi-Town, Kagami-ishi-Town, Ishikawa-Town, Asakawa-Town, Furudono-Town, Miharu-Town, Ono-Town, Yabuki-Town, Yamatsuri-Town, Hanawa-Town, Otama-Village, Hirata-Village, Nishigo-Village, Izumizaki-Village, Nakajima-Village, Samegawa-Village

(2) Request for restriction of drinking for tap-water (As of 15:00 April_18th)

Scope under restriction	Water service (Local governments requested for restriction)
All residents	None
Babies ・Water services that continue to respond to the directive	<Fukushima Prefecture> Iitate small water service (Iitate Village, Fukushima Prefecture)
・Tap-water supply service that continues to respond to the directive	None

<Directive regarding the ventilation when using heating equipments in the aria of indoor evacuation >

On March 21st, Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Iwaki City, Tamura City, Minamisouma City, Hirono Town, Kawauchi Village, Namie Town, Katsurao Village, and Iitate Village) was issued, which directs those governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

< Fire Bureaus' Activities>

- From 11:00 till around 14:00 on March 22nd, Niigata-City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the set up of large decontamination system.
- From 8:30 till 9:30, from 13:30 till 14:30 on March 23rd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the operation of large decontamination system.

News Release

経済産業省
Ministry of Economy, Trade and Industry

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News Release

経済産業省
Ministry of Economy, Trade and Industry

April 19, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 101st Release)
(As of 08:00 April 19th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)
   - Fukushima Dai-ichi NPS
     - Fresh water spray of around 30t for Unit 3 using Concrete Pump Truck (62m class) was carried out. (From 14:17 till 15:02 April 18th)
     - Removal of the rubble (Amounts equivalent to 4 containers) using remote-control heavy machineries was carried out. (From 09:00 till 16:00 April 18th)
     - The watertight measures in the buildings of the Radioactive Waste Treatment Facilities were completed. (April 18th)

2. Action taken by NISA
   NISA accepted (18 April) and confirmed (19 April) the report from TEPCO, in accordance with the direction for the collection of report issued on 10 April, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

<Directives regarding foods and drinks>
- Items under the suspension of shipment and restriction of intake were updated. (As 08:00 April 19th)

QQQ1325

(Attached sheet)

1. The state of operation at NPS (Number of automatic shutdown units: 10)

- Fukushima Dai-ichi NPS, TEPCO
  (Okuma Town and FutabaTown, Futaba County, Fukushima Prefecture)

(1) The state of operation

Unit 1 (460MWe):	automatic shutdown
Unit 2 (784MWe):	automatic shutdown
Unit 3 (784MWe):	automatic shutdown
Unit 4 (784MWe):	in periodic inspection outage
Unit 5 (784MWe):	in periodic inspection outage, cold shutdown at 14:30 March 20th
Unit 6 (1,100MWe):	in periodic inspection outage, cold shutdown at 19:27 March 20th

(2) Major Plant Parameters (As of 07:00 April 19th)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure*1 [MPa]	0.524(A) 1.141(B)	0.081(A) 0.072(D)	0.067(A) 0.016(C)	–	0.108	0.111
CV Pressure (D/W) [kPa]	170	85	104.1	–	–	–
Reactor Water Level*2 [mm]	-1,600(A) -1,650(B)	-1,500(A) -2,100 (B)	-1,800(A) -2,250(B)	–	1,682	2,090
Suppression Pool Water Temperature (S/C) [℃]	53.3(A) 53.2B)	74.5(A) 74.8(B)	43.4(A) 43.3(B)	–	–	–
Suppression Pool Pressure (S/C) [kPa]	170	Indicator Failure	172.4	–	–	–
Spent Fuel Pool Water Temperature [℃]	Indicator Failure	50.0	Indicator Failure	Indicator Failure	36.8	25.0
Time of Measurement	06:00 April 19th	06:00 April 19th	06:00 April 19th	April 19th	07:00 April 19th	07:00 April 19th

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (10:17 March 12th)
- Seawater injection to the Reactor Pressure Vessel (RPV) via the Fire Extinguish Line was started. (20:20 March 12th)
  →Temporary interruption of the injection (01:10 March 14th)
- The sound of explosion in Unit 1 occurred. (15:36 March 12th)
- The amount of injected water to the Reactor Core was increased by utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$). (02:33 March 23rd) Later, it was switched to the Feedwater Line only (around $11m^3/h$). (09:00 March 23rd)
- Lighting in the Central Operation Room was recovered. (11:30 March 24th)
- Fresh water injection to RPV was started. (15:37 March 25)
- As the result of concentration measurement in the stagnant water on the basement floor of the turbine building, $2.1 \times 10^5 Bq/cm^3$ of ^{131}I (Iodine) and $1.8 \times 10^6 Bq/cm^3$ of ^{137}Cs (Caesium) were detected as major radioactive nuclides.
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (08:32 March 29th.)
- The Stagnant water on the basement floor of the turbine building was started to be transferred to the Condenser around 17:00 March 24. As the Condenser was confirmed to be almost filled with water, pumping out of the water to the Condenser was stopped. (07:30 March 29th) In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank started to be transferred to the Surge Tank of Suppression Pool Water (A) (12:00 March 31th), after switching the place where the water was to be transferred to the Surge Tank of Suppression Pool Water (B) (15:25 March 31th), the transfer was

resumed and finished. (15:26 April 2nd)

- Water spray of around 90t (fresh water) over the Spent Fuel Pool using Concrete Pump Truck (62m class) was carried out. (From 13:03 till 16:04 March 31st) A test water spray using Concrete Pump Truck (62m class) was carried out in order to confirm the appropriate position for water spray. (From 17:16 till 17:19 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (10:42 to 11:52 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:02 April 3rd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (13:55 April 3rd)
- Aiming at reducing the possibility of hydrogen combustion in the Primary Containment Vessel (PCV), the operations for the injection of nitrogen to PCV were started. (22:30 April 6th)
- The start of nitrogen injection to PCV was confirmed. (01:31 April 7th)
- The nitrogen injection to PCV was switched to the generator of high purity nitrogen. (04:10 April 9th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (09:30 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost and the fresh water injection to RPV and the nitrogen injection to PVC were suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The nitrogen injection to PCV was started. (23:34 April 11th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 16:00 till 17:30 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 11:50 till 12:12 April 18th)

- White smoke was not confirmed to generate. (As of 06:30 April 19th)
- Fresh water injection to RPV is being carried out. (As of 08:00 April 19th)

<Unit 2>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (11:00 March 13th)
- The Blow-out Panel of reactor building was opened due to the explosion in the reactor building of Unit 3. (After 11:00 March 14th)
- Reactor water level tended to decrease. (13:18 March 14th) TEPCO reported to NISA the event (Loss of reactor cooling functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:49 March 14th)
- Seawater injection to RPV via the Fire Extinguish line was started. (16:34 March 14th)
- Water level in RPV tended to decrease. (22:50 March 14th)
- Started to vent (0:02 March 15th)
- A sound of explosion was made in Unit 2. As the pressure in Suppression Pool (Suppression Chamber) decreased (06:10 March 15th), there was a possibility that an incident occurred in the Chamber. (About 06:20 March 15th)
- Electric power receiving at the emergency power source transformer from the external transmission line was completed. The work for laying the electric cable from the facility to the load side was carried out. (13:30 March 19th)
- Seawater injection of 40t to the Spent Fuel Pool was started. (From 15:05 till 17:20 March 20th)
- Power Center received electricity (15:46 March 20th)
- White smoke generated. (18:22 March 21st)
- White smoke was died down and almost invisible. (As of 07:11 March 22nd)
- Seawater injection of 18t to the Spent Fuel Pool was carried out. (From 16:07 till 17:01 March 22nd)

- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:30 till 12:19 March 25th)
- Fresh water injection to RPV was started. (10:10 March 26th)
- Lighting of Central Operation Room was recovered (16:46 March26th)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump.(18:31 March 27th)
- Regarding the result of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, TEPCO reported to NISA that as the result of analysis and evaluation through re-sampling, judging the measured value of ^{134}I (Iodine) was wrong, the concentrations of gamma nuclides including ^{134}I (Iodine) were less than the detection limit. (00:07 March 28).
- Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump. (From 16:30 till 18:25 March 29th)
- As the malfunction of the temporary motor-driven pump, which had been injecting to the Spent Fuel Pool since 09:25 March 30th, was confirmed at 09:45 March 30th, the injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. Fresh water injection was resumed. (From 19:05 till 23:50 March 30th)
- Fresh water injection of around 70t to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 14:56 till 17:05 April 1st)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank was transferred to the Surge Tank of Suppression Pool Water. (From 16:45 March 29th till 11:50 April 1st)
- The water, of which the dose rate was at the level of more than 1,000 mSv/h, was confirmed to be collected in the pit (a vertical portion of an underground structure) for laying electric cables, located near the Intake Channel. In addition, the outflow from the crack with a length of around 20 cm in the concrete portion of the lateral surface of the pit into the sea was confirmed. (Around 09:30 April 2nd) In order to stop the

outflow, concrete was poured into the pit. (16:25, 19:02 April 2nd)

- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (17:10 April 2nd)
- The cameras for monitoring the water levels in the vertical part of the trench outside of the turbine building and on the basement floor of the turbine building were installed. (April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:22 till 12:06 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- As the measure to prevent the outflow of the water accumulated in the Pits for Conduit in the area around the Inlet Bar Screen, the upper part of the Power Cable Trench for power source at Intake Channel was crushed and 20 bags of sawdust (3 kg/bag), 80 bags of high polymer absorbent (100 g/bag) and 3 bags of cutting-processed newspaper (Large garbage bag) were put inside. (From 13:47 till 14:30 April 3rd)
- Approximately 13kg of tracer (milk white bath agent) was put in from the Pit for the Duct for Seawater Pipe. (From 07:08 till 07:11 April 4th)
- Fresh water injection (Around 70t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 11:05 till 13:37 April 4th)
- The tracer solution was put in from the two holes dug around the Pit for the Conduit near the Inlet Bar Screen of Unit 2 and was confirmed to be flowed out from the crack to the sea. (14:15 April 5th) The coagulant (soluble glass) started to be injected from the holes around the Pit in order to prevent the outflow of the water. (15:07 April 5th) The outflow of the water was confirmed to stop. (Around 05:38 April 6th) In addition, it was confirmed that the water level in the turbine building did not rise. Furthermore, the measurements to stop water by means of rubber board and jig (prop) were implemented at the outflowing point. (Finished at 13: 15 April 6th)

- One more pump for the transfer of the water in the Condenser to the Condensate Storage Tank was installed. (Two pumps in total: 30 m^3/h) (Around 15:40 April 5th)
- Fresh water injection (Around 36t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 13:39 till 14:34 April 7th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (13:10 April 9th)
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:37 till 12:38 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The stagnant water in the trench of the turbine building was started to be transferred to the Hot Well of the Condenser using a submersible pump (19:35 April 12th) Thereafter it was confirmed that no leakage was found, the transfer of stagnant water resumed from 15:02 April 13th and was stopped 17:04 April 13th. The amount of transfer was about 660t.
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Cooling Line was carried out. (From 13:15 till 14:55 April 13th)
- Fresh water injection (Around 45t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:13 till 11:54 April 16th. Due to the occurrence of earthquake at around 11:19, the temporary motor-driven pump was stopped at 11:39. The Spent Fuel Pool was confirmed to be filled with water by the increase of Skimmer Level at 11:54.)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 12:13 till 12:37 April 18th)
- Confirmation of situations, etc. using an unmanned robot at the reactor building was carried out. (From 13:42 till 14:33 April 18th)
- White smoke was confirmed to generate continuously. (As of 06:30 April 19th)

- Fresh water injection to RPV is being carried out. (As of 08:00 April 19th)

<Unit 3>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (05:10 March 13th)
- Started to vent (08:41 March 13th)
- Fresh water started to be injected to RPV via the Fire Extinguish Line. (11:55 March 13th)
- Seawater started to be injected to RPV via the Fire Extinguish Line. (13:12 March 13th)
- Seawater injection for Units 1 and 3 was suspended due to the lack of seawater in pit. (01:10 March 14th)
- Seawater injection to RPV for Unit 3 was resumed. (03:20 March 14th)
- Started to vent. (05:20 March 14th)
- PCV rose unusually. (07:44 March 14th) TEPCO reported to NISA on the event falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (7:52 March 14th)
- The explosion like Unit 1 occurred around the reactor building (11:01 March 14th)
- The white smoke like steam generated. (08:30 March 16th)
- Because of the possibility that PCV was damaged, the workers evacuated from the main control room (common control room). (10:45 March 16th) Thereafter the operators returned to the room and resumed the operation of water injection. (11:30 March 16th)
- Seawater was discharged 4 times to Unit 3 by the helicopters of the Self-Defence Force. (9:48, 9:52, 9:58 and 10:01 March 17th)
- The riot police arrived at the site for the water spray from the grand. (16:10 March 17th)
- The Self-Defence Force started the water spray using a fire engine. (19:35 March 17th)
- The water spray from the ground was carried out by the riot police. (From 19:05 till 19:13 March 17th)
- The water spray from the ground was carried out by the Self-Defense

Force using 5 fire engines. (19:35, 19:45, 19:53, 20:00 and 20:07 March 17th)

- The water spray from the ground using 6 fire engines (6 tons of water spray per engine) was carried out by the Self-Defence Force. (From before 14:00 till 14:38 March 18th)
- The water spray from the ground using a fire engine provided by the US Military was carried out. (Finished at 14:45 March 18th)
- Hyper Rescue Unit of Tokyo Fire Department carried out the water spray. (Finished at 03:40 March 20th)
- The pressure in PCV rose (320 kPa at 11:00 March 20th). Preparation to lower the pressure was carried out. Judging from the situation, immediate pressure relief was not required. Monitoring the pressure continues. (120 kPa at 12:15 March 21st)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool of Unit 3 by Hyper Rescue Unit of Tokyo Fire Department was carried out. (From 21:30 March 20th till 03:58 March 21st)
- Grayish smoke generated. (Around 15:55 March 21st)
- The smoke was confirmed to be died down. (17:55 March 21st)
- Grayish smoke changed to be whitish and seems to be ceasing. (As of 07:11 March 22nd)
- Water spray (Around 180t) by Tokyo Fire Department and Osaka City Fire Bureau was carried out. (From 15:10 till 16:00 March 22nd)
- Lighting was recovered in the Central Operation Room. (22:43 March 22nd)
- Seawater injection of 35t to the Spent Fuel Pool via the Fuel Pool Cooling Line was carried out. (From 11:03 till 13:20 March 23rd) Around 120t of seawater was injected. (From around 5:35 till around 16:05 March 24th)
- Slightly blackish smoke generated from the reactor building. (Around 16:20 March 23rd) Around 23:30 March 23rd and around 4:50 March 24th, it was reported that the smoke seemed to cease.
- As the results of the survey of the stagnant water, into which workers who were laying electric cable on the ground floor and the basement floor of the turbine building walked, the dose rate on the water surface

was around 400mSv/h, and as the result of gamma-ray analysis of the sampling water, the totaled concentration of each nuclide of the sampling water was around 3.9×10^{6} Bq/cm^{3}.

- Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department was carried out. (From 13:28 till 16:00 March 25th)
- Fresh water injection to RPV was started. (18:02 March 25th)
- Seawater spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 12:34 till 14:36 March 27th)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water. (From 17:40 March 28th till around 8:40 March 31st)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (20:30 March 28th)
- Fresh water spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 14:17 till 18:18 March 29th)
- Fresh water spray of around 105t using Concrete Pump Truck (52m class) was carried out. (From 16:30 till 19:33 March 31st)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 09:52 till 12:54 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- The camera for monitoring the water level in the vertical part of the trench outside of the turbine building was installed. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:03 till 12:16 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:18 April 3rd)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 17:03 till 19:19 April 4th)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 06:53 till 08:53 April 7th)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 17:06 till 20:00 April 8th)

- Fresh water spray of around 80t using Concrete Pump Truck (52m class) was carried out. (From 17:15 till 19:15 April 10th)
- Due to the occurrence of earthquake, the external power supply for Units 1 and 2 was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- Because the external power supply for Units 1 and 2 was recovered (17:56 April 11th), fresh water injection to RPV was resumed. (18:04 April 11th)
- Fresh water spray of around 35t using Concrete Pump Truck (62m class) was carried out. (From 16:26 till 17:16 April 12th)
- Fresh water spray around 25t using Concrete Pump Truck (62m class) was started. (From 15:56 till 16:32 April 14th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 11:30 till 14:00 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (12:38 till 13:05 April 18th)
- Fresh water spray of around 30t over the Spent Fuel Pool using Concrete Pump Truck (62m class) was started. (From 14:17 till 15:02 April 18th)
- White smoke was confirmed to generate continuously (As of 06:30 April 19th)
- Fresh water injection to RPV is being carried out. (As of 08:00 April 19th)

<Unit 4>

- Because of the replacement work of the Shroud of RPV, no fuel was inside the RPV.
- The temperature of water in the Spent Fuel Pool had increased. (84 ℃ at 04:08 March 14th)
- It was confirmed that a part of wall in the operation area was damaged. (06:14 March 15th)
- The fire occurred. (09:38 March 15th) TEPCO reported that the fire was extinguished spontaneously. (Around 11:00 March 15th)
- The fire occurred. (05:45 March 16th) TEPCO reported that no fire could be confirmed on the ground.(Around 06:15 March 16th)

- The Self-Defence Force started water spray over the Spent Fuel Pool.(09:43 March 20th)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool by Self-Defense Force was started. (From around 18:30 till 19:46 March 20th).
- Water spray over the Spent Fuel Pool by Self-Defence Force using 13 fire engines was started (From 06:37 till 08:41 March 21st).
- Works for laying electric cable to the Power Center was completed. (Around 15:00 March 21st)
- Power Center received electricity. (10:35 March 22nd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 17:17 till 20:32 March 22nd)
- Seawater spray of around 130t using Concrete Pump Truck (58m class) was carried out. (From 10:00 till 13:02 March 23rd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 14:36 till 17:30 March 24th)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 19:05 till 22:07 March 25th)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 06:05 till 10:20 March 25th)
- Seawater spray of around 125t using Concrete Pump Truck (58m class) was carried out. (From 16:55 till 19:25 March 27th)
- Lighting of Central Operation Room was recovered. (11:50 March 29th)
- Fresh water spray of around 140t using Concrete Pump Truck (58m class) was carried out. (From 14:04 till 18:33 March 30th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 08:28 till 14:14 April 1st)
- Lighting in the turbine building was partially turned on. (April 2nd)
- From 2 April, the stagnant water in the Main Building of Radioactive Waste Treatment Facilities was being transferred to the turbine building of Unit 4. As the water level in the vertical portion of the trench for Unit 3 rose from 3 April, by way of precaution, the transfer was suspended notwithstanding that the path of the water was not clear. (09:22 April 4th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m

class) was carried out. (From 17:14 till 22:16 April 3rd)

- Fresh water spray of around 20t using Concrete Pump Truck (58m class) was carried out. (From 17:35 till 18:22 April 5th)
- Fresh water spray of around 38t using Concrete Pump Truck (58m class) was carried out. (From 18:23 till 19:40 April 7th)
- Fresh water spray of around 90t using Concrete Pump Truck (58m class) was carried out. (From 17:07 till 19:24 April 9th)
- The work for sampling water in the Spent Fuel Pool was carried out in order to grasp the conditions of the fuels that are kept in the pool. (From 12:00 till 13:04 April 12th) Nuclide analysis of radio active materials was carried out regarding the sampled water of the Spent Fuel Pool. (April 13th) As a result of nuclide analysis, 2.2×10^{2}Bq/cm^{3} of ^{131}I (Iodine), 8.8×10^{1}Bq/cm^{3} of ^{134}Cs (Caesium), 9.3×10^{1}Bq/cm^{3} of ^{137}Cs (Caesium) were detected. (April 14th)
- Fresh water spray of around 195t using Concrete Pump Truck (62m class) was carried out. (From 0:30 till 6:57 April 13th)
- Fresh water spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 14:30 till 18:29 April 15th)
- Fresh waster spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 17:39 till 21:22 April 17th)
- White smoke was confirmed to generate. (As of 06:30 April 19th)

<Units 5 and 6>

- The first unit of Emergency Diesel Generator (D/G) (B) for Unit 6 is operating and supplying electricity. Water injection to RPV and the Spent Fuel Pool through the system of Make up Water Condensate (MUWC) is being carried out.
- The second unit of Emergency Diesel Generator (D/G) (A) for Unit 6 started up. (04:22 March 19th)
- The pumps for Residual Heat Removal (RHR) (C) for Unit 5 (05:00 March 19th) and RHR (B) for Unit 6 (22:14 March 19th) started up and recovered heat removal function. It cools Spent Fuel Pool with priority. (Power supply : Emergency Diesel Generator for Unit 6) (05:00 March 19th)
- Unit 5 under cold shut down (14:30 March 20th)
- Unit 6 under cold shut down (19:27 March 20th)

- Receiving electricity reached to the transformer of starter. (19:52 March 20th)
- Power supply to Unit 5 was switched from the Emergency Diesel Generator to external power supply. (11:36 March 21st)
- Power supply to Unit 6 was switched from the Emergency Diesel Generator to external power supply. (19:17 March 22nd)
- The temporary pump for RHR Seawater System (RHRS) of Unit 5 was automatically stopped when the power supply was switched from the temporary to the permanent. (17:24 March 23rd)
- Repair of the temporary pump for RHRS of Unit 5 was completed (16:14 March 24th) and cooling was started again. (16:35 March 24th)
- Power supply for the temporary pump for RHRS of Unit 6 was switched from the temporary to the permanent. (15:38 and 15:42 March 25th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was started to be discharged through the Water Discharge Canal to the sea. (21:00 April 4th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was discharged through the Water Discharge Canal to the sea. (Unit5 from 21:00 April 4th till 12:14 April 8th (Around 950t), Unit6 from 21:00 April 4th till 18:52 April 9th (Around 373t))

<Common Spent Fuel Pool>

- It was confirmed that the water level of Spent Fuel Pool was maintained almost full at after 06:00 March 18th.
- Water spray over the Common Spent Fuel Pool was started. (From 10:37 till 15:30 March 21st)
- The power was started to be supplied (15:37 March 24th) and cooling was also started.(18:05 March 24th)
- The power supply was stopped due to short-circuiting of the end of the power supply circuit. (14:34 April 17th) Thereafter the facility inspection was carried out and the power supply was recovered. (17:30 April 17th)
- As of <u>04:30</u> April <u>18th</u>, water temperature of the pool was around <u>33</u>℃.

<Seawater and Soil Monitoring>

- As the result of nuclide analysis at around the Southern Water Discharge Canal, 7.4×10^{1}Bq/cm^{3} of ^{131}I (Iodine) (1,850.5 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected. (14:30 March 26th)
  (As the result of measurement on 29 March, it was detected as 3,355.0 times higher than the limit in water (13:55 March 29th). On the other hand, as the result of the analysis at the northern side of the Water Discharge Canal of the NPS, 4.6×10^{1}Bq/cm^{3} of ^{131}I (Iodine) (1,262.5 times higher than the limit in water) was detected. (14:10 March 29th)
- In the samples of soil collected on 21 and 22 March on the site (at 5 points) of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (23:45 March 28th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- As the result of nuclide analysis at around the Southern Water Discharge Canal, 1.8×10^{2} Bq/cm^{3} of ^{131}I (Iodine) (4,385.0 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected (13:55 March 30th).
- The permanent monitoring posts (No.1 to 8) installed near the Site Boundary were recovered. (March 31st) They are measuring once a day.
- In the samples of soil (7 samples in total) collected on 25 March (at 4 points) and 28 March (at 3 points) on the site of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (18:30 April 6th announced by TEPCO). The concentration of the detected plutonium was, in the same as the last one (Announced on 28 March), at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- In the 3 soil samples (6 samples in total) collected on 31 March and 4 April from the soil at the 3 points on the site of Fukushima Dai-ichi NPS

where the regular sampling is to be carried out, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected. (18:30 April 14th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.

<Prevention of the Spread of Contaminated Water>

- In order to prevent the outflow of the contaminated water from the exclusive port, the work for stopping water by means of large-sized sandbags was implemented around the seawall on the south side of the NPS. (From 15:00 till 16:30 April 5th)
- The silt fences to prevent the spread of the contaminated water were completed to be doubly installed at the appropriate part of the seawall on the south side of the NPS.(10:45 April 11th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary board to stop water (one of the 7 steel plates) was installed. (From 12:00 till 13:00 April 12th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary boards to stop water (2 of the 7 steel plates) was installed. (From around 8:30 till around 10:00 April 13th)
- The silt fence to prevent the spread of the contaminated water was completed to be installed in front of the Screen of Units 3 and 4. (13:50 April 13th)
- The silt fences to prevent the spread of the contaminated water were installed at the Curtain Wall and in front of the Screen of Units 1 and 2. (12:20 April 14th)
- 3 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 3 and the Inlet Screen Pump Room of Unit 4. (From 14:30 till 15:45 April 15th)
- Temporary boards to stop water (4 steel plates out of 7) were installed on the ocean-side of the Inlet Bar Screen of Unit 2. (From 9:00 till 14:15 April 15th)
- 2 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 1 and the Inlet Screen Pump Room of Unit 2 and 5

sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 2 and the Inlet Screen Pump room of Unit 3. (From 9:00 till 11:15 April 17th)

<Spray of Anti-scattering Agent>

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (From 15:00 till 16:05 April 1st)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 600 m^2 on the mountain-side of the Common Pool. (From 13:00 till 16:30 April 5th, From 12:30 till 14:30 April 6th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 680 m^2 on the mountain-side of the Common Pool. (From 11:00 till 14:00 April 8th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 550 m^2 on the mountain-side of the Common Pool. (From 13:00 till 14:00 April 10th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,200 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 11th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 700 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 12th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 400 m^2 on the mountain-side of the Common Pool. (From 11:00 till 11:30 April 13th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,600 m^2 on the mountain-side of the Common Pool.

(From 12:00 till 13:30 April 14th)

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 on the mountain-side of the Common Pool. (From 11:30 till 13:00 April 15th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,800 m^2 on the mountain-side of the Surge Tank of Suppression Pool Water. (From 11:00 till 13:00 April 16th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 around the Radioactive Waste Treatment Facilities.(From 10:00 till 13:30 April 17th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1200 m^2 around the Radioactive Waste Treatment Facilities. (From 09:00 till 14:30 April 18th)

<Situation of Removal of the Rubble>

- Removal of the rubble using remote-control heavy machineries was carried out. (April 10th)
- Removal of rubble (Amounts equivalent to 6 containers) using remote-control heavy machineries was carried out. (From 11:00 till 16:10 April 13th)
- Removal of rubble (Amount equivalent to a container) using remote-control heavy machineries was carried out. (From 09:00 till 15:45 April 15th)
- Removal of rubble (Amount equivalent to 8 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 16th)
- Removal of rubble (Amount equivalent to 2 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 17th)
- Removal of rubble (Amount equivalent to 4 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 18th)

<Other>

- The water was confirmed to be collected in the vertical parts of the trenches (an underground structure for laying pipes, shaped like a tunnel) outside of the turbine building of Units 1 to 3. The dose rates on the water surface were 0.4 mSv/h of the Unit 1's trench and 1,000 mSv/h of the Unit 2's trench. The rate of the Unit 3's trench could not measure because of the rubble. (Around 15:30 March 27th) The collected water in the vertical part of the trench outside of the turbine building of Unit 1 was transferred to the storage tank in the Main Building of Radioactive Waste Treatment Facilities by the temporary pump. Thereafter the water level from the top of the vertical part went down from approximately -0.14m to approximately -1.14m. (From 09:20 till 11:25 March 31st)
- When removing the flange of pipes of Residual Heat Removal Seawater System outside the building of Unit 3, three subcontractor's employees were wetted by the water remaining in the pipe. However, as the result of wiping the water off, no radioactive materials were attached to their bodies. (12:03 March 29th)
- On March 28th, the stagnant water was confirmed in the Main Building of Radioactive Waste Treatment Facilities. As the result of analysis of radioactivity, the total amount of the radioactivity 1.2×10^{1} Bq/cm^3 in the controlled area and that of 2.2×10^{1} Bq/cm^3 in the non-controlled area were detected in March 29th.
- The barge (the first ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (15:42 March 31st) The transfer of fresh water from the barge (the first ship) to the Filtrate Tank was started. (15:58 April 1st) Thereafter it was suspended due to the malfunction of the hose (16:25 April 1st), but was resumed on April 2nd. (From 10:20 till 16:40 April 2nd)
- The barge (the second ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (9:10 April 2nd)
- The freshwater was transferred from the barge (the second ship) of the

US armed force to the barge (the first ship). (From 09:52 till 11:15 April 3rd)

- The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps in total was carried out (19:07 April 4th) and stopped discharging to the sea using submersible pumps at 17:40 April 10th. Confirmation of the remaining water is being carried out. (Total amount of discharged water is around 9,070t.)
- The stagnant water with low-level radioactivity in the Building of Miscellaneous Solid Waste Volume Reduction Processing was discharged from the southern side of the Water Discharge Canal to the sea using 5 pumps.(From 17:20 April 6th till 18:20 April 7th)
- In order to prepare to transfer the stagnant water in the turbine buildings to the Radioactive Waste Treatment Facilities, drilling the outer walls of the turbine buildings of Units 2 to 4 was carried out. (April 7th)
- The pumping out of the water in the Radioactive Waste Treatment Facilities, which was suspended by the earthquake off the coast of Miyagi Prefecture occurred at 11:32 April 7th, was resumed. (14:30 April 8th)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 15:59 till 16:28 April 10th)
- It was confirmed that a fire occurred at the Building for Water Discharge Canal Sampling for Units 1 to 4. (Around 6:38 April 12th) It was confirmed that there were no fire and smoke as a result of the initial activity of fire fighting. (Just before 07:00 on the same day) The fire was then confirmed to be completely under control. (09:12 on the same day)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 3 and 4. (From 10:17 till 12:25 April 14th)
- Videotaping using an unmanned helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 08:02 till 09:55 April 15th)
- As a countermeasure for tsunami, the distribution boards, etc. for the pumps injecting water to the reactors of Units 1 to 3 were transferred to

a hill. (From 10:19 till 17:00 April 15th)

- The watertight measures in the buildings of the Radioactive Waste Treatment Facilities were completed. (April 18th)

- Fukushima Dai-ni NPS (TEPCO)

(Naraha Town / Tomioka Town, Futaba County, Fukushima Prefecture.)

(1) The state of operation

Unit1 (1,100MWe): automatic shutdown, cold shut down at 17:00, March 14th

Unit2 (1,100MWe): automatic shutdown, cold shut down at 18:00, March 14th

Unit3 (1,100MWe): automatic shutdown, cold shut down at 12:15, March 12th

Unit4 (1,100MWe): automatic shutdown, cold shut down at 07:15, March 15th

(2) Major plant parameters (As of 06:00 April 19th)

	Unit	Unit 1	Unit 2	Unit 3	Unit 4
Reactor Pressure*1	MPa	0.15	0.13	0.10	0.17
Reactor water temperature	℃	24.9	24.8	33.9	28.8
Reactor water level*2	mm	9,296	10,296	7,797	8,785
Suppression pool water temperature	℃	24	24	26	29
Suppression pool pressure	kPa (abs)	104	105	110	107
Remarks		cold shutdown	cold shutdown	cold shutdown	cold shutdown

*1: Converted from reading value to absolute pressure

*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- Around 17:56 March 30th, smoke was rising from the power distribution panel on the first floor of the turbine building of Unit 1. However, when the power supply was turned off, the smoke stopped to generate. It was judged by the fire station at 19:15 that this event was caused by the malfunction of the power distribution panel and was not a fire.

- The Residual Heat Removal System (B) to cool the reactor of Unit 1 became to be able to receive power from the emergency power supply as well as the external power supply. This resulted in securing the backup power supplies (emergency power supplies) of Residual Heat Removal System (B) for all Units. (14:30 March 30th)

(4) Report concerning other incidents

- TEPCO reported to NISA the event in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (18:08 March 11th)
- TEPCO reported to NISA the events in accordance with the Article 10 regarding Units 1, 2 and 4. (18:33 March 11th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (5:22 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 2. (5:32 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 4 of Fukushima Dai-ni NPS. (6:07 March 12th)

● Onagawa NPS (Tohoku Electric Power Co. Inc.)
(Onagawa Town, Oga County and Ishinomaki City, Miyagi Prefecture)

(1) The state of operation

Unit 1 (524MWe):	automatic shutdown, cold shut down at 0:58, March 12th
Unit 2 (825MWe):	automatic shutdown, cold shut down at earthquake
Unit 3 (825MWe):	automatic shutdown, cold shut down at 1:17, March 12th

(2) Readings of monitoring post, etc.

MP2 (Monitoring at the Northern End of Site Boundary)
Approx. 0.30 μ SV/h (16:00 April 18th) (Approx. 0.30 μ SV/h (16:00 April 17th))

(3) Report concerning other incidents

- Fire Smoke on the first basement of the Turbine Building was confirmed to be extinguished. (22:55 on March 11th)
- Tohoku Electric Power Co. reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:09 March 13th)

2. Action taken by NISA

(March 11th)

14:46 Set up of the NISA Emergency Preparedness Headquarters (Tokyo) immediately after the earthquake

15:42 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

16:36 TEPCO recognized the event (Inability of water injection of the Emergency Core Cooling System) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Units 1 and 2 of Fukushima Dai-ichi NPS. (Reported to NISA at 16:45)

18:08 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

18:33 Regarding Units 1, 2 and 4 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of Act on Special Measures Concerning Nuclear Emergency Preparedness.

19:03 The Government declared the state of nuclear emergency. (Establishment of the Government Nuclear Emergency Response Headquarters and the Local Nuclear Emergency Response Headquarters)

20:50 Fukushima Prefecture's Emergency Response Headquarters issued a direction for the residents within 2 km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate. (The population of this area is

1,864.)

21:23 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayor of Okuma Town and the Mayor of Futaba Town were issued regarding the event occurred at Fukushima Dai-ichi NPS, TEPCO, in accordance with the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate
- Direction for the residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS to stay in-house

24:00 Vice Minister of Economy, Trade and Industry, Ikeda arrived at the Local Nuclear Emergency Response Headquarters

(March12th)

0:49 Regarding Units 1 TEPCO Fukushima Dai-ichi NPS, TEPCO recognized the event (Unusual rise of the pressure in PCV) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 01:20)

05:22 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 06:27)

05:32 Regarding Unit 2 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

05:44 Residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS shall evacuate by the Prime Minister Directive.

06:07 Regarding of Unit 4 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

06:50 In accordance with the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to control the internal pressure of PCV of Units 1 and 2 of Fukushima Dai-ichi NPS.

07:45 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayors of Hirono Town, Naraha Town , Tomioka Town and Okuma Town were issued regarding the event occurred at Fukushima Dai-ni NPS, TEPCO, pursuant to the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Fukushima Dai-ni NPS to evacuate
- Direction for the residents within 10km radius from Fukushima Dai-ni NPS to stay in-house

17:00 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

17:39 The Prime Minister directed evacuation of the residents within the 10 km radius from Fukushima Dai-ni NPS.

18:25 The Prime Minister directed evacuation of the residents within the 20km radius from Fukushima Dai-ichi NPS.

19:55 Directives from the Prime Minister was issued regarding seawater injection to Unit 1 of Fukushima Dai-ichi NPS.

20:05 Considering the Directives from the Prime Minister and pursuant to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to inject seawater to Unit 1 of Fukushima Dai-ichi NPS and so on.

20:20 At Unit 1 of Fukushima Dai-ichi NPS, seawater injection was started.

(March 13th)

05:38 TEPCO reported to NISA the event (Total loss of coolant injection function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS. Recovering efforts by TEPCO of the power source and coolant injection function and the work on venting were under way.

09:01 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on

Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

09:08 Pressure suppression and fresh water injection was started for Unit 3 of Fukushima Dai-ichi NPS.

09:20 The Pressure Vent Valve of Unit 3 of Fukushima Dai-ichi NPS was opened.

09:30 Directive was issued for the Governor of Fukushima Prefecture, the Mayors of Okuma Town, Futaba Town, Tomioka Town and Namie Town in accordance with the Act on Special Measures Concerning Nuclear Emergency Preparedness on the contents of radioactivity decontamination screening.

13:09 Tohoku Electric Power Co. reported to NISA that Onagawa NPS reached a situation specified in the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

13:12 Fresh water injection was switched to seawater injection for Unit 3 of Fukushima Dai-ichi NPS.

14:36 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 14th)

01:10 Seawater injection for Units 1 and 3 of Fukushima Dai-ichi NPS were temporarily interrupted due to the lack of seawater in pit.

03:20 Seawater injection for Unit 3 of Fukushima Dai-ichi NPS was resumed.

04:40 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

05:38 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:52 TEPCO reported to NISA the event (Unusual rise of the pressure in PCV) falling under the Article 15 of the Act on Special Measures

Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS.

13:25 Regarding Unit 2 of Fukushima Dai-ichi NPS, TEPCO recognised the event (Loss of reactor cooling function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

22:13 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ni NPS.

22:35 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 15th)

00:00: The acceptance of experts from International Atomic Energy Agency (IAEA) was decided. NISA agreed to accept the offer of dispatching of the expert on NPS damage from IAEA considering the intention by Mr. Amano, Director General of IAEA. Therefore, the schedule of expert acceptance will be planned from now on according to the situation.

00:00: NISA also decided the acceptance of experts dispatched from U.S. Nuclear Regulatory Commission (NRC).

07:21 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:24 Incorporated Administration Agency, Japan Atomic Energy Agency (JAEA) reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre.

07:44 JAEA reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Science Research Institute.

08:54 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

10:30 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the directions as follows.
For Unit 4: To extinguish fire and to prevent the occurrence of re-criticality
For Unit 2: To inject water to reactor vessel promptly and to vent Drywell.

10:59 Considering the possibility of lingering situation, it was decided that the function of the Local Nuclear Emergency Response Headquarters was moved to the Fukushima Prefectural Office.

11:00 The Prime Minister directed the in-house stay area.
In-house stay was additionally directed to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS considering in-reactor situation.

16:30 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

22:00 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the following direction.
For Unit 4: To implement the water injection to the Spent Fuel Pool.

23:46 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 18th)

13:00 Ministry of Education, Culture, Sports, Science and Technology decided to reinforce the nation-wide monitoring survey in the emergency of Fukushima Dai-ichi and Dai-ni NPS.

15:55 TEPCO reported to NISA on the accidents and failure at Units 1, 2, 3 and 4 of Fukushima Dai-ichi NPS (Leakage of the radioactive materials inside of the reactor buildings to non-controlled area of radiation) pursuant to the Article 62-3 of the Nuclear Regulation Act.

16:48 Japan Atomic Power Co. reported to NISA accidents and failures in Tokai NPS (Failure of the seawater pump motor of the Emergency Diesel Generator 2C) pursuant to the Article 62-3 of the Nuclear Regulation Act.

(March 19th)

07:44 The second unit of Emergency Diesel Generator (A) for Unit 6 started up.

TEPCO reported to NISA that the pump for RHR (C) for Unit 5 started up and started to cooling Spent Fuel Storage Pool. (Power supply: Emergency Diesel Generator for Unit 6)

08:58 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 20th)

23:30 Directive from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisoma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village) was issued regarding the change of the reference value for the screening level for decontamination of radioactivity.

(March 21st)

07:45 Directive titled as "Administration of the stable Iodine" was issued from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and the heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

16:45 Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" was issued from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

17:50 Directive from the Director-general of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Gunma was issued, which direct the above-mentioned governors to issue a request to relevant businesses and people to suspend shipment of spinach, *Kakina* (a green vegetable) and raw milk for the time being.

(March 22nd)

16:00 NISA received the response (Advice) from Nuclear Safety Commission Emergency Technical Advisory Body to the request for advice made by NISA, regarding the report from TEPCO titled as "The Results of Analysis of Seawater" dated March 22nd.

(March 25th)

NISA directed orally to the TEPCO regarding the exposure of workers at the turbine building of Unit 3 of Fukushima Dai-ichi Nuclear Power Station occurred on March 24th, to review immediately and to improve its radiation control measures from the viewpoint of preventing a recurrence.

(March 28th)

Regarding the mistake in the evaluation of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by

TEPCO on 27 March, NISA directed TEPCO orally to prevent the recurrence of such a mistake.

13:50 Receiving the suggestion by the special meeting of Nuclear Safety Commission (NSC) (Stagnant water on the underground floor of the turbine building at Fukushima Dai-ichi Plant Unit 2), NISA directed TEPCO orally to add the sea water monitoring points and carry out the groundwater monitoring.

Regarding the delay in the reporting of the water confirmed outside of the turbine buildings, NISA directed TEPCO to accomplish the communication in the company on significant information in a timely manner and to report it in a timely and appropriate manner.

(March 29th)

11:16 The report was received, regarding the accident and trouble etc. in Onagawa NPS of Tohoku Electric Power Co. Inc. (the trouble of pump of component cooling water system etc. in Unit 2 and the fall of heavy oil tank for auxiliary boiler of Unit 1 by tsunami), pursuant to the Article 62-3 of the Nuclear Regulation Act and the Article 3 of the Ministerial Ordinance for the Reports related to Electricity.

In order to strengthen the system to assist the nuclear accident sufferers, the "Team to Assist the Lives of the Nuclear Accident Sufferers" headed by the Minister of Economy, Trade and Industry was established and the visits, etc. by the team to relevant cities, towns and villages were carried out.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.1 for the residents within the area from 20 km to 30 km radius.

(March 30th)

Directions as to the implementation of the emergency safety measures for the other power stations considering the accident of Fukushima Dai-ichi and Dai-ni NPSs in 2011 was issued and handed to each electric power company and the relevant organization.

(March 31st)

Regarding the break-in of the propaganda vehicle to Fukushima

Dai-ni NPS on 31 March, NISA directed TEPCO orally to take the carefully thought-out measures regarding physical protection, etc.

NISA alerted TEPCO to taking the carefully though-out measures regarding radiation control for workers.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.2 for the residents within the area from 20 km to 30 km radius.

(April 1st)

NISA strictly alerted TEPCO to taking appropriate measures concerning the following three matters regarding the mistake in the result of nuclide analysis.

- Regarding the past evaluation results on nuclide analysis, all the nuclides erroneously evaluated should be identified and the re-evaluation on them should be promptly carried out.
- The causes for the erroneous evaluation should be investigated and the thorough measures for preventing the recurrence should be taken.
- Immediate notification should be done in the stage when any erroneous evaluation results, etc. are identified.

(April 2nd)

Regarding the outflow of the liquid including radioactive materials from the area around the Intake Channel of Unit 2 of Fukushima Dai-ichi NPS, NISA directed TEPCO orally to carry out nuclide analysis of the liquid sampled, to confirm whether there are other outflows from the same parts of the facilities as the one, from which the outflow was confirmed around the Unit 2, and to strengthen monitoring through sampling water at more points around the facilities concerned.

(April 4th)

On the imperative execution of the discharge to the sea as an emergency measure, NISA requested the technical advice of NSC and directed TEPCO to survey and confirm the impact of the spread of radioactive materials caused by the discharge, by ensuring continuity of the sea monitoring currently underway and enhancing it (Increase of the frequency of measuring as well as the number of monitoring points), disclose required information, as well as to enhance the strategy to minimize the discharge amount.

(April 5th)

Directions as to the implementation of advance notification and contact to the local governments with regard to taking measures related to discharge of radioactive materials from Fukushima Dai-ichi NPS, which have a possible impact on the environment, was issued.

(April 6th)

On the implementation of the nitrogen injection to PCV of Unit 1, NISA directed TEPCO on the following three points. (12:40 April 6th) ① Properly control the plant parameters, and take measures appropriately to ensure safety in response to changes in the parameters. ②Establish and implement an organizational structure and so on that will ensure the safety of the workers who will engage in the operation. ③As the possibility of leakage of the air in PCV to the outside due to the nitrogen injection cannot be ruled out, through the judicious and further enhanced monitoring, TEPCO shall survey and confirm the impact of the release and spreading of radioactive materials due to the nitrogen injection, and strive to disclose information.

(April 7th)

The Local Nuclear Emergency Response Headquarters issued the News Letter No.3 for the residents within the area from 20km to 30km radius. (April 7th)

(April 9th)

Due to the earthquake off the coast of Miyagi Prefecture occurred around 23:32 April 7th, all the Emergency Diesel Generators for Unit 1 of the Higashidori NPS of Tohoku Electric Power Co., Inc. were not workable. Considering this event, NISA issued the letters of direction titled "Regarding the Treatment of Emergency Power Generating Facilities in Terms of Safety Regulations (Directions)" to each Electricity Utility and other organizations concerned.

In accordance with the Paragraph 1, the Article 67 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the evaluation of necessity and safety, and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 10th)

In accordance with Article 67, paragraph 1 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the necessity, the evaluation of safety and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 13th)

- In accordance with paragraph 1, Article 67 of the Nuclear Regulation Act, NISA directed TEPCO to report the result of implementation on seismic safety evaluation as well as the result of consideration on the measurement of effective seismic reinforcement work, etc., regarding the buildings of Fukushima Dai-ichi NPS.
- NISA directed TEPCO to implement detailed analysis and consideration regarding the tsunami caused by the 2011 Tohoku District - off the Pacific Ocean Earthquake.
- NISA directed Tohoku Electric Power Co. Inc. to report the analysis of seismic data observed when the 2011 Earthquake off the Coast of Miyagi Prefecture occurred around 23:32 on 7 April and the assessment on seismic impact on the facilities that are important from the seismic safety viewpoints.

(April 14th)

- NISA directed TEPCO orally to strengthen the monitoring of the Sub Drain (the groundwater collected and controlled in the facilities) of Units 1 and 2, because the radioactive concentration of the water sampled on 13 April rose one digit up in comparison with the preceding result.

(April 15th)

- NISA strictly alerted TEPCO and directed it orally to prepare the measures for preventing the recurrence regarding the delay in the notification of the dismissal of Nuclear Emergency Preparedness Manager, accompanied with the personnel changes dated on 1 April, in accordance with Article 9, paragraph 5 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.
- NISA directed General Electricity Utilities and other organizations concerned to consider the measures to ensure reliability on external power supply due to the temporary loss of external power supply at NPSs, etc., caused by ground faults in part of electric power system when the earthquake off the coast of Miyagi Prefecture occurred on April 7, 2011.

(April 18th)

- NISA accepted (18 April) and confirmed (19 April) the report from TEPCO, in accordance with the direction for the collection of report issued on 10 April, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

< Possibility on radiation exposure (As of 08:00 April 19th) >

1. Exposure of residents

(1) Including the about 60 evacuees from Futaba Public Welfare Hospital to Nihonmatsu City Fukushima Gender Equality Centre, as the result of measurement of 133 persons at the Centre, 23 persons counted more than 13,000 cpm were decontaminated.

(2) The 35 residents transferred from Futaba Public Welfare Hospital to Kawamata Town Saiseikai Kawamata Hospital by private bus arranged by Fukushima Prefecture were judged to be not contaminated by the Prefectural Response Centre.

(3) As for the about 100 residents in Futaba Town evacuated by bus, the results of measurement for 9 of the 100 residents were as follows. The evacuees, moving outside the Prefecture (Miyagi Prefecture), were divided into two groups, which joined later to Nihonmatsu City Fukushima Gender Equality Centre.

No. of Counts	No. of Persons
18,000 cpm	1
30,000-36,000 cpm	1
40,000 cpm	1
little less than 40,000 cpm*	1
very small counts	5

*(These results were measured without shoes, though the first measurement exceeded 100,000 cpm.)

(4) The screening was started at the Off site Centre in Okuma Town from March 12th to 15th. 162 people received examination until now. At the beginning, the reference value was set at 6,000 cpm. 110 people were at the level below 6,000 cpm and 41 people were at the level of 6,000 cpm or more. When the reference value was increased to 13,000 cpm afterward, 8 people were at the level below 13,000 cpm and 3 people are at the level of 13,000 cpm or more.

The 5 out of 162 people examined were transported to hospital after being decontaminated.

(5) The Fukushima Prefecture carried out the evacuation of patients and personnel of the hospitals located within 10km area. The screening of all the members showed that 3 persons have the high counting rate. These

members were transported to the secondary medical institute of exposure. As a result of the screening on 60 fire fighting personnel involved in the transportation activities, the radioactivity higher than twice of the back ground was detected on 3 members. Therefore, all the 60 members were decontaminated.

(6) Fukushima Prefecture has started the screening from 13 March. It is carried out at the evacuation sites and the 11 places (set up permanently) such as health offices. Up until April 16th, the screening was done to 156,487 people. Among them, 102 people were above the 100,000 cpm, but when measured these people again without clothes, etc., the counts decreased to 100,000 cpm and below, and there was no case which affects health.

2. Exposure of workers

As for the workers conducting operations in Fukushima Dai-ichi NPS, the total number of people who were at the level of exposure more than 100 mSv becomes 29.

For two out of the three workers who were confirmed to be at the level of exposure more than 170 mSv on March 24, the attachment of radioactive material on the skin of both legs was confirmed. As the two workers were judged to have a possibility of beta ray burn, they were transferred to the Fukushima Medical University Hospital, and after that, on March 25th, all of the three workers arrived at the National Institute of Radiological Sciences in the Chiba Prefecture. As the result of examination, the level of exposure of their legs was estimated to be from 2 to 3 Sv. The level of exposure of both legs and internal did not require medical treatment, but they decided to monitor the progress of all three workers in the hospital. All the three workers have been discharged from the hospital around the noon on 28 March. The three workers had the second medical examination at the National Institute of Radiological Sciences on 11 April, as a result, there was no problem regarding the condition of their health. The two workers who had been partially exposed to radiation on their skin of both legs were judged that any conditions of burn or red spots were not found on their skin.

At around 11:35 April 1st, a worker fell into the sea when he went on board the barge of the US Armed forces in order to adjust the hose. He was rescued immediately by other workers around without any injury and external contamination. In order to make double sure, the measurement by a whole-body counter was implemented. As a result, it was evaluated that there was no internal radionuclide contaminant on April 12th.

3. Others

(1) 4 members of Self-Defence Force who worked in Fukushima Dai-ichi NPS were injured by explosion. One member was transferred to National Institute of Radiological Sciences. After the examination, judged that there were wounds but no risk for health from the exposure, the one was released from the hospital on March 17th. No other exposure of the Self-Defence Force member was confirmed at the Ministry of Defence.

(2) As for policeman, the decontaminations of two policemen were confirmed by the National Police Agency. Nothing unusual was reported.

(3) On March 24th, examinations of thyroid gland for 66 children aged from 1 to 15 years old were carried out at the Kawamata Town public health Center. The result was at not at the level of having harmful influence.

(4) From March 26th to 27th, examinations of thyroid gland for 137 children aged from 0 to 15 years old were carried out at the Iwaki City Public Health Center. The result was not at the level of having harmful influence.

(5) From March 28th to 30th, examinations of thyroid gland for 946 children aged from 0 to 15 years old were carried out at the Kawamata Town Community Center and the Iitate Village Office. The result was not at the level of having harmful influence.

<Directive of screening levels for decontamination of radioactivity>

(1) On March 20th, the Local Nuclear Emergency Response Headquarters issued the directive to change the reference value for the screening level for decontamination of radioactivity as the following to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

Old: 40 Bq/cm^2 measured by a gamma-ray survey meter or 6,000 cpm
New: 1 μ Sv/hour (dose rate at 10cm distance) or 100,000cpm equivalent

<Directives of administrating stable Iodine during evacuation>

(1) On March 16th, the Local Nuclear Emergency Response Headquarters issued "Directive to administer the stable Iodine during evacuation from the evacuation area (20 km radius)" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

(2) On March 21st, the Local Nuclear Emergency Response Headquarters issued Directive titled as "Administration of the stable Iodine" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

<Situation of the injured (As of 08:00 April 19th)>

1. Injury in Unit 1 of Fukushima Dai-ichi NPS due to earthquake on 11 March
   - Two employees (slightly, have already returned to work)
   - Two employees (a cut by a broken glass by earthquake and tsunami, have already returned to work)
   - One employee (a scratch when evacuating, has already returned to work)
   - One subcontract employee (fracture in both legs, be in hospital)
   - Two died (After the earthquake, two TEPCO's employees missed and had been searched continuously. In the afternoon of March 30th, the two employees were found on the basement floor of the turbine building of Unit 4 and were confirmed dead by April 2nd.)

2. Injury due to the explosion of Unit 1 of Fukushima Dai-ichi NPS on 12 March
   - Four employees (two TEPCO's employees and two subcontractor's employees) were injured at the explosion and smoke of Unit 1 around the turbine building (non-controlled area of radiation) and were examined by Kawauchi Clinic. Two TEPCO's employees return to work again and two subcontractors' employees are under home treatment.

3. Injury due to the explosion of Unit 3 of Fukushima Dai-ichi NPS on 14 March.
   - Four TEPCO's employees (They have already returned to work.)
   - Three subcontractor's employees (They have already returned to work.)
   - Four members of Self-Defence Force (one of them was transported to National Institute of Radiological Sciences considering internal possible exposure. The examination resulted in no internal exposure. The member was discharged from the institute on March 17th.)

4. Other injuries
   - On the earthquake on 11 March, one subcontractor's employees (a crane operator) died in Fukushima Dai-ni NPS. (It seems that the tower crane broke and the operator room was crushed and the person was hit on the head.)
   - One subcontractor's employee was transported to the hospital on March 11th. (Later, turned out a cerebral infarction)
   - One emergency patient on 12 March. (a cerebral stroke, transported by the ambulance, be in hospital)
   - Ambulance was requested for one employee complaining the pain at left chest outside of control area on March 12. (Conscious, under home treatment)
   - One employee suffered lacerations on his left arm and was transported to the hospital for treatment on March 12th. (Has already returned to work)
   - Two employees complaining discomfort wearing full-face mask in the main control room were transported to Fukushima Dai-ni NPS for a consultation with an industrial doctor on 13 March. (One employee has already returned to work and the other is under home treatment.)

- Two subcontractor's employees were injured during working at temporary control panel of power source in the Common Spent Fuel Pool, transported to where were industrial medical doctors the Fukushima Dai-ni NPS on 22 and 23 March. (One employee has already returned to work and the other is under home treatment.)
- On the afternoon of 7 April, a worker who was making sandbags at the soil disposal yard (spoil bank) on the north side of Fukushima Dai-ichi NPS got sick and was transported to J-Village for the body survey of contamination of radioactive materials. Being confirmed to be free from contamination, the worker was taken to the Iwaki City Kyouritsu Hospital by ambulance. On 8 April, the worker was diagnosed as dehydration and transient unconsciousness.
- At 09:19 April 9th, one subcontractor's employee was transported to a hospital as the worker wearing full-face mask felt discomfort during the work for cable processing in the Building of Water Processing, stepped on the manhole outside the building, which lid was shifted, and injured. As a result of medical examination, the worker was diagnosed as a right knee contusion and suspect of right knee medial collateral ligament injury. Furthermore, as a result of the body survey, it was confirmed that the worker was free from contamination of radioactive materials.
- Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body

<Situation of resident evacuation (As of 08:00 April 19th)>

At 11:00 March 15th, the Prime Minister directed in-house stay to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS. The directive was conveyed to Fukushima Prefecture and related municipalities.

Regarding the evacuation as far as 20-km from Fukushima Dai-ichi NPS and 10-km from Fukushima Dai-ni NPS, necessary measures have already been taken.

- The in-house stay in the area from 20 km to 30 km from Fukushima Dai-ichi NPS is made fully known to the residents concerned.
- Cooperating with Fukushima Prefecture, livelihood support to the residents in the in-house stay area are implemented.
- On March 28th, Chief Cabinet Secretary mentioned the continuation of the limited-access within the area of 20 km from Fukushima Dai-ichi NPS. On the same day, the Local Nuclear Emergency Response Headquarters notified the related municipalities of forbidding entry to the evacuation area within the 20 km zone.

<Directives regarding foods and drinks>

Directive from the Director-General of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Chiba was issued, which directed above-mentioned governors to suspend shipment and so on of the following products for the time being.

The Government Nuclear Emergency Response Headquarters organized the thoughts of imposing and lifting restrictions on shipment as follows, considering the NSC's advice.

- The area where restrictions on shipment to be imposed or lifted could be decided in units of the area where a prefecture is divided into, such as cities, towns, villages and so on, considering the spread of the contamination affected area and the actual situation of produce collection, etc.
- The restriction on shipment of the item, of which the result of the sample test exceeded the provisional regulation limits, shall be decided by judging in a comprehensive manner considering the regional spread of the contamination impact.
- Lifting the restrictions on shipment shall be implemented when a series of three results of nearly weekly tests for the item or the area falls below the provisional regulation limits, considering the situation of the Fukushima Dai-ichi NPS.
- However, the tests shall be carried out nearly weekly after the lifting, while the release of the radioactive materials from the NPS continues.

(1) Items under the suspension of shipment and restriction of intake (As of 08:00 April 19th)

Prefectures	Suspension of shipment	Restriction of intake
Fukushima Prefecture	Non-head type leafy vegetables, head type leafy vegetables , flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna**, Rape, *Chijirena, Santouna**, *Kousaitai*, Kakina*, etc.*), Turnip, Raw milk (Except some areas**) and Shiitake (only ones grown on raw lumber in an open field of Date-City, Souma-City, Minamisouma-City, Tamura-City, Iwaki-City, Sinchi-Town, Kawamata-Town, Namie-Town, Futaba-Town, Ookuma-Town, Tomioka-Town, Naraha-Town, Hirono-Town, Iitate-Village, Katsurao-Village , Kawauchi-Village and Fukushima-City)	Non-head type leafy vegetables, head type leafy vegetables, flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna,* Rape, *Chijirena, Santouna**, *Kousaitai*, Kakina*, etc.*) , Shiitake (only ones grown on raw lumber in an open field of Iitate-Village)
Ibaraki Pref.	Spinach (only ones produced in Kitaibaraki City and Takahagi City)	
Tochigi Pref.	Spinach	
Chiba Pref.	- Spinach from Katori-City	

	and Tako-Town - Spinach, Qing-geng-cai, Garland chrysanthemum, Sanchu Asian lettuce, Celery and Parsley from Asahi City	

*a green vegetable

**Kitakata-City, Bandai-Town, Inawashiro-Town, Mishima-Town, Aizumisato-Town, Shimogo-Town, Minamiaizu-Town, Fukushima-City, Nihonmatsu-City, Date-City, Motomiya-City, Koriyama-City, Sukagawa-City, Tamura-City (except former Miyakoji-Village area), Shirakawa-City, Iwaki-City, Kunimi-Town, Kagami-ishi-Town, Ishikawa-Town, Asakawa-Town, Furudono-Town, Miharu-Town, Ono-Town, Yabuki-Town, Yamatsuri-Town, Hanawa-Town, Otama-Village, Hirata-Village, Nishigo-Village, Izumizaki-Village, Nakajima-Village, Samegawa-Village

(2) Request for restriction of drinking for tap-water (As of 08:00 April 19th)

Scope under restriction	Water service (Local governments requested for restriction)
All residents	None
Babies ・Water services that continue to respond to the directive	<Fukushima Prefecture> Iitate small water service (Iitate Village, Fukushima Prefecture)
・Tap-water supply service that continues to respond to the directive	None

<Directive regarding the ventilation when using heating equipments in the aria of indoor evacuation >

On March 21st, Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural

Governor and the heads of cities, towns and villages (Iwaki City, Tamura City, Minamisouma City, Hirono Town, Kawauchi Village, Namie Town, Katsurao Village, and Iitate Village) was issued, which directs those governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

< Fire Bureaus' Activities>

- From 11:00 till around 14:00 on March 22nd, Niigata-City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the set up of large decontamination system.
- From 8:30 till 9:30, from 13:30 till 14:30 on March 23rd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the operation of large decontamination system.

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News Release

経済産業省
Ministry of Economy, Trade and Industry

April 19, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 102nd Release)
(As of 15:00 April 19th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)
   - Fukushima Dai-ichi NPS
     - The stagnant water (stagnant water with high-level radioactivity) in the turbine building of Unit 2 was started to be transferred to the Radioactive Waste Treatment Facilities (From 10:08 April 19th)
     - Fresh water spray of around 40t over the Spent Fuel Pool of Unit 4 using Concrete Pump Truck (62m class) was carried out. (From 10:17 till 11:35 April 19th)
     - Work of strengthening connection of the power supplies between Units 1, 2 and Units 3, 4 was completed. (10:23 April 19th)

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(Attached sheet)

1. The state of operation at NPS (Number of automatic shutdown units: 10)

- Fukushima Dai-ichi NPS, TEPCO
  (Okuma Town and FutabaTown, Futaba County, Fukushima Prefecture)

(1) The state of operation

Unit 1 (460MWe):	automatic shutdown
Unit 2 (784MWe):	automatic shutdown
Unit 3 (784MWe):	automatic shutdown
Unit 4 (784MWe):	in periodic inspection outage
Unit 5 (784MWe):	in periodic inspection outage, cold shutdown at 14:30 March 20th
Unit 6 (1,100MWe):	in periodic inspection outage, cold shutdown at 19:27 March 20th

(2) Major Plant Parameters (As of 13:00 April 19th)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure*1 [MPa]	0.531(A) 1.149(B)	0.081(A) 0.072(D)	0.061(A) 0.016(C)	–	0.108	0.111
CV Pressure (D/W) [kPa]	165	85	103.6	–	–	–
Reactor Water Level*2 [mm]	-1,600(A) -1,550(B)	-1,500(A) -2,100 (B)	-1,850(A) -2,250(B)	–	2,222	2,033
Suppression Pool Water Temperature (S/C) [℃]	53.3(A) 53.2B)	74.4(A) 74.8(B)	43.2(A) 43.2(B)	–	–	–
Suppression Pool Pressure (S/C) [kPa]	170	Indicator Failure	172.2	–	–	–
Spent Fuel Pool Water Temperature [℃]	Indicator Failure	49.0	Indicator Failure	Indicator Failure	37.2	25.0
Time of Measurement	12:00 April 19th	12:00 April 19th	12:00 April 19th	April 19th	13:00 April 19th	13:00 April 19th

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (10:17 March 12th)
- Seawater injection to the Reactor Pressure Vessel (RPV) via the Fire Extinguish Line was started. (20:20 March 12th)
  →Temporary interruption of the injection (01:10 March 14th)
- The sound of explosion in Unit 1 occurred. (15:36 March 12th)
- The amount of injected water to the Reactor Core was increased by utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$). (02:33 March 23rd) Later, it was switched to the Feedwater Line only (around $11m^3/h$). (09:00 March 23rd)
- Lighting in the Central Operation Room was recovered. (11:30 March 24th)
- Fresh water injection to RPV was started. (15:37 March 25)
- As the result of concentration measurement in the stagnant water on the basement floor of the turbine building, $2.1 \times 10^5 Bq/cm^3$ of ^{131}I (Iodine) and $1.8 \times 10^6 Bq/cm^3$ of ^{137}Cs (Caesium) were detected as major radioactive nuclides.
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (08:32 March 29th.)
- The Stagnant water on the basement floor of the turbine building was started to be transferred to the Condenser around 17:00 March 24. As the Condenser was confirmed to be almost filled with water, pumping out of the water to the Condenser was stopped. (07:30 March 29th) In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank started to be transferred to the Surge Tank of Suppression Pool Water (A) (12:00 March 31th), after switching the place where the water was to be transferred to the Surge Tank of Suppression Pool Water (B) (15:25 March 31th), the transfer was

resumed and finished. (15:26 April 2nd)

- Water spray of around 90t (fresh water) over the Spent Fuel Pool using Concrete Pump Truck (62m class) was carried out. (From 13:03 till 16:04 March 31st) A test water spray using Concrete Pump Truck (62m class) was carried out in order to confirm the appropriate position for water spray. (From 17:16 till 17:19 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (10:42 to 11:52 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:02 April 3rd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (13:55 April 3rd)
- Aiming at reducing the possibility of hydrogen combustion in the Primary Containment Vessel (PCV), the operations for the injection of nitrogen to PCV were started. (22:30 April 6th)
- The start of nitrogen injection to PCV was confirmed. (01:31 April 7th)
- The nitrogen injection to PCV was switched to the generator of high purity nitrogen. (04:10 April 9th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (09:30 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost and the fresh water injection to RPV and the nitrogen injection to PVC were suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The nitrogen injection to PCV was started. (23:34 April 11th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 16:00 till 17:30 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 11:50 till 12:12 April 18th)

- White smoke was not confirmed to generate. (As of 06:30 April 19th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 19th)

<Unit 2>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (11:00 March 13th)
- The Blow-out Panel of reactor building was opened due to the explosion in the reactor building of Unit 3. (After 11:00 March 14th)
- Reactor water level tended to decrease. (13:18 March 14th) TEPCO reported to NISA the event (Loss of reactor cooling functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:49 March 14th)
- Seawater injection to RPV via the Fire Extinguish line was started. (16:34 March 14th)
- Water level in RPV tended to decrease. (22:50 March 14th)
- Started to vent (0:02 March 15th)
- A sound of explosion was made in Unit 2. As the pressure in Suppression Pool (Suppression Chamber) decreased (06:10 March 15th), there was a possibility that an incident occurred in the Chamber. (About 06:20 March 15th)
- Electric power receiving at the emergency power source transformer from the external transmission line was completed. The work for laying the electric cable from the facility to the load side was carried out. (13:30 March 19th)
- Seawater injection of 40t to the Spent Fuel Pool was started. (From 15:05 till 17:20 March 20th)
- Power Center received electricity (15:46 March 20th)
- White smoke generated. (18:22 March 21st)
- White smoke was died down and almost invisible. (As of 07:11 March 22nd)
- Seawater injection of 18t to the Spent Fuel Pool was carried out. (From 16:07 till 17:01 March 22nd)

- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:30 till 12:19 March 25th)
- Fresh water injection to RPV was started. (10:10 March 26th)
- Lighting of Central Operation Room was recovered (16:46 March26th)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump.(18:31 March 27th)
- Regarding the result of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, TEPCO reported to NISA that as the result of analysis and evaluation through re-sampling, judging the measured value of ^{134}I (Iodine) was wrong, the concentrations of gamma nuclides including ^{134}I (Iodine) were less than the detection limit. (00:07 March 28).
- Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump. (From 16:30 till 18:25 March 29th)
- As the malfunction of the temporary motor-driven pump, which had been injecting to the Spent Fuel Pool since 09:25 March 30th, was confirmed at 09:45 March 30th, the injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. Fresh water injection was resumed. (From 19:05 till 23:50 March 30th)
- Fresh water injection of around 70t to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 14:56 till 17:05 April 1st)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank was transferred to the Surge Tank of Suppression Pool Water. (From 16:45 March 29th till 11:50 April 1st)
- The water, of which the dose rate was at the level of more than 1,000 mSv/h, was confirmed to be collected in the pit (a vertical portion of an underground structure) for laying electric cables, located near the Intake Channel. In addition, the outflow from the crack with a length of around 20 cm in the concrete portion of the lateral surface of the pit into the sea was confirmed. (Around 09:30 April 2nd) In order to stop the

outflow, concrete was poured into the pit. (16:25, 19:02 April 2nd)

- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (17:10 April 2nd)
- The cameras for monitoring the water levels in the vertical part of the trench outside of the turbine building and on the basement floor of the turbine building were installed. (April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:22 till 12:06 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- As the measure to prevent the outflow of the water accumulated in the Pits for Conduit in the area around the Inlet Bar Screen, the upper part of the Power Cable Trench for power source at Intake Channel was crushed and 20 bags of sawdust (3 kg/bag), 80 bags of high polymer absorbent (100 g/bag) and 3 bags of cutting-processed newspaper (Large garbage bag) were put inside. (From 13:47 till 14:30 April 3rd)
- Approximately 13kg of tracer (milk white bath agent) was put in from the Pit for the Duct for Seawater Pipe. (From 07:08 till 07:11 April 4th)
- Fresh water injection (Around 70t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 11:05 till 13:37 April 4th)
- The tracer solution was put in from the two holes dug around the Pit for the Conduit near the Inlet Bar Screen of Unit 2 and was confirmed to be flowed out from the crack to the sea. (14:15 April 5th) The coagulant (soluble glass) started to be injected from the holes around the Pit in order to prevent the outflow of the water. (15:07 April 5th) The outflow of the water was confirmed to stop. (Around 05:38 April 6th) In addition, it was confirmed that the water level in the turbine building did not rise. Furthermore, the measurements to stop water by means of rubber board and jig (prop) were implemented at the outflowing point. (Finished at 13: 15 April 6th)

- One more pump for the transfer of the water in the Condenser to the Condensate Storage Tank was installed. (Two pumps in total: 30 m^3/h) (Around 15:40 April 5th)
- Fresh water injection (Around 36t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 13:39 till 14:34 April 7th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (13:10 April 9th)
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:37 till 12:38 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The stagnant water in the trench of the turbine building was started to be transferred to the Hot Well of the Condenser using a submersible pump (19:35 April 12th) Thereafter it was confirmed that no leakage was found, the transfer of stagnant water resumed from 15:02 April 13th and was stopped 17:04 April 13th. The amount of transfer was about 660t.
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Cooling Line was carried out. (From 13:15 till 14:55 April 13th)
- Fresh water injection (Around 45t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:13 till 11:54 April 16th. Due to the occurrence of earthquake at around 11:19, the temporary motor-driven pump was stopped at 11:39. The Spent Fuel Pool was confirmed to be filled with water by the increase of Skimmer Level at 11:54.)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 12:13 till 12:37 April 18th)
- Confirmation of situations, etc. using an unmanned robot at the reactor building was carried out. (From 13:42 till 14:33 April 18th)
- <u>The stagnant water (stagnant water with high-level radioactivity) in the turbine building was started to be transferred to the Radioactive Waste</u>

Treatment Facilities (From 10:08 April 19th)

- White smoke was confirmed to generate continuously. (As of 06:30 April 19th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 19th)

<Unit 3>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (05:10 March 13th)
- Started to vent (08:41 March 13th)
- Fresh water started to be injected to RPV via the Fire Extinguish Line. (11:55 March 13th)
- Seawater started to be injected to RPV via the Fire Extinguish Line. (13:12 March 13th)
- Seawater injection for Units 1 and 3 was suspended due to the lack of seawater in pit. (01:10 March 14th)
- Seawater injection to RPV for Unit 3 was resumed. (03:20 March 14th)
- Started to vent. (05:20 March 14th)
- PCV rose unusually. (07:44 March 14th) TEPCO reported to NISA on the event falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (7:52 March 14th)
- The explosion like Unit 1 occurred around the reactor building (11:01 March 14th)
- The white smoke like steam generated. (08:30 March 16th)
- Because of the possibility that PCV was damaged, the workers evacuated from the main control room (common control room). (10:45 March 16th) Thereafter the operators returned to the room and resumed the operation of water injection. (11:30 March 16th)
- Seawater was discharged 4 times to Unit 3 by the helicopters of the Self-Defence Force. (9:48, 9:52, 9:58 and 10:01 March 17th)
- The riot police arrived at the site for the water spray from the grand. (16:10 March 17th)
- The Self-Defence Force started the water spray using a fire engine. (19:35 March 17th)

- The water spray from the ground was carried out by the riot police. (From 19:05 till 19:13 March 17th)
- The water spray from the ground was carried out by the Self-Defense Force using 5 fire engines. (19:35, 19:45, 19:53, 20:00 and 20:07 March 17th)
- The water spray from the ground using 6 fire engines (6 tons of water spray per engine) was carried out by the Self-Defence Force. (From before 14:00 till 14:38 March 18th)
- The water spray from the ground using a fire engine provided by the US Military was carried out. (Finished at 14:45 March 18th)
- Hyper Rescue Unit of Tokyo Fire Department carried out the water spray. (Finished at 03:40 March 20th)
- The pressure in PCV rose (320 kPa at 11:00 March 20th). Preparation to lower the pressure was carried out. Judging from the situation, immediate pressure relief was not required. Monitoring the pressure continues. (120 kPa at 12:15 March 21st)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool of Unit 3 by Hyper Rescue Unit of Tokyo Fire Department was carried out. (From 21:30 March 20th till 03:58 March 21st)
- Grayish smoke generated. (Around 15:55 March 21st)
- The smoke was confirmed to be died down. (17:55 March 21st)
- Grayish smoke changed to be whitish and seems to be ceasing. (As of 07:11 March 22nd)
- Water spray (Around 180t) by Tokyo Fire Department and Osaka City Fire Bureau was carried out. (From 15:10 till 16:00 March 22nd)
- Lighting was recovered in the Central Operation Room. (22:43 March 22nd)
- Seawater injection of 35t to the Spent Fuel Pool via the Fuel Pool Cooling Line was carried out. (From 11:03 till 13:20 March 23rd) Around 120t of seawater was injected. (From around 5:35 till around 16:05 March 24th)
- Slightly blackish smoke generated from the reactor building. (Around 16:20 March 23rd) Around 23:30 March 23rd and around 4:50 March 24th, it was reported that the smoke seemed to cease.

- As the results of the survey of the stagnant water, into which workers who were laying electric cable on the ground floor and the basement floor of the turbine building walked, the dose rate on the water surface was around 400mSv/h, and as the result of gamma-ray analysis of the sampling water, the totaled concentration of each nuclide of the sampling water was around 3.9×10^{6} Bq/cm^3.
- Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department was carried out. (From 13:28 till 16:00 March 25th)
- Fresh water injection to RPV was started. (18:02 March 25th)
- Seawater spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 12:34 till 14:36 March 27th)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water. (From 17:40 March 28th till around 8:40 March 31st)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (20:30 March 28th)
- Fresh water spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 14:17 till 18:18 March 29th)
- Fresh water spray of around 105t using Concrete Pump Truck (52m class) was carried out. (From 16:30 till 19:33 March 31st)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 09:52 till 12:54 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- The camera for monitoring the water level in the vertical part of the trench outside of the turbine building was installed. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:03 till 12:16 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:18 April 3rd)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 17:03 till 19:19 April 4th)

- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 06:53 till 08:53 April 7th)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 17:06 till 20:00 April 8th)
- Fresh water spray of around 80t using Concrete Pump Truck (52m class) was carried out. (From 17:15 till 19:15 April 10th)
- Due to the occurrence of earthquake, the external power supply for Units 1 and 2 was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- Because the external power supply for Units 1 and 2 was recovered (17:56 April 11th), fresh water injection to RPV was resumed. (18:04 April 11th)
- Fresh water spray of around 35t using Concrete Pump Truck (62m class) was carried out. (From 16:26 till 17:16 April 12th)
- Fresh water spray around 25t using Concrete Pump Truck (62m class) was started. (From 15:56 till 16:32 April 14th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 11:30 till 14:00 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (12:38 till 13:05 April 18th)
- Fresh water spray of around 30t over the Spent Fuel Pool using Concrete Pump Truck (62m class) was started. (From 14:17 till 15:02 April 18th)
- White smoke was confirmed to generate continuously (As of 06:30 April 19th)
- Fresh water injection to RPV is being carried out. (As of 15:00 April 19th)

<Unit 4>

- Because of the replacement work of the Shroud of RPV, no fuel was inside the RPV.
- The temperature of water in the Spent Fuel Pool had increased. (84 ℃ at 04:08 March 14th)
- It was confirmed that a part of wall in the operation area was damaged. (06:14 March 15th)

- The fire occurred. (09:38 March 15th) TEPCO reported that the fire was extinguished spontaneously. (Around 11:00 March 15th)
- The fire occurred. (05:45 March 16th) TEPCO reported that no fire could be confirmed on the ground.(Around 06:15 March 16th)
- The Self-Defence Force started water spray over the Spent Fuel Pool.(09:43 March 20th)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool by Self-Defense Force was started. (From around 18:30 till 19:46 March 20th).
- Water spray over the Spent Fuel Pool by Self-Defence Force using 13 fire engines was started (From 06:37 till 08:41 March 21st).
- Works for laying electric cable to the Power Center was completed. (Around 15:00 March 21st)
- Power Center received electricity. (10:35 March 22nd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 17:17 till 20:32 March 22nd)
- Seawater spray of around 130t using Concrete Pump Truck (58m class) was carried out. (From 10:00 till 13:02 March 23rd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 14:36 till 17:30 March 24th)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 19:05 till 22:07 March 25th)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 06:05 till 10:20 March 25th)
- Seawater spray of around 125t using Concrete Pump Truck (58m class) was carried out. (From 16:55 till 19:25 March 27th)
- Lighting of Central Operation Room was recovered. (11:50 March 29th)
- Fresh water spray of around 140t using Concrete Pump Truck (58m class) was carried out. (From 14:04 till 18:33 March 30th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 08:28 till 14:14 April 1st)
- Lighting in the turbine building was partially turned on. (April 2nd)
- From 2 April, the stagnant water in the Main Building of Radioactive Waste Treatment Facilities was being transferred to the turbine building of Unit 4. As the water level in the vertical portion of the

trench for Unit 3 rose from 3 April, by way of precaution, the transfer was suspended notwithstanding that the path of the water was not clear. (09:22 April 4th)

- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 17:14 till 22:16 April 3rd)
- Fresh water spray of around 20t using Concrete Pump Truck (58m class) was carried out. (From 17:35 till 18:22 April 5th)
- Fresh water spray of around 38t using Concrete Pump Truck (58m class) was carried out. (From 18:23 till 19:40 April 7th)
- Fresh water spray of around 90t using Concrete Pump Truck (58m class) was carried out. (From 17:07 till 19:24 April 9th)
- The work for sampling water in the Spent Fuel Pool was carried out in order to grasp the conditions of the fuels that are kept in the pool. (From 12:00 till 13:04 April 12th) Nuclide analysis of radio active materials was carried out regarding the sampled water of the Spent Fuel Pool. (April 13th) As a result of nuclide analysis, 2.2×10^{2}Bq/cm^{3} of ^{131}I (Iodine), 8.8×10^{1}Bq/cm^{3} of ^{134}Cs (Caesium), 9.3×10^{1}Bq/cm^{3} of ^{137}Cs (Caesium) were detected. (April 14th)
- Fresh water spray of around 195t using Concrete Pump Truck (62m class) was carried out. (From 0:30 till 6:57 April 13th)
- Fresh water spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 14:30 till 18:29 April 15th)
- Fresh waster spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 17:39 till 21:22 April 17th)
- Fresh water spray of around 40t using Concrete Pump Truck (62m class) was carried out. (From 10:17 till 11:35 April 19th)
- White smoke was confirmed to generate. (As of 06:30 April 19th)

<Units 5 and 6>

- The first unit of Emergency Diesel Generator (D/G) (B) for Unit 6 is operating and supplying electricity. Water injection to RPV and the Spent Fuel Pool through the system of Make up Water Condensate (MUWC) is being carried out.
- The second unit of Emergency Diesel Generator (D/G) (A) for Unit 6 started up. (04:22 March 19th)
- The pumps for Residual Heat Removal (RHR) (C) for Unit 5 (05:00

March 19th) and RHR (B) for Unit 6 (22:14 March 19th) started up and recovered heat removal function. It cools Spent Fuel Pool with priority. (Power supply : Emergency Diesel Generator for Unit 6) (05:00 March 19th)

- Unit 5 under cold shut down (14:30 March 20th)
- Unit 6 under cold shut down (19:27 March 20th)
- Receiving electricity reached to the transformer of starter. (19:52 March 20th)
- Power supply to Unit 5 was switched from the Emergency Diesel Generator to external power supply. (11:36 March 21st)
- Power supply to Unit 6 was switched from the Emergency Diesel Generator to external power supply. (19:17 March 22nd)
- The temporary pump for RHR Seawater System (RHRS) of Unit 5 was automatically stopped when the power supply was switched from the temporary to the permanent. (17:24 March 23rd)
- Repair of the temporary pump for RHRS of Unit 5 was completed (16:14 March 24th) and cooling was started again. (16:35 March 24th)
- Power supply for the temporary pump for RHRS of Unit 6 was switched from the temporary to the permanent. (15:38 and 15:42 March 25th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was started to be discharged through the Water Discharge Canal to the sea. (21:00 April 4th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was discharged through the Water Discharge Canal to the sea. (Unit5 from 21:00 April 4th till 12:14 April 8th (Around 950t), Unit6 from 21:00 April 4th till 18:52 April 9th (Around 373t))

<Common Spent Fuel Pool>

- It was confirmed that the water level of Spent Fuel Pool was maintained almost full at after 06:00 March 18th.
- Water spray over the Common Spent Fuel Pool was started. (From 10:37 till 15:30 March 21st)
- The power was started to be supplied (15:37 March 24th) and cooling was also started.(18:05 March 24th)

- The power supply was stopped due to short-circuiting of the end of the power supply circuit. (14:34 April 17th) Thereafter the facility inspection was carried out and the power supply was recovered. (17:30 April 17th)
- As of 07:30 April 19th, water temperature of the pool was around 32℃.

<Seawater and Soil Monitoring>

- As the result of nuclide analysis at around the Southern Water Discharge Canal, 7.4×10^{1}Bq/cm^3 of ^{131}I (Iodine) (1,850.5 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected. (14:30 March 26th)
  (As the result of measurement on 29 March, it was detected as 3,355.0 times higher than the limit in water (13:55 March 29th). On the other hand, as the result of the analysis at the northern side of the Water Discharge Canal of the NPS, 4.6×10^{1}Bq/cm^3 of ^{131}I (Iodine) (1,262.5 times higher than the limit in water) was detected. (14:10 March 29th)
- In the samples of soil collected on 21 and 22 March on the site (at 5 points) of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (23:45 March 28th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- As the result of nuclide analysis at around the Southern Water Discharge Canal, 1.8×10^{2} Bq/cm^3 of ^{131}I (Iodine) (4,385.0 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected (13:55 March 30th).
- The permanent monitoring posts (No.1 to 8) installed near the Site Boundary were recovered. (March 31st) They are measuring once a day.
- In the samples of soil (7 samples in total) collected on 25 March (at 4 points) and 28 March (at 3 points) on the site of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (18:30 April 6th announced by TEPCO). The concentration of the detected plutonium was, in the same as the last one (Announced on

28 March), at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.

- In the 3 soil samples (6 samples in total) collected on 31 March and 4 April from the soil at the 3 points on the site of Fukushima Dai-ichi NPS where the regular sampling is to be carried out, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected. (18:30 April 14th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.

<Prevention of the Spread of Contaminated Water>

- In order to prevent the outflow of the contaminated water from the exclusive port, the work for stopping water by means of large-sized sandbags was implemented around the seawall on the south side of the NPS. (From 15:00 till 16:30 April 5th)
- The silt fences to prevent the spread of the contaminated water were completed to be doubly installed at the appropriate part of the seawall on the south side of the NPS.(10:45 April 11th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary board to stop water (one of the 7 steel plates) was installed. (From 12:00 till 13:00 April 12th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary boards to stop water (2 of the 7 steel plates) was installed. (From around 8:30 till around 10:00 April 13th)
- The silt fence to prevent the spread of the contaminated water was completed to be installed in front of the Screen of Units 3 and 4. (13:50 April 13th)
- The silt fences to prevent the spread of the contaminated water were installed at the Curtain Wall and in front of the Screen of Units 1 and 2. (12:20 April 14th)
- 3 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 3 and the Inlet Screen Pump Room of Unit 4. (From 14:30

till 15:45 April 15th)

- Temporary boards to stop water (4 steel plates out of 7) were installed on the ocean-side of the Inlet Bar Screen of Unit 2. (From 9:00 till 14:15 April 15th)
- 2 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 1 and the Inlet Screen Pump Room of Unit 2 and 5 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 2 and the Inlet Screen Pump room of Unit 3. (From 9:00 till 11:15 April 17th)

<Spray of Anti-scattering Agent>

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (From 15:00 till 16:05 April 1st)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 600 m^2 on the mountain-side of the Common Pool. (From 13:00 till 16:30 April 5th, From 12:30 till 14:30 April 6th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 680 m^2 on the mountain-side of the Common Pool. (From 11:00 till 14:00 April 8th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 550 m^2 on the mountain-side of the Common Pool. (From 13:00 till 14:00 April 10th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,200 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 11th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 700 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 12th)
- The test implementation of spraying anti-scattering agent to prevent the

spread of radioactive materials on the ground surface was carried out in the area of about 400 m^2 on the mountain-side of the Common Pool. (From 11:00 till 11:30 April 13th)

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,600 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:30 April 14th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 on the mountain-side of the Common Pool. (From 11:30 till 13:00 April 15th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,800 m^2 on the mountain-side of the Surge Tank of Suppression Pool Water. (From 11:00 till 13:00 April 16th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 around the Radioactive Waste Treatment Facilities.(From 10:00 till 13:30 April 17th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1200 m^2 around the Radioactive Waste Treatment Facilities. (From 09:00 till 14:30 April 18th)

<Situation of Removal of the Rubble>

- Removal of the rubble using remote-control heavy machineries was carried out. (April 10th)
- Removal of rubble (Amounts equivalent to 6 containers) using remote-control heavy machineries was carried out. (From 11:00 till 16:10 April 13th)
- Removal of rubble (Amount equivalent to a container) using remote-control heavy machineries was carried out. (From 09:00 till 15:45 April 15th)
- Removal of rubble (Amount equivalent to 8 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 16th)

- Removal of rubble (Amount equivalent to 2 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 17th)
- Removal of rubble (Amount equivalent to 4 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 18th)

<Other>

- The water was confirmed to be collected in the vertical parts of the trenches (an underground structure for laying pipes, shaped like a tunnel) outside of the turbine building of Units 1 to 3. The dose rates on the water surface were 0.4 mSv/h of the Unit 1's trench and 1,000 mSv/h of the Unit 2's trench. The rate of the Unit 3's trench could not measure because of the rubble. (Around 15:30 March 27th) The collected water in the vertical part of the trench outside of the turbine building of Unit 1 was transferred to the storage tank in the Main Building of Radioactive Waste Treatment Facilities by the temporary pump. Thereafter the water level from the top of the vertical part went down from approximately -0.14m to approximately -1.14m. (From 09:20 till 11:25 March 31st)
- When removing the flange of pipes of Residual Heat Removal Seawater System outside the building of Unit 3, three subcontractor's employees were wetted by the water remaining in the pipe. However, as the result of wiping the water off, no radioactive materials were attached to their bodies. (12:03 March 29th)
- On March 28th, the stagnant water was confirmed in the Main Building of Radioactive Waste Treatment Facilities. As the result of analysis of radioactivity, the total amount of the radioactivity 1.2×10^{1} Bq/cm^3 in the controlled area and that of 2.2×10^{1} Bq/cm^3 in the non-controlled area were detected in March 29th.
- The barge (the first ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (15:42 March 31st) The transfer of fresh water from the barge (the first ship) to the Filtrate Tank was started. (15:58 April 1st) Thereafter it was suspended due to the malfunction of the hose (16:25 April 1st), but was resumed on

April 2nd. (From 10:20 till 16:40 April 2nd)

- The barge (the second ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (9:10 April 2nd)
- The freshwater was transferred from the barge (the second ship) of the US armed force to the barge (the first ship). (From 09:52 till 11:15 April 3rd)
- The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps in total was carried out (19:07 April 4th) and stopped discharging to the sea using submersible pumps at 17:40 April 10th. Confirmation of the remaining water is being carried out. (Total amount of discharged water is around 9,070t.)
- The stagnant water with low-level radioactivity in the Building of Miscellaneous Solid Waste Volume Reduction Processing was discharged from the southern side of the Water Discharge Canal to the sea using 5 pumps.(From 17:20 April 6th till 18:20 April 7th)
- In order to prepare to transfer the stagnant water in the turbine buildings to the Radioactive Waste Treatment Facilities, drilling the outer walls of the turbine buildings of Units 2 to 4 was carried out. (April 7th)
- The pumping out of the water in the Radioactive Waste Treatment Facilities, which was suspended by the earthquake off the coast of Miyagi Prefecture occurred at 11:32 April 7th, was resumed. (14:30 April 8th)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 15:59 till 16:28 April 10th)
- It was confirmed that a fire occurred at the Building for Water Discharge Canal Sampling for Units 1 to 4. (Around 6:38 April 12th) It was confirmed that there were no fire and smoke as a result of the initial activity of fire fighting. (Just before 07:00 on the same day) The fire was then confirmed to be completely under control. (09:12 on the same day)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 3 and 4. (From 10:17 till

12:25 April 14th)

- Videotaping using an unmanned helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 08:02 till 09:55 April 15th)
- As a countermeasure for tsunami, the distribution boards, etc. for the pumps injecting water to the reactors of Units 1 to 3 were transferred to a hill. (From 10:19 till 17:00 April 15th)
- The watertight measures in the buildings of the Radioactive Waste Treatment Facilities were completed. (April 18th)
- Work of strengthening connection of the power supplies between Units 1, 2 and Units 3, 4 was completed. (10:23 April 19th)

● Fukushima Dai-ni NPS (TEPCO)
(Naraha Town / Tomioka Town, Futaba County, Fukushima Prefecture.)

(1) The state of operation

Unit1 (1,100MWe): automatic shutdown, cold shut down at 17:00, March 14th
Unit2 (1,100MWe): automatic shutdown, cold shut down at 18:00, March 14th
Unit3 (1,100MWe): automatic shutdown, cold shut down at 12:15, March 12th
Unit4 (1,100MWe): automatic shutdown, cold shut down at 07:15, March 15th

(2) Major plant parameters (As of 12:00 April 19th)

	Unit	Unit 1	Unit 2	Unit 3	Unit 4
Reactor Pressure*1	MPa	0.15	0.14	0.10	0.17
Reactor water temperature	℃	24.8	24.7	33.7	28.8
Reactor water level*2	mm	9,296	10,296	7,796	8,785
Suppression pool water temperature	℃	24	24	26	29
Suppression pool pressure	kPa (abs)	104	105	110	107
Remarks		cold shutdown	cold shutdown	cold shutdown	cold shutdown

*1: Converted from reading value to absolute pressure

*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- Around 17:56 March 30th, smoke was rising from the power distribution panel on the first floor of the turbine building of Unit 1. However, when the power supply was turned off, the smoke stopped to generate. It was judged by the fire station at 19:15 that this event was caused by the malfunction of the power distribution panel and was not a fire.
- The Residual Heat Removal System (B) to cool the reactor of Unit 1 became to be able to receive power from the emergency power supply as well as the external power supply. This resulted in securing the backup power supplies (emergency power supplies) of Residual Heat Removal System (B) for all Units. (14:30 March 30th)

(4) Report concerning other incidents

- TEPCO reported to NISA the event in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (18:08 March 11th)
- TEPCO reported to NISA the events in accordance with the Article 10 regarding Units 1, 2 and 4. (18:33 March 11th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (5:22 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 2. (5:32 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 4 of Fukushima Dai-ni NPS. (6:07 March 12th)

- Onagawa NPS (Tohoku Electric Power Co. Inc.)
  (Onagawa Town, Oga County and Ishinomaki City, Miyagi Prefecture)

(1) The state of operation

Unit 1 (524MWe): automatic shutdown, cold shut down at 0:58, March 12th

Unit 2 (825MWe): automatic shutdown, cold shut down at earthquake

Unit 3 (825MWe): automatic shutdown, cold shut down at 1:17, March 12th

(2) Readings of monitoring post, etc.

MP2 (Monitoring at the Northern End of Site Boundary)

Approx. 0.30 μ SV/h (16:00 April 18th) (Approx. 0.30 μ SV/h (16:00 April 17th))

(3) Report concerning other incidents

- Fire Smoke on the first basement of the Turbine Building was confirmed to be extinguished. (22:55 on March 11th)
- Tohoku Electric Power Co. reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:09 March 13th)

2. Action taken by NISA

(March 11th)

14:46 Set up of the NISA Emergency Preparedness Headquarters (Tokyo) immediately after the earthquake

15:42 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

16:36 TEPCO recognized the event (Inability of water injection of the Emergency Core Cooling System) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Units 1 and 2 of Fukushima Dai-ichi NPS. (Reported to NISA at 16:45)

18:08 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

18:33 Regarding Units 1, 2 and 4 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of Act on Special

Measures Concerning Nuclear Emergency Preparedness.

19:03 The Government declared the state of nuclear emergency. (Establishment of the Government Nuclear Emergency Response Headquarters and the Local Nuclear Emergency Response Headquarters)

20:50 Fukushima Prefecture's Emergency Response Headquarters issued a direction for the residents within 2 km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate. (The population of this area is 1,864.)

21:23 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayor of Okuma Town and the Mayor of Futaba Town were issued regarding the event occurred at Fukushima Dai-ichi NPS, TEPCO, in accordance with the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate
- Direction for the residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS to stay in-house

24:00 Vice Minister of Economy, Trade and Industry, Ikeda arrived at the Local Nuclear Emergency Response Headquarters

(March12th)

0:49 Regarding Units 1 TEPCO Fukushima Dai-ichi NPS, TEPCO recognized the event (Unusual rise of the pressure in PCV) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 01:20)

05:22 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 06:27)

05:32 Regarding Unit 2 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

05:44 Residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS shall evacuate by the Prime Minister Directive.

06:07 Regarding of Unit 4 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

06:50 In accordance with the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to control the internal pressure of PCV of Units 1 and 2 of Fukushima Dai-ichi NPS.

07:45 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayors of Hirono Town, Naraha Town , Tomioka Town and Okuma Town were issued regarding the event occurred at Fukushima Dai-ni NPS, TEPCO, pursuant to the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Fukushima Dai-ni NPS to evacuate
- Direction for the residents within 10km radius from Fukushima Dai-ni NPS to stay in-house

17:00 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

17:39 The Prime Minister directed evacuation of the residents within the 10 km radius from Fukushima Dai-ni NPS.

18:25 The Prime Minister directed evacuation of the residents within the 20km radius from Fukushima Dai-ichi NPS.

19:55 Directives from the Prime Minister was issued regarding seawater injection to Unit 1 of Fukushima Dai-ichi NPS.

20:05 Considering the Directives from the Prime Minister and pursuant to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to inject seawater to Unit 1 of Fukushima Dai-ichi NPS and so on.

20:20 At Unit 1 of Fukushima Dai-ichi NPS, seawater injection was started.

(March 13th)

05:38 TEPCO reported to NISA the event (Total loss of coolant injection function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS. Recovering efforts by TEPCO of the power source and coolant injection function and the work on venting were under way.

09:01 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

09:08 Pressure suppression and fresh water injection was started for Unit 3 of Fukushima Dai-ichi NPS.

09:20 The Pressure Vent Valve of Unit 3 of Fukushima Dai-ichi NPS was opened.

09:30 Directive was issued for the Governor of Fukushima Prefecture, the Mayors of Okuma Town, Futaba Town, Tomioka Town and Namie Town in accordance with the Act on Special Measures Concerning Nuclear Emergency Preparedness on the contents of radioactivity decontamination screening.

13:09 Tohoku Electric Power Co. reported to NISA that Onagawa NPS reached a situation specified in the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

13:12 Fresh water injection was switched to seawater injection for Unit 3 of Fukushima Dai-ichi NPS.

14:36 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 14th)

01:10 Seawater injection for Units 1 and 3 of Fukushima Dai-ichi NPS were temporarily interrupted due to the lack of seawater in pit.

03:20 Seawater injection for Unit 3 of Fukushima Dai-ichi NPS was resumed.

04:40 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on

Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

05:38 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:52 TEPCO reported to NISA the event (Unusual rise of the pressure in PCV) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS.

13:25 Regarding Unit 2 of Fukushima Dai-ichi NPS, TEPCO recognised the event (Loss of reactor cooling function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

22:13 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ni NPS.

22:35 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 15th)

00:00: The acceptance of experts from International Atomic Energy Agency (IAEA) was decided. NISA agreed to accept the offer of dispatching of the expert on NPS damage from IAEA considering the intention by Mr. Amano, Director General of IAEA. Therefore, the schedule of expert acceptance will be planned from now on according to the situation.

00:00: NISA also decided the acceptance of experts dispatched from U.S. Nuclear Regulatory Commission (NRC).

07:21 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:24 Incorporated Administration Agency, Japan Atomic Energy Agency

(JAEA) reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre.

07:44 JAEA reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Science Research Institute.

08:54 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

10:30 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the directions as follows.

For Unit 4: To extinguish fire and to prevent the occurrence of re-criticality

For Unit 2: To inject water to reactor vessel promptly and to vent Drywell.

10:59 Considering the possibility of lingering situation, it was decided that the function of the Local Nuclear Emergency Response Headquarters was moved to the Fukushima Prefectural Office.

11:00 The Prime Minister directed the in-house stay area.

In-house stay was additionally directed to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS considering in-reactor situation.

16:30 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

22:00 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the following direction.

For Unit 4: To implement the water injection to the Spent Fuel Pool.

23:46 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 18th)

13:00 Ministry of Education, Culture, Sports, Science and Technology decided to reinforce the nation-wide monitoring survey in the emergency of Fukushima Dai-ichi and Dai-ni NPS.

15:55 TEPCO reported to NISA on the accidents and failure at Units 1, 2, 3 and 4 of Fukushima Dai-ichi NPS (Leakage of the radioactive materials inside of the reactor buildings to non-controlled area of radiation) pursuant to the Article 62-3 of the Nuclear Regulation Act.

16:48 Japan Atomic Power Co. reported to NISA accidents and failures in Tokai NPS (Failure of the seawater pump motor of the Emergency Diesel Generator 2C) pursuant to the Article 62-3 of the Nuclear Regulation Act.

(March 19th)

07:44 The second unit of Emergency Diesel Generator (A) for Unit 6 started up.

TEPCO reported to NISA that the pump for RHR (C) for Unit 5 started up and started to cooling Spent Fuel Storage Pool. (Power supply: Emergency Diesel Generator for Unit 6)

08:58 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 20th)

23:30 Directive from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisoma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village) was issued regarding the change of the reference value for the screening level for decontamination of radioactivity.

(March 21st)

07:45 Directive titled as "Administration of the stable Iodine" was issued from Local Nuclear Emergency Response Headquarters to the

Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and the heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

16:45 Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" was issued from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

17:50 Directive from the Director-general of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Gunma was issued, which direct the above-mentioned governors to issue a request to relevant businesses and people to suspend shipment of spinach, *Kakina* (a green vegetable) and raw milk for the time being.

(March 22nd)

16:00 NISA received the response (Advice) from Nuclear Safety Commission Emergency Technical Advisory Body to the request for advice made by NISA, regarding the report from TEPCO titled as "The Results of Analysis of Seawater" dated March 22nd.

(March 25th)

NISA directed orally to the TEPCO regarding the exposure of workers at the turbine building of Unit 3 of Fukushima Dai-ichi Nuclear Power Station occurred on March 24th, to review immediately and to improve its radiation control measures from the viewpoint of preventing a recurrence.

(March 28th)

Regarding the mistake in the evaluation of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, NISA directed TEPCO orally to prevent the recurrence of such a mistake.

13:50 Receiving the suggestion by the special meeting of Nuclear Safety Commission (NSC) (Stagnant water on the underground floor of the turbine building at Fukushima Dai-ichi Plant Unit 2), NISA directed TEPCO orally to add the sea water monitoring points and carry out the groundwater monitoring.

Regarding the delay in the reporting of the water confirmed outside of the turbine buildings, NISA directed TEPCO to accomplish the communication in the company on significant information in a timely manner and to report it in a timely and appropriate manner.

(March 29th)

11:16 The report was received, regarding the accident and trouble etc. in Onagawa NPS of Tohoku Electric Power Co. Inc. (the trouble of pump of component cooling water system etc. in Unit 2 and the fall of heavy oil tank for auxiliary boiler of Unit 1 by tsunami), pursuant to the Article 62-3 of the Nuclear Regulation Act and the Article 3 of the Ministerial Ordinance for the Reports related to Electricity.

In order to strengthen the system to assist the nuclear accident sufferers, the "Team to Assist the Lives of the Nuclear Accident Sufferers" headed by the Minister of Economy, Trade and Industry was established and the visits, etc. by the team to relevant cities, towns and villages were carried out.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.1 for the residents within the area from 20 km to 30 km radius.

(March 30th)

Directions as to the implementation of the emergency safety measures for the other power stations considering the accident of Fukushima Dai-ichi and Dai-ni NPSs in 2011 was issued and handed to each electric power company and the relevant organization.

(March 31st)

Regarding the break-in of the propaganda vehicle to Fukushima Dai-ni NPS on 31 March, NISA directed TEPCO orally to take the carefully thought-out measures regarding physical protection, etc.

NISA alerted TEPCO to taking the carefully though-out measures regarding radiation control for workers.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.2 for the residents within the area from 20 km to 30 km radius.

(April 1st)

NISA strictly alerted TEPCO to taking appropriate measures concerning the following three matters regarding the mistake in the result of nuclide analysis.

- Regarding the past evaluation results on nuclide analysis, all the nuclides erroneously evaluated should be identified and the re-evaluation on them should be promptly carried out.
- The causes for the erroneous evaluation should be investigated and the thorough measures for preventing the recurrence should be taken.
- Immediate notification should be done in the stage when any erroneous evaluation results, etc. are identified.

(April 2nd)

Regarding the outflow of the liquid including radioactive materials from the area around the Intake Channel of Unit 2 of Fukushima Dai-ichi NPS, NISA directed TEPCO orally to carry out nuclide analysis of the liquid sampled, to confirm whether there are other outflows from the same parts of the facilities as the one, from which the outflow was confirmed around the Unit 2, and to strengthen monitoring through sampling water at more points around the facilities concerned.

(April 4th)

On the imperative execution of the discharge to the sea as an emergency measure, NISA requested the technical advice of NSC and directed TEPCO to survey and confirm the impact of the spread of radioactive materials caused by the discharge, by ensuring continuity of the sea monitoring currently underway and enhancing it (Increase of the frequency of measuring as well as the number of monitoring points), disclose required information, as well as to enhance the strategy to minimize the discharge amount.

(April 5th)

Directions as to the implementation of advance notification and contact to the local governments with regard to taking measures related to discharge of radioactive materials from Fukushima Dai-ichi NPS, which have a possible impact on the environment, was issued.

(April 6th)

On the implementation of the nitrogen injection to PCV of Unit 1, NISA directed TEPCO on the following three points. (12:40 April 6th) ① Properly control the plant parameters, and take measures appropriately to ensure safety in response to changes in the parameters. ②Establish and implement an organizational structure and so on that will ensure the safety of the workers who will engage in the operation. ③As the possibility of leakage of the air in PCV to the outside due to the nitrogen injection cannot be ruled out, through the judicious and further enhanced monitoring, TEPCO shall survey and confirm the impact of the release and spreading of radioactive materials due to the nitrogen injection, and strive to disclose information.

(April 7th)

The Local Nuclear Emergency Response Headquarters issued the

News Letter No.3 for the residents within the area from 20km to 30km radius. (April 7th)

(April 9th)

Due to the earthquake off the coast of Miyagi Prefecture occurred around 23:32 April 7th, all the Emergency Diesel Generators for Unit 1 of the Higashidori NPS of Tohoku Electric Power Co., Inc. were not workable. Considering this event, NISA issued the letters of direction titled "Regarding the Treatment of Emergency Power Generating Facilities in Terms of Safety Regulations (Directions)" to each Electricity Utility and other organizations concerned.

In accordance with the Paragraph 1, the Article 67 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the evaluation of necessity and safety, and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 10th)

In accordance with Article 67, paragraph 1 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the necessity, the evaluation of safety and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 13th)

- In accordance with paragraph 1, Article 67 of the Nuclear Regulation Act, NISA directed TEPCO to report the result of implementation on seismic safety evaluation as well as the result of consideration on the measurement of effective seismic reinforcement work, etc., regarding the buildings of Fukushima Dai-ichi NPS.
- NISA directed TEPCO to implement detailed analysis and

consideration regarding the tsunami caused by the 2011 Tohoku District - off the Pacific Ocean Earthquake.

- NISA directed Tohoku Electric Power Co. Inc. to report the analysis of seismic data observed when the 2011 Earthquake off the Coast of Miyagi Prefecture occurred around 23:32 on 7 April and the assessment on seismic impact on the facilities that are important from the seismic safety viewpoints.

(April 14th)

- NISA directed TEPCO orally to strengthen the monitoring of the Sub Drain (the groundwater collected and controlled in the facilities) of Units 1 and 2, because the radioactive concentration of the water sampled on 13 April rose one digit up in comparison with the preceding result.

(April 15th)

- NISA strictly alerted TEPCO and directed it orally to prepare the measures for preventing the recurrence regarding the delay in the notification of the dismissal of Nuclear Emergency Preparedness Manager, accompanied with the personnel changes dated on 1 April, in accordance with Article 9, paragraph 5 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.
- NISA directed General Electricity Utilities and other organizations concerned to consider the measures to ensure reliability on external power supply due to the temporary loss of external power supply at NPSs, etc., caused by ground faults in part of electric power system when the earthquake off the coast of Miyagi Prefecture occurred on April 7, 2011.

(April 18th)

- NISA accepted (18 April) and confirmed (19 April) the report from TEPCO, in accordance with the direction for the collection of report issued on 10 April, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

< Possibility on radiation exposure (As of 15:00 April 19th) >

1. Exposure of residents

(1) Including the about 60 evacuees from Futaba Public Welfare Hospital to Nihonmatsu City Fukushima Gender Equality Centre, as the result of measurement of 133 persons at the Centre, 23 persons counted more than 13,000 cpm were decontaminated.

(2) The 35 residents transferred from Futaba Public Welfare Hospital to Kawamata Town Saiseikai Kawamata Hospital by private bus arranged by Fukushima Prefecture were judged to be not contaminated by the Prefectural Response Centre.

(3) As for the about 100 residents in Futaba Town evacuated by bus, the results of measurement for 9 of the 100 residents were as follows. The evacuees, moving outside the Prefecture (Miyagi Prefecture), were divided into two groups, which joined later to Nihonmatsu City Fukushima Gender Equality Centre.

No. of Counts	No. of Persons
18,000 cpm	1
30,000-36,000 cpm	1
40,000 cpm	1
little less than 40,000 cpm*	1
very small counts	5

*(These results were measured without shoes, though the first measurement exceeded 100,000 cpm.)

(4) The screening was started at the Off site Centre in Okuma Town from March 12th to 15th. 162 people received examination until now. At the beginning, the reference value was set at 6,000 cpm. 110 people were at the level below 6,000 cpm and 41 people were at the level of 6,000 cpm or more. When the reference value was increased to 13,000 cpm afterward, 8 people were at the level below 13,000 cpm and 3 people are at the level of 13,000 cpm or more.

The 5 out of 162 people examined were transported to hospital after being decontaminated.

(5) The Fukushima Prefecture carried out the evacuation of patients and personnel of the hospitals located within 10km area. The screening of all the members showed that 3 persons have the high counting rate. These members were transported to the secondary medical institute of exposure. As a result of the screening on 60 fire fighting personnel involved in the transportation activities, the radioactivity higher than twice of the back ground was detected on 3 members. Therefore, all the 60 members were decontaminated.

(6) Fukushima Prefecture has started the screening from 13 March. It is carried out at the evacuation sites and the 11 places (set up permanently) such as health offices. Up until April 17th, the screening was done to 159,269 people. Among them, 102 people were above the 100,000 cpm, but when measured these people again without clothes, etc., the counts decreased to 100,000 cpm and below, and there was no case which affects health.

2. Exposure of workers

As for the workers conducting operations in Fukushima Dai-ichi NPS, the total number of people who were at the level of exposure more than 100 mSv becomes 29.

For two out of the three workers who were confirmed to be at the level of exposure more than 170 mSv on March 24, the attachment of radioactive material on the skin of both legs was confirmed. As the two workers were judged to have a possibility of beta ray burn, they were transferred to the Fukushima Medical University Hospital, and after that, on March 25th, all of the three workers arrived at the National Institute of Radiological Sciences in the Chiba Prefecture. As the result of examination, the level of exposure of their legs was estimated to be from 2 to 3 Sv. The level of exposure of both legs and internal did not require medical treatment, but they decided to monitor the progress of all three workers in the hospital. All the three workers have been discharged from the hospital around the noon on 28 March. The three workers had the second medical examination at the National Institute of Radiological

Sciences on 11 April, as a result, there was no problem regarding the condition of their health. The two workers who had been partially exposed to radiation on their skin of both legs were judged that any conditions of burn or red spots were not found on their skin.

At around 11:35 April 1st, a worker fell into the sea when he went on board the barge of the US Armed forces in order to adjust the hose. He was rescued immediately by other workers around without any injury and external contamination. In order to make double sure, the measurement by a whole-body counter was implemented. As a result, it was evaluated that there was no internal radionuclide contaminant on April 12th.

3. Others

(1) 4 members of Self-Defence Force who worked in Fukushima Dai-ichi NPS were injured by explosion. One member was transferred to National Institute of Radiological Sciences. After the examination, judged that there were wounds but no risk for health from the exposure, the one was released from the hospital on March 17th. No other exposure of the Self-Defence Force member was confirmed at the Ministry of Defence.

(2) As for policeman, the decontaminations of two policemen were confirmed by the National Police Agency. Nothing unusual was reported.

(3) On March 24th, examinations of thyroid gland for 66 children aged from 1 to 15 years old were carried out at the Kawamata Town public health Center. The result was at not at the level of having harmful influence.

(4) From March 26th to 27th, examinations of thyroid gland for 137 children aged from 0 to 15 years old were carried out at the Iwaki City Public Health Center. The result was not at the level of having harmful influence.

(5) From March 28th to 30th, examinations of thyroid gland for 946 children aged from 0 to 15 years old were carried out at the Kawamata Town Community Center and the Iitate Village Office. The result was not at the level of having harmful influence.

<Directive of screening levels for decontamination of radioactivity>

(1) On March 20th, the Local Nuclear Emergency Response Headquarters issued the directive to change the reference value for the screening level for decontamination of radioactivity as the following to the Prefectural

Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

Old: 40 Bq/cm^2 measured by a gamma-ray survey meter or 6,000 cpm

New: 1 μ Sv/hour (dose rate at 10cm distance) or 100,000cpm equivalent

<Directives of administrating stable Iodine during evacuation>

(1) On March 16th, the Local Nuclear Emergency Response Headquarters issued "Directive to administer the stable Iodine during evacuation from the evacuation area (20 km radius)" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

(2) On March 21st, the Local Nuclear Emergency Response Headquarters issued Directive titled as "Administration of the stable Iodine" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

<Situation of the injured (As of 15:00 April 19th)>

1. Injury in Unit 1 of Fukushima Dai-ichi NPS due to earthquake on 11 March
   - Two employees (slightly, have already returned to work)
   - Two employees (a cut by a broken glass by earthquake and tsunami, have already returned to work)
   - One employee (a scratch when evacuating, has already returned to work)
   - One subcontract employee (fracture in both legs, be in hospital)
   - Two died (After the earthquake, two TEPCO's employees missed and had been searched continuously. In the afternoon of March 30th, the two

employees were found on the basement floor of the turbine building of Unit 4 and were confirmed dead by April 2nd.)

2. Injury due to the explosion of Unit 1 of Fukushima Dai-ichi NPS on 12 March
   - Four employees (two TEPCO's employees and two subcontractor's employees) were injured at the explosion and smoke of Unit 1 around the turbine building (non-controlled area of radiation) and were examined by Kawauchi Clinic. Two TEPCO's employees return to work again and two subcontractors' employees are under home treatment.

3. Injury due to the explosion of Unit 3 of Fukushima Dai-ichi NPS on 14 March.
   - Four TEPCO's employees (They have already returned to work.)
   - Three subcontractor's employees (They have already returned to work.)
   - Four members of Self-Defence Force (one of them was transported to National Institute of Radiological Sciences considering internal possible exposure. The examination resulted in no internal exposure. The member was discharged from the institute on March 17th.)

4. Other injuries
   - On the earthquake on 11 March, one subcontractor's employees (a crane operator) died in Fukushima Dai-ni NPS. (It seems that the tower crane broke and the operator room was crushed and the person was hit on the head.)
   - One subcontractor's employee was transported to the hospital on March 11th. (Later, turned out a cerebral infarction)
   - One emergency patient on 12 March. (a cerebral stroke, transported by the ambulance, be in hospital)
   - Ambulance was requested for one employee complaining the pain at left chest outside of control area on March 12. (Conscious, under home treatment)
   - One employee suffered lacerations on his left arm and was transported to the hospital for treatment on March 12th. (Has already returned to work)

- Two employees complaining discomfort wearing full-face mask in the main control room were transported to Fukushima Dai-ni NPS for a consultation with an industrial doctor on 13 March. (One employee has already returned to work and the other is under home treatment.)
- Two subcontractor's employees were injured during working at temporary control panel of power source in the Common Spent Fuel Pool, transported to where were industrial medical doctors the Fukushima Dai-ni NPS on 22 and 23 March. (One employee has already returned to work and the other is under home treatment.)
- On the afternoon of 7 April, a worker who was making sandbags at the soil disposal yard (spoil bank) on the north side of Fukushima Dai-ichi NPS got sick and was transported to J-Village for the body survey of contamination of radioactive materials. Being confirmed to be free from contamination, the worker was taken to the Iwaki City Kyouritsu Hospital by ambulance. On 8 April, the worker was diagnosed as dehydration and transient unconsciousness.
- At 09:19 April 9th, one subcontractor's employee was transported to a hospital as the worker wearing full-face mask felt discomfort during the work for cable processing in the Building of Water Processing, stepped on the manhole outside the building, which lid was shifted, and injured. As a result of medical examination, the worker was diagnosed as a right knee contusion and suspect of right knee medial collateral ligament injury. Furthermore, as a result of the body survey, it was confirmed that the worker was free from contamination of radioactive materials.
- Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body

<Situation of resident evacuation (As of 15:00 April 19th)>

At 11:00 March 15th, the Prime Minister directed in-house stay to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS. The directive was conveyed to Fukushima Prefecture and related municipalities.

Regarding the evacuation as far as 20-km from Fukushima Dai-ichi NPS and 10-km from Fukushima Dai-ni NPS, necessary measures have already been taken.

- The in-house stay in the area from 20 km to 30 km from Fukushima Dai-ichi NPS is made fully known to the residents concerned.
- Cooperating with Fukushima Prefecture, livelihood support to the residents in the in-house stay area are implemented.
- On March 28th, Chief Cabinet Secretary mentioned the continuation of the limited-access within the area of 20 km from Fukushima Dai-ichi NPS. On the same day, the Local Nuclear Emergency Response Headquarters notified the related municipalities of forbidding entry to the evacuation area within the 20 km zone.

<Directives regarding foods and drinks>

Directive from the Director-General of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Chiba was issued, which directed above-mentioned governors to suspend shipment and so on of the following products for the time being.

The Government Nuclear Emergency Response Headquarters organized the thoughts of imposing and lifting restrictions on shipment as follows, considering the NSC's advice.

- The area where restrictions on shipment to be imposed or lifted could be decided in units of the area where a prefecture is divided into, such as cities, towns, villages and so on, considering the spread of the contamination affected area and the actual situation of produce collection, etc.
- The restriction on shipment of the item, of which the result of the sample test exceeded the provisional regulation limits, shall be decided by judging in a comprehensive manner considering the regional spread of the contamination impact.
- Lifting the restrictions on shipment shall be implemented when a series of three results of nearly weekly tests for the item or the area falls below the provisional regulation limits, considering the situation of the Fukushima Dai-ichi NPS.

- However, the tests shall be carried out nearly weekly after the lifting, while the release of the radioactive materials from the NPS continues.

(1) Items under the suspension of shipment and restriction of intake (As of 15:00 April 19th)

Prefectures	Suspension of shipment	Restriction of intake
Fukushima Prefecture	Non-head type leafy vegetables, head type leafy vegetables , flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna*, Kukitachina*, Shinobufuyuna**, Rape, *Chijirena, Santouna*, Kousaitai*, Kakina*, etc.*), Turnip, Raw milk (Except some areas**) and Shiitake (only ones grown on raw lumber in an open field of Date-City, Souma-City, Minamisouma-City, Tamura-City, Iwaki-City, Sinchi-Town, Kawamata-Town, Namie-Town, Futaba-Town, Ookuma-Town, Tomioka-Town, Naraha-Town, Hirono-Town, Iitate-Village, Katsurao-Village , Kawauchi-Village and Fukushima-City)	Non-head type leafy vegetables, head type leafy vegetables, flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna*, Kukitachina*, Shinobufuyuna,* Rape, *Chijirena, Santouna*, Kousaitai*, Kakina*, etc.*) , Shiitake (only ones grown on raw lumber in an open field of Iitate-Village)
Ibaraki Pref.	Spinach (only ones produced in Kitaibaraki City and Takahagi City)	

Tochigi Pref.	Spinach	
Chiba Pref.	- Spinach from Katori-City and Tako-Town - Spinach, Qing-geng-cai, Garland chrysanthemum, Sanchu Asian lettuce, Celery and Parsley from Asahi City	

*a green vegetable

**Kitakata-City, Bandai-Town, Inawashiro-Town, Mishima-Town, Aizumisato-Town, Shimogo-Town, Minamiaizu-Town, Fukushima-City, Nihonmatsu-City, Date-City, Motomiya-City, Koriyama-City, Sukagawa-City, Tamura-City (except former Miyakoji-Village area), Shirakawa-City, Iwaki-City, Kunimi-Town, Kagami-ishi-Town, Ishikawa-Town, Asakawa-Town, Furudono-Town, Miharu-Town, Ono-Town, Yabuki-Town, Yamatsuri-Town, Hanawa-Town, Otama-Village, Hirata-Village, Nishigo-Village, Izumizaki-Village, Nakajima-Village, Samegawa-Village

(2) Request for restriction of drinking for tap-water (As of 15:00 April 19th)

Scope under restriction	Water service (Local governments requested for restriction)
All residents	None
Babies ・Water services that continue to respond to the directive	<Fukushima Prefecture> Iitate small water service (Iitate Village, Fukushima Prefecture)
・Tap-water supply service that continues to respond to the directive	None

<Directive regarding the ventilation when using heating equipments in the aria of indoor evacuation >

On March 21st, Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Iwaki City, Tamura City, Minamisouma City, Hirono Town, Kawauchi Village, Namie Town, Katsurao Village, and Iitate Village) was issued, which directs those governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

< Fire Bureaus' Activities>

- From 11:00 till around 14:00 on March 22nd, Niigata-City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the set up of large decontamination system.
- From 8:30 till 9:30, from 13:30 till 14:30 on March 23rd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the operation of large decontamination system.

(Contact Person)
Mr. Toshihiro Bannai
Director, International Affairs Office, NISA/METI
Phone:+81-(0)3-3501-1087

From:	PMT10 Hoc
Sent:	Tuesday, April 19, 2011 6:59 PM
To:	skeith@cdc.gov
Subject:	FW: TEPCO "Roadmap towards Restoration" OFFICIAL USE ONLY
Attachments:	TEPCO.zip; NRC Site Team Quick Look Assessment of TEPCO Roadmap.docx

For ability to work remotely with NRC on this.

From: Hoc, PMT12
Sent: Sunday, April 17, 2011 9:40 PM
To: PMT10 Hoc
Subject: FW: TEPCO "Roadmap towards Restoration"

From: Boger, Bruce
Sent: Sunday, April 17, 2011 6:11 PM
To: OST01 HOC
Cc: RST01 Hoc; Hoc, PMT12; LIA08 Hoc; Zimmerman, Roy; Uhle, Jennifer; Tracy, Glenn; Andersen, James; Reynolds, Steven
Subject: FW: TEPCO "Roadmap towards Restoration"

Please create a new tasker for NRR to provide comments on the attached TEPCO roadmap. Quick look comments provided to the Ambassador and Secretary Clinton were quickly coordinated this morning and are also attached. Deeper consideration is desired. High priority for now, subject to the determination of a due date by the Japan Team. Send to NRR POC Pat Hiland and Bill Ruland. Thanks.

From: Zimmerman, Roy
Sent: Sunday, April 17, 2011 9:01 AM
To: Virgilio, Martin; Weber, Michael; Boger, Bruce; Wiggins, Jim
Subject: FW: TEPCO "Roadmap towards Restoration"

From: OST01 HOC
Sent: Sunday, April 17, 2011 5:37 AM
To: Castleman, Patrick; Orders, William; Franovich, Mike; Hipschman, Thomas; Snodderly, Michael
Cc: Hoc, PMT12; RST01 Hoc; LIA08 Hoc; Tracy, Glenn; Zimmerman, Roy
Subject: TEPCO "Roadmap towards Restoration"

On April 17, TEPCO presented the attached Roadmap to Restoration, and METI provided a subsequent statement. DOS has requested NRC's thoughts on the plan through brief, high-level bullets to be used by the SoS upon her return to the US. The HOC Team and Japan Team are drafting points at this time. Requested by noon, Sunday 4/17 to DOS Embassy.

000/327

From: PROTOCOLOFFICE-EM [mailto:protocoloffice-em@mofa.go.jp]
Sent: Sunday, April 17, 2011 4:43 PM
To: PROTOCOLOFFICE-EM
Subject: Urgent: Roadmap towards Restoration

URGENT (15:50) Sunday 17 April 2011

To All Missions (Embassies, Consular posts and International Organizations in Japan)

Please find attached the "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station", that was made public at the press conference by Mr. Tsunehisa Katsumata, Chairman of the Tokyo Electric Power Company (TEPCO) at TEPCO headquarters at 3 pm today.

Please also find attached the statement by Mr. Banri Kaieda, Minister of Economy, Trade and Industry at the press conference at METI following the announcement of the Roadmap by TEPCO.

The Missions are kindly requested to forward this message to their headquarters as soon as possible.

Contact: International Nuclear Energy Cooperation Division, Tel 03-5501-8227

Attachment TEPCO.zip(1255903 bytes) cannot be converted to PDF format.

NRC SITE TEAM QUICK-LOOK REVIEW OF THE TEPCO "ROADMAP TO RESTORATION"

April 17, 2011

This document is a Quick-Look review by the NRC Site Team of the TEPCO Roadmap Plan released today. In the near term a more comprehensive assessment of the Roadmap will be conducted by the NRC staff. On April 17, 2011, TEPCO announced publically their "Roadmap towards Restoration from the Accident at Fukushima Daiichi Nuclear Power Station." The Roadmap has a basic policy of "bringing the reactors and spent fuel pools to a stable cooling condition and mitigating the release of radioactive materials." It is a Two-Step Plan. Step 1 is a three-month plan to reduce radiation levels at the site. Step 2 is aimed at controlling radiation releases and radiation doses so that they are "significantly held down." Step 2, is set for about three to six months after completing Step 1.

Coincident with the release of the TEPCO document, Minister of Economy, Trade and Industry (METI), Mr. Banri Kaidea, released a statement. That statement suggests that TEPCO "ensure early implementation of the Roadmap." Also, that after Step 2, the government will review the "deliberate evacuation area" (evacuation) and the "evacuation prepared area" (sheltering) to determine whether residents can return to the evacuated areas.

The TEPCO Roadmap consists of three immediate action targets. They include actions to: 1. Cool the reactors and spent fuel pools, 2. Contain, process contaminated water and mitigate the release of radioactive material, and 3. Monitor and decontaminate the nuclear site and the surrounding areas.

The NRC Site Team quick-look review of the Roadmap concludes the following:

- It is encouraging that the Roadmap lays out a strategy
- Public disclosure of the Roadmap is very positive

- Actions and countermeasures are necessary for any plan to succeed. The TEPCO Roadmap contains such actions and countermeasures that could lead to achieving the Roadmap goals
- The NRC Site Team has identified areas of enhancements for consideration by the Government of Japan and TEPCO that may improve the effectiveness of the Roadmap. Those areas included the timing for certain activities and stabilizing actions relating to improved reactor and spent fuel pool safety
- The NRC and its partners will continue to provide their assistance and support to the resolution of the incident. We believe an enhanced Roadmap should provide a path forward to reach stable plant conditions, significantly reduce radiation levels, and provide proper controls for ingestion pathway activities, e.g., agricultural, fishing and habitation

News Release

経済産業省
Ministry of Economy, Trade and Industry

April 20, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 104th Release)
(As of 15:30 April 20th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tōhoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)
   - Fukushima Dai-ichi NPS
   - The work of sampling water that flowed out in the Skimmer Surge Tank from the Spent Fuel Pool of Unit 2 was carried out in order to grasp the condition of water in the pool. (April 16th) As a result of nuclide analysis of radioactive materials regarding the sampled water of the pool, 4.1×10^{3}Bq/ cm^3 of ^{131}I (Iodine), 1.6×10^{5}Bq/ cm^3 of ^{134}Cs (Cesium), 1.5×10^{5}Bq/ cm^3 of ^{137}Cs (Cesium) were detected. (April 17th)
   - The pump for Residual Heat Removal (RHR) was temporarily stopped in order to change the position of the hose of the temporary RHR Seawater System of Unit 6. (From 09:51 April 20th)

<Directives regarding foods and drinks>

Items under the suspension of shipment and restriction of intake were updated. (As of 15:30 April 20th)

0001328

(Attached sheet)

1. The state of operation at NPS (Number of automatic shutdown units: 10)

- Fukushima Dai-ichi NPS, TEPCO
  (Okuma Town and FutabaTown, Futaba County, Fukushima Prefecture)

(1) The state of operation

Unit 1 (460MWe):	automatic shutdown
Unit 2 (784MWe):	automatic shutdown
Unit 3 (784MWe):	automatic shutdown
Unit 4 (784MWe):	in periodic inspection outage
Unit 5 (784MWe):	in periodic inspection outage, cold shutdown at 14:30 March 20th
Unit 6 (1,100MWe):	in periodic inspection outage, cold shutdown at 19:27 March 20th

(2) Major Plant Parameters (As of 13:00 April 20th)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure*1 [MPa]	0.521(A) 1.179(B)	0.078(A) 0.072(D)	0.058(A) 0.012(C)	–	0.108	0.111
CV Pressure (D/W) [kPa]	160	80	104.5	–	–	–
Reactor Water Level*2 [mm]	-1,700(A) -1,700(B)	-1,500(A) -2,100(B)	-1,850(A) -2,250(B)	–	2,059	1,941
Suppression Pool Water Temperature (S/C) [℃]	53.2(A) 53.1(B)	73.7(A) 74.0(B)	42.8(A) 42.8(B)	–	–	–
Suppression Pool Pressure (S/C) [kPa]	160	Indicator Failure	174.1	–	–	–
Spent Fuel Pool Water Temperature [℃]	Indicator Failure	71.0	Indicator Failure	Indicator Failure	36.7	33.5
Time of Measurement	12:00 April 20th	12:00 April 20th	12:00 April 20th	April 20th	13:00 April 20th	13:00 April 20th

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (10:17 March 12th)
- Seawater injection to the Reactor Pressure Vessel (RPV) via the Fire Extinguish Line was started. (20:20 March 12th)
  →Temporary interruption of the injection (01:10 March 14th)
- The sound of explosion in Unit 1 occurred. (15:36 March 12th)
- The amount of injected water to the Reactor Core was increased by utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$). (02:33 March 23rd) Later, it was switched to the Feedwater Line only (around $11m^3/h$). (09:00 March 23rd)
- Lighting in the Central Operation Room was recovered. (11:30 March 24th)
- Fresh water injection to RPV was started. (15:37 March 25)
- As the result of concentration measurement in the stagnant water on the basement floor of the turbine building, $2.1 \times 10^5 Bq/cm^3$ of ^{131}I (Iodine) and $1.8 \times 10^6 Bq/cm^3$ of ^{137}Cs (Caesium) were detected as major radioactive nuclides.
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (08:32 March 29th.)
- The Stagnant water on the basement floor of the turbine building was started to be transferred to the Condenser around 17:00 March 24. As the Condenser was confirmed to be almost filled with water, pumping out of the water to the Condenser was stopped. (07:30 March 29th) In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank started to be transferred to the Surge Tank of Suppression Pool Water (A) (12:00 March 31th), after switching the place where the water was to be transferred to the Surge Tank of Suppression Pool Water (B) (15:25 March 31th), the transfer was

resumed and finished. (15:26 April 2nd)

- Water spray of around 90t (fresh water) over the Spent Fuel Pool using Concrete Pump Truck (62m class) was carried out. (From 13:03 till 16:04 March 31st) A test water spray using Concrete Pump Truck (62m class) was carried out in order to confirm the appropriate position for water spray. (From 17:16 till 17:19 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (10:42 to 11:52 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:02 April 3rd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (13:55 April 3rd)
- Aiming at reducing the possibility of hydrogen combustion in the Primary Containment Vessel (PCV), the operations for the injection of nitrogen to PCV were started. (22:30 April 6th)
- The start of nitrogen injection to PCV was confirmed. (01:31 April 7th)
- The nitrogen injection to PCV was switched to the generator of high purity nitrogen. (04:10 April 9th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (09:30 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost and the fresh water injection to RPV and the nitrogen injection to PVC were suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The nitrogen injection to PCV was started. (23:34 April 11th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 16:00 till 17:30 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 11:50 till 12:12 April 18th)

- White smoke was not confirmed to generate. (As of 06:30 April 20th)
- Fresh water injection to RPV is being carried out. (As of 15:30 April 20th)

<Unit 2>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (11:00 March 13th)
- The Blow-out Panel of reactor building was opened due to the explosion in the reactor building of Unit 3. (After 11:00 March 14th)
- Reactor water level tended to decrease. (13:18 March 14th) TEPCO reported to NISA the event (Loss of reactor cooling functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:49 March 14th)
- Seawater injection to RPV via the Fire Extinguish line was started. (16:34 March 14th)
- Water level in RPV tended to decrease. (22:50 March 14th)
- Started to vent (0:02 March 15th)
- A sound of explosion was made in Unit 2. As the pressure in Suppression Pool (Suppression Chamber) decreased (06:10 March 15th), there was a possibility that an incident occurred in the Chamber. (About 06:20 March 15th)
- Electric power receiving at the emergency power source transformer from the external transmission line was completed. The work for laying the electric cable from the facility to the load side was carried out. (13:30 March 19th)
- Seawater injection of 40t to the Spent Fuel Pool was started. (From 15:05 till 17:20 March 20th)
- Power Center received electricity (15:46 March 20th)
- White smoke generated. (18:22 March 21st)
- White smoke was died down and almost invisible. (As of 07:11 March 22nd)
- Seawater injection of 18t to the Spent Fuel Pool was carried out. (From 16:07 till 17:01 March 22nd)

- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:30 till 12:19 March 25th)
- Fresh water injection to RPV was started. (10:10 March 26th)
- Lighting of Central Operation Room was recovered (16:46 March26th)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump.(18:31 March 27th)
- Regarding the result of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, TEPCO reported to NISA that as the result of analysis and evaluation through re-sampling, judging the measured value of ^{134}I (Iodine) was wrong, the concentrations of gamma nuclides including ^{134}I (Iodine) were less than the detection limit. (00:07 March 28).
- Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump. (From 16:30 till 18:25 March 29th)
- As the malfunction of the temporary motor-driven pump, which had been injecting to the Spent Fuel Pool since 09:25 March 30th, was confirmed at 09:45 March 30th, the injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. Fresh water injection was resumed. (From 19:05 till 23:50 March 30th)
- Fresh water injection of around 70t to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 14:56 till 17:05 April 1st)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank was transferred to the Surge Tank of Suppression Pool Water. (From 16:45 March 29th till 11:50 April 1st)
- The water, of which the dose rate was at the level of more than 1,000 mSv/h, was confirmed to be collected in the pit (a vertical portion of an underground structure) for laying electric cables, located near the Intake Channel. In addition, the outflow from the crack with a length of around 20 cm in the concrete portion of the lateral surface of the pit into the sea was confirmed. (Around 09:30 April 2nd) In order to stop the

outflow, concrete was poured into the pit. (16:25, 19:02 April 2nd)

- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (17:10 April 2nd)
- The cameras for monitoring the water levels in the vertical part of the trench outside of the turbine building and on the basement floor of the turbine building were installed. (April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:22 till 12:06 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- As the measure to prevent the outflow of the water accumulated in the Pits for Conduit in the area around the Inlet Bar Screen, the upper part of the Power Cable Trench for power source at Intake Channel was crushed and 20 bags of sawdust (3 kg/bag), 80 bags of high polymer absorbent (100 g/bag) and 3 bags of cutting-processed newspaper (Large garbage bag) were put inside. (From 13:47 till 14:30 April 3rd)
- Approximately 13kg of tracer (milk white bath agent) was put in from the Pit for the Duct for Seawater Pipe. (From 07:08 till 07:11 April 4th)
- Fresh water injection (Around 70t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 11:05 till 13:37 April 4th)
- The tracer solution was put in from the two holes dug around the Pit for the Conduit near the Inlet Bar Screen of Unit 2 and was confirmed to be flowed out from the crack to the sea. (14:15 April 5th) The coagulant (soluble glass) started to be injected from the holes around the Pit in order to prevent the outflow of the water. (15:07 April 5th) The outflow of the water was confirmed to stop. (Around 05:38 April 6th) In addition, it was confirmed that the water level in the turbine building did not rise. Furthermore, the measurements to stop water by means of rubber board and jig (prop) were implemented at the outflowing point. (Finished at 13: 15 April 6th)

- One more pump for the transfer of the water in the Condenser to the Condensate Storage Tank was installed. (Two pumps in total: 30 m^3/h) (Around 15:40 April 5th)
- Fresh water injection (Around 36t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 13:39 till 14:34 April 7th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (13:10 April 9th)
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:37 till 12:38 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The stagnant water in the trench of the turbine building was started to be transferred to the Hot Well of the Condenser using a submersible pump (19:35 April 12th) Thereafter it was confirmed that no leakage was found, the transfer of stagnant water resumed from 15:02 April 13th and was stopped 17:04 April 13th. The amount of transfer was about 660t.
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Cooling Line was carried out. (From 13:15 till 14:55 April 13th)
- Fresh water injection (Around 45t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:13 till 11:54 April 16th. Due to the occurrence of earthquake at around 11:19, the temporary motor-driven pump was stopped at 11:39. The Spent Fuel Pool was confirmed to be filled with water by the increase of Skimmer Level at 11:54.)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 12:13 till 12:37 April 18th)
- Confirmation of situations, etc. using an unmanned robot at the reactor building was carried out. (From 13:42 till 14:33 April 18th)
- Injection of around 17,000L of the coagulant (soluble glass) to the Power Cable Trench was carried out. (From 09:30 till 17:40 April 18th)

- The work of sampling water that flowed out in the Skimmer Surge Tank from the Spent Fuel Pool was carried out in order to grasp the condition of water in the pool. (April 16th) As a result of nuclide analysis of radioactive materials regarding the sampled water of the pool, 4.1×10^3Bq/cm^3 of ^{131}I (Iodine), 1.6×10^5Bq/cm^3 of ^{134}Cs (Cesium), 1.5×10^5Bq/ cm^3 of ^{137}Cs (Cesium) were detected. (April 17th)
- The stagnant water (stagnant water with high-level radioactivity) in the trench of the turbine building* was started to be transferred to the Radioactive Waste Treatment Facilities (From 10:08 April 19th)
- Fresh water injection (Around 47t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 16:08 till 17:28 April 19th)
- Injection of around 7,000L of the coagulant (soluble glass) to the Power Cable Trench was carried out.(From 08:00 till 15:30 April 19th)
- White smoke was confirmed to generate continuously. (As of 06:30 April 20th)
- Fresh water injection to RPV is being carried out. (As of 15:30 April 20th)

* (corrected explanation, April 21st)

<Unit 3>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (05:10 March 13th)
- Started to vent (08:41 March 13th)
- Fresh water started to be injected to RPV via the Fire Extinguish Line. (11:55 March 13th)
- Seawater started to be injected to RPV via the Fire Extinguish Line. (13:12 March 13th)
- Seawater injection for Units 1 and 3 was suspended due to the lack of seawater in pit. (01:10 March 14th)
- Seawater injection to RPV for Unit 3 was resumed. (03:20 March 14th)
- Started to vent. (05:20 March 14th)
- PCV rose unusually. (07:44 March 14th) TEPCO reported to NISA on

the event falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (7:52 March 14th)

- The explosion like Unit 1 occurred around the reactor building (11:01 March 14th)
- The white smoke like steam generated. (08:30 March 16th)
- Because of the possibility that PCV was damaged, the workers evacuated from the main control room (common control room). (10:45 March 16th) Thereafter the operators returned to the room and resumed the operation of water injection. (11:30 March 16th)
- Seawater was discharged 4 times to Unit 3 by the helicopters of the Self-Defence Force. (9:48, 9:52, 9:58 and 10:01 March 17th)
- The riot police arrived at the site for the water spray from the grand. (16:10 March 17th)
- The Self-Defence Force started the water spray using a fire engine. (19:35 March 17th)
- The water spray from the ground was carried out by the riot police. (From 19:05 till 19:13 March 17th)
- The water spray from the ground was carried out by the Self-Defense Force using 5 fire engines. (19:35, 19:45, 19:53, 20:00 and 20:07 March 17th)
- The water spray from the ground using 6 fire engines (6 tons of water spray per engine) was carried out by the Self-Defence Force. (From before 14:00 till 14:38 March 18th)
- The water spray from the ground using a fire engine provided by the US Military was carried out. (Finished at 14:45 March 18th)
- Hyper Rescue Unit of Tokyo Fire Department carried out the water spray. (Finished at 03:40 March 20th)
- The pressure in PCV rose (320 kPa at 11:00 March 20th). Preparation to lower the pressure was carried out. Judging from the situation, immediate pressure relief was not required. Monitoring the pressure continues. (120 kPa at 12:15 March 21st)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool of Unit 3 by Hyper Rescue Unit of Tokyo Fire Department was carried out. (From 21:30 March 20th till 03:58 March 21st)

- Grayish smoke generated. (Around 15:55 March 21st)
- The smoke was confirmed to be died down. (17:55 March 21st)
- Grayish smoke changed to be whitish and seems to be ceasing. (As of 07:11 March 22nd)
- Water spray (Around 180t) by Tokyo Fire Department and Osaka City Fire Bureau was carried out. (From 15:10 till 16:00 March 22nd)
- Lighting was recovered in the Central Operation Room. (22:43 March 22nd)
- Seawater injection of 35t to the Spent Fuel Pool via the Fuel Pool Cooling Line was carried out.. (From 11:03 till 13:20 March 23rd) Around 120t of seawater was injected. (From around 5:35 till around 16:05 March 24th)
- Slightly blackish smoke generated from the reactor building. (Around 16:20 March 23rd) Around 23:30 March 23rd and around 4:50 March 24th, it was reported that the smoke seemed to cease.
- As the results of the survey of the stagnant water, into which workers who were laying electric cable on the ground floor and the basement floor of the turbine building walked, the dose rate on the water surface was around 400mSv/h, and as the result of gamma-ray analysis of the sampling water, the totaled concentration of each nuclide of the sampling water was around 3.9×10^6 Bq/cm^3.
- Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department was carried out. (From 13:28 till 16:00 March 25th)
- Fresh water injection to RPV was started. (18:02 March 25th)
- Seawater spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 12:34 till 14:36 March 27th)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water. (From 17:40 March 28th till around 8:40 March 31st)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (20:30 March 28th)
- Fresh water spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 14:17 till 18:18 March 29th)

- Fresh water spray of around 105t using Concrete Pump Truck (52m class) was carried out. (From 16:30 till 19:33 March 31st)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 09:52 till 12:54 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- The camera for monitoring the water level in the vertical part of the trench outside of the turbine building was installed. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:03 till 12:16 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:18 April 3rd)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 17:03 till 19:19 April 4th)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 06:53 till 08:53 April 7th)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 17:06 till 20:00 April 8th)
- Fresh water spray of around 80t using Concrete Pump Truck (52m class) was carried out. (From 17:15 till 19:15 April 10th)
- Due to the occurrence of earthquake, the external power supply for Units 1 and 2 was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- Because the external power supply for Units 1 and 2 was recovered (17:56 April 11th), fresh water injection to RPV was resumed. (18:04 April 11th)
- Fresh water spray of around 35t using Concrete Pump Truck (62m class) was carried out. (From 16:26 till 17:16 April 12th)
- Fresh water spray around 25t using Concrete Pump Truck (62m class) was started. (From 15:56 till 16:32 April 14th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 11:30 till 14:00 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (12:38 till 13:05 April 18th)

- Fresh water spray of around 30t over the Spent Fuel Pool using Concrete Pump Truck (62m class) was started. (From 14:17 till 15:02 April 18th)
- White smoke was confirmed to generate continuously (As of 06:30 April 20th)
- Fresh water injection to RPV is being carried out. (As of 15:30 April 20th)

<Unit 4>

- Because of the replacement work of the Shroud of RPV, no fuel was inside the RPV.
- The temperature of water in the Spent Fuel Pool had increased. (84 ℃ at 04:08 March 14th)
- It was confirmed that a part of wall in the operation area was damaged. (06:14 March 15th)
- The fire occurred. (09:38 March 15th) TEPCO reported that the fire was extinguished spontaneously. (Around 11:00 March 15th)
- The fire occurred. (05:45 March 16th) TEPCO reported that no fire could be confirmed on the ground.(Around 06:15 March 16th)
- The Self-Defence Force started water spray over the Spent Fuel Pool.(09:43 March 20th)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool by Self-Defense Force was started. (From around 18:30 till 19:46 March 20th).
- Water spray over the Spent Fuel Pool by Self-Defence Force using 13 fire engines was started (From 06:37 till 08:41 March 21st).
- Works for laying electric cable to the Power Center was completed. (Around 15:00 March 21st)
- Power Center received electricity. (10:35 March 22nd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 17:17 till 20:32 March 22nd)
- Seawater spray of around 130t using Concrete Pump Truck (58m class) was carried out. (From 10:00 till 13:02 March 23rd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 14:36 till 17:30 March 24th)

- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 19:05 till 22:07 March 25th)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 06:05 till 10:20 March 25th)
- Seawater spray of around 125t using Concrete Pump Truck (58m class) was carried out. (From 16:55 till 19:25 March 27th)
- Lighting of Central Operation Room was recovered. (11:50 March 29th)
- Fresh water spray of around 140t using Concrete Pump Truck (58m class) was carried out. (From 14:04 till 18:33 March 30th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 08:28 till 14:14 April 1st)
- Lighting in the turbine building was partially turned on. (April 2nd)
- From 2 April, the stagnant water in the Main Building of Radioactive Waste Treatment Facilities was being transferred to the turbine building of Unit 4. As the water level in the vertical portion of the trench for Unit 3 rose from 3 April, by way of precaution, the transfer was suspended notwithstanding that the path of the water was not clear. (09:22 April 4th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 17:14 till 22:16 April 3rd)
- Fresh water spray of around 20t using Concrete Pump Truck (58m class) was carried out. (From 17:35 till 18:22 April 5th)
- Fresh water spray of around 38t using Concrete Pump Truck (58m class) was carried out. (From 18:23 till 19:40 April 7th)
- Fresh water spray of around 90t using Concrete Pump Truck (58m class) was carried out. (From 17:07 till 19:24 April 9th)
- The work for sampling water in the Spent Fuel Pool was carried out in order to grasp the conditions of the fuels that are kept in the pool. (From 12:00 till 13:04 April 12th) Nuclide analysis of radio active materials was carried out regarding the sampled water of the Spent Fuel Pool. (April 13th) As a result of nuclide analysis, 2.2×10^{2}Bq/cm^3 of ^{131}I (Iodine), 8.8×10^{1}Bq/cm^3 of ^{134}Cs (Caesium), 9.3×10^{1}Bq/cm^3 of ^{137}Cs (Caesium) were detected. (April 14th)
- Fresh water spray of around 195t using Concrete Pump Truck (62m class) was carried out. (From 0:30 till 6:57 April 13th)
- Fresh water spray of around 140t using Concrete Pump Truck (62m

class) was carried out. (From 14:30 till 18:29 April 15th)

- Fresh waster spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 17:39 till 21:22 April 17th)
- Fresh water spray of around 40t using Concrete Pump Truck (62m class) was carried out. (From 10:17 till 11:35 April 19th)
- White smoke was confirmed to generate. (As of 06:30 April 20th)

<Units 5 and 6>

- The first unit of Emergency Diesel Generator (D/G) (B) for Unit 6 is operating and supplying electricity. Water injection to RPV and the Spent Fuel Pool through the system of Make up Water Condensate (MUWC) is being carried out.
- The second unit of Emergency Diesel Generator (D/G) (A) for Unit 6 started up. (04:22 March 19th)
- The pumps for Residual Heat Removal (RHR) (C) for Unit 5 (05:00 March 19th) and RHR (B) for Unit 6 (22:14 March 19th) started up and recovered heat removal function. It cools Spent Fuel Pool with priority. (Power supply : Emergency Diesel Generator for Unit 6) (05:00 March 19th)
- Unit 5 under cold shut down (14:30 March 20th)
- Unit 6 under cold shut down (19:27 March 20th)
- Receiving electricity reached to the transformer of starter. (19:52 March 20th)
- Power supply to Unit 5 was switched from the Emergency Diesel Generator to external power supply. (11:36 March 21st)
- Power supply to Unit 6 was switched from the Emergency Diesel Generator to external power supply. (19:17 March 22nd)
- The temporary pump for RHR Seawater System (RHRS) of Unit 5 was automatically stopped when the power supply was switched from the temporary to the permanent. (17:24 March 23rd)
- Repair of the temporary pump for RHRS of Unit 5 was completed (16:14 March 24th) and cooling was started again. (16:35 March 24th)
- Power supply for the temporary pump for RHRS of Unit 6 was switched from the temporary to the permanent. (15:38 and 15:42 March 25th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around

1,500t) was started to be discharged through the Water Discharge Canal to the sea. (21:00 April 4th)

- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was discharged through the Water Discharge Canal to the sea. (Unit5 from 21:00 April 4th till 12:14 April 8th (Around 950t), Unit6 from 21:00 April 4th till 18:52 April 9th (Around 373t))
- The stagnant water in the basement floor of the turbine building of Unit 6 (Around 100 m³) was transferred to the Condenser. (From 11:00 till 15:00 April 19th)
- The pump for Residual Heat Removal (RHR) was temporarily stopped in order to change the position of the hose of the temporary RHR Seawater System of Unit 6. (From 09:51 April 20th)

<Common Spent Fuel Pool>

- It was confirmed that the water level of Spent Fuel Pool was maintained almost full at after 06:00 March 18th.
- Water spray over the Common Spent Fuel Pool was started. (From 10:37 till 15:30 March 21st)
- The power was started to be supplied (15:37 March 24th) and cooling was also started.(18:05 March 24th)
- The power supply was stopped due to short-circuiting of the end of the power supply circuit. (14:34 April 17th) Thereafter the facility inspection was carried out and the power supply was recovered. (17:30 April 17th)
- As of 08:00 April 20th, water temperature of the pool was around 30℃.

<Seawater and Soil Monitoring>

- As the result of nuclide analysis at around the Southern Water Discharge Canal, 7.4×10^{1}Bq/cm^3 of ^{131}I (Iodine) (1,850.5 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected. (14:30 March 26th)

  (As the result of measurement on 29 March, it was detected as 3,355.0 times higher than the limit in water (13:55 March 29th). On the other hand, as the result of the analysis at the northern side of the Water

Discharge Canal of the NPS, 4.6×10^{1}Bq/cm^3 of ^{131}I (Iodine) (1,262.5 times higher than the limit in water) was detected. (14:10 March 29th)

- In the samples of soil collected on 21 and 22 March on the site (at 5 points) of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (23:45 March 28th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- As the result of nuclide analysis at around the Southern Water Discharge Canal, 1.8×10^{2} Bq/cm^3 of ^{131}I (Iodine) (4,385.0 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected (13:55 March 30th).
- The permanent monitoring posts (No.1 to 8) installed near the Site Boundary were recovered. (March 31st) They are measuring once a day.
- In the samples of soil (7 samples in total) collected on 25 March (at 4 points) and 28 March (at 3 points) on the site of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (18:30 April 6th announced by TEPCO). The concentration of the detected plutonium was, in the same as the last one (Announced on 28 March), at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- In the 3 soil samples (6 samples in total) collected on 31 March and 4 April from the soil at the 3 points on the site of Fukushima Dai-ichi NPS where the regular sampling is to be carried out, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected. (18:30 April 14th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.

<Prevention of the Spread of Contaminated Water>

- In order to prevent the outflow of the contaminated water from the exclusive port, the work for stopping water by means of large-sized sandbags was implemented around the seawall on the south side of the NPS. (From 15:00 till 16:30 April 5th)
- The silt fences to prevent the spread of the contaminated water were completed to be doubly installed at the appropriate part of the seawall on the south side of the NPS.(10:45 April 11th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary board to stop water (one of the 7 steel plates) was installed. (From 12:00 till 13:00 April 12th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary boards to stop water (2 of the 7 steel plates) was installed. (From around 8:30 till around 10:00 April 13th)
- The silt fence to prevent the spread of the contaminated water was completed to be installed in front of the Screen of Units 3 and 4. (13:50 April 13th)
- The silt fences to prevent the spread of the contaminated water were installed at the Curtain Wall and in front of the Screen of Units 1 and 2. (12:20 April 14th)
- 3 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 3 and the Inlet Screen Pump Room of Unit 4. (From 14:30 till 15:45 April 15th)
- Temporary boards to stop water (4 steel plates out of 7) were installed on the ocean-side of the Inlet Bar Screen of Unit 2. (From 9:00 till 14:15 April 15th)
- 2 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 1 and the Inlet Screen Pump Room of Unit 2 and 5 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 2 and the Inlet Screen Pump room of Unit 3. (From 9:00 till 11:15 April 17th)

<Spray of Anti-scattering Agent>

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (From 15:00 till 16:05 April 1st)

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 600 m^2 on the mountain-side of the Common Pool. (From 13:00 till 16:30 April 5th, From 12:30 till 14:30 April 6th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 680 m^2 on the mountain-side of the Common Pool. (From 11:00 till 14:00 April 8th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 550 m^2 on the mountain-side of the Common Pool. (From 13:00 till 14:00 April 10th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,200 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 11th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 700 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 12th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 400 m^2 on the mountain-side of the Common Pool. (From 11:00 till 11:30 April 13th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,600 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:30 April 14th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 on the mountain-side of the Common Pool. (From 11:30 till 13:00 April 15th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,800 m^2 on the mountain-side of the Surge Tank of Suppression Pool Water. (From 11:00 till 13:00 April 16th)

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 around the Radioactive Waste Treatment Facilities.(From 10:00 till 13:30 April 17th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1200 m^2 around the Radioactive Waste Treatment Facilities. (From 09:00 till 14:30 April 18th)

<Situation of Removal of the Rubble>

- Removal of the rubble using remote-control heavy machineries was carried out. (April 10th)
- Removal of rubble (Amounts equivalent to 6 containers) using remote-control heavy machineries was carried out. (From 11:00 till 16:10 April 13th)
- Removal of rubble (Amount equivalent to a container) using remote-control heavy machineries was carried out. (From 09:00 till 15:45 April 15th)
- Removal of rubble (Amount equivalent to 8 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 16th)
- Removal of rubble (Amount equivalent to 2 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 17th)
- Removal of rubble (Amount equivalent to 4 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 18th)
- Removal of rubble (Amounts equivalent to 3 containers) using remote-control heavy machineries was carried out. (From 9:00 till 15:00 April 19th)

<Other>

- The water was confirmed to be collected in the vertical parts of the trenches (an underground structure for laying pipes, shaped like a tunnel) outside of the turbine building of Units 1 to 3. The dose rates on the water surface were 0.4 mSv/h of the Unit 1's trench and 1,000 mSv/h of the Unit 2's trench. The rate of the Unit 3's trench could not measure because of the rubble. (Around 15:30 March 27th) The collected water in the vertical part of the trench outside of the turbine building of Unit 1 was transferred to the storage tank in the Main Building of Radioactive Waste Treatment Facilities by the temporary pump. Thereafter the water level from the top of the vertical part went down from approximately -0.14m to approximately -1.14m. (From 09:20 till 11:25 March 31st)

- When removing the flange of pipes of Residual Heat Removal Seawater System outside the building of Unit 3, three subcontractor's employees were wetted by the water remaining in the pipe. However, as the result of wiping the water off, no radioactive materials were attached to their bodies. (12:03 March 29th)
- On March 28th, the stagnant water was confirmed in the Main Building of Radioactive Waste Treatment Facilities. As the result of analysis of radioactivity, the total amount of the radioactivity 1.2×10^{1} Bq/cm^3 in the controlled area and that of 2.2×10^{1} Bq/cm^3 in the non-controlled area were detected in March 29th.
- The barge (the first ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (15:42 March 31st) The transfer of fresh water from the barge (the first ship) to the Filtrate Tank was started. (15:58 April 1st) Thereafter it was suspended due to the malfunction of the hose (16:25 April 1st), but was resumed on April 2nd. (From 10:20 till 16:40 April 2nd)
- The barge (the second ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (9:10 April 2nd)
- The freshwater was transferred from the barge (the second ship) of the US armed force to the barge (the first ship). (From 09:52 till 11:15 April 3rd)
- The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps

in total was carried out (19:07 April 4th) and stopped discharging to the sea using submersible pumps at 17:40 April 10th. Confirmation of the remaining water is being carried out. (Total amount of discharged water is around 9,070t.)

- The stagnant water with low-level radioactivity in the Building of Miscellaneous Solid Waste Volume Reduction Processing was discharged from the southern side of the Water Discharge Canal to the sea using 5 pumps.(From 17:20 April 6th till 18:20 April 7th)
- In order to prepare to transfer the stagnant water in the turbine buildings to the Radioactive Waste Treatment Facilities, drilling the outer walls of the turbine buildings of Units 2 to 4 was carried out. (April 7th)
- The pumping out of the water in the Radioactive Waste Treatment Facilities, which was suspended by the earthquake off the coast of Miyagi Prefecture occurred at 11:32 April 7th, was resumed. (14:30 April 8th)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 15:59 till 16:28 April 10th)
- It was confirmed that a fire occurred at the Building for Water Discharge Canal Sampling for Units 1 to 4. (Around 6:38 April 12th) It was confirmed that there were no fire and smoke as a result of the initial activity of fire fighting. (Just before 07:00 on the same day) The fire was then confirmed to be completely under control. (09:12 on the same day)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 3 and 4. (From 10:17 till 12:25 April 14th)
- Videotaping using an unmanned helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 08:02 till 09:55 April 15th)
- As a countermeasure for tsunami, the distribution boards, etc. for the pumps injecting water to the reactors of Units 1 to 3 were transferred to a hill. (From 10:19 till 17:00 April 15th)
- The watertight measures in the buildings of the Radioactive Waste Treatment Facilities were completed. (April 18th)
- Work of strengthening connection of the power supplies between Units 1, 2 and Units 3, 4 was completed. (10:23 April 19th)

- Fukushima Dai-ni NPS (TEPCO)
  (Naraha Town / Tomioka Town, Futaba County, Fukushima Prefecture.)

(1) The state of operation

Unit1 (1,100MWe): automatic shutdown, cold shut down at 17:00, March 14th

Unit2 (1,100MWe): automatic shutdown, cold shut down at 18:00, March 14th

Unit3 (1,100MWe): automatic shutdown, cold shut down at 12:15, March 12th

Unit4 (1,100MWe): automatic shutdown, cold shut down at 07:15, March 15th

(2) Major plant parameters (As of 12:00 April 20th)

	Unit	Unit 1	Unit 2	Unit 3	Unit 4
Reactor Pressure*1	MPa	0.15	0.14	0.10	0.17
Reactor water temperature	℃	24.4	24.2	32.7	28.5
Reactor water level*2	mm	9,346	10,296	7,792	8,785
Suppression pool water temperature	℃	23	24	26	29
Suppression pool pressure	kPa (abs)	105	104	111	106
Remarks		cold shutdown	cold shutdown	cold shutdown	cold shutdown

*1: Converted from reading value to absolute pressure

*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- Around 17:56 March 30th, smoke was rising from the power distribution panel on the first floor of the turbine building of Unit 1. However, when the power supply was turned off, the smoke stopped to generate. It was judged by the fire station at 19:15 that this event was caused by the malfunction of the power distribution panel and was not a fire.
- The Residual Heat Removal System (B) to cool the reactor of Unit 1 became to be able to receive power from the emergency power supply as well as the external power supply. This resulted in securing the backup

power supplies (emergency power supplies) of Residual Heat Removal System (B) for all Units. (14:30 March 30th)

(4) Report concerning other incidents

- TEPCO reported to NISA the event in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (18:08 March 11th)
- TEPCO reported to NISA the events in accordance with the Article 10 regarding Units 1, 2 and 4. (18:33 March 11th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (5:22 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 2. (5:32 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 4 of Fukushima Dai-ni NPS. (6:07 March 12th)

● Onagawa NPS (Tohoku Electric Power Co. Inc.)
(Onagawa Town, Oga County and Ishinomaki City, Miyagi Prefecture)

(1) The state of operation

Unit 1 (524MWe):	automatic shutdown, cold shut down at 0:58, March 12th
Unit 2 (825MWe):	automatic shutdown, cold shut down at earthquake
Unit 3 (825MWe):	automatic shutdown, cold shut down at 1:17, March 12th

(2) Readings of monitoring post, etc.

MP2 (Monitoring at the Northern End of Site Boundary)
Approx. 0.29 μ SV/h (16:00 April 19th) (Approx. 0.30 μ SV/h (16:00 April 18th))

(3) Report concerning other incidents

- Fire Smoke on the first basement of the Turbine Building was confirmed to be extinguished. (22:55 on March 11th)
- Tohoku Electric Power Co. reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:09 March 13th)

2. Action taken by NISA

(March 11th)

14:46 Set up of the NISA Emergency Preparedness Headquarters (Tokyo) immediately after the earthquake

15:42 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

16:36 TEPCO recognized the event (Inability of water injection of the Emergency Core Cooling System) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Units 1 and 2 of Fukushima Dai-ichi NPS. (Reported to NISA at 16:45)

18:08 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

18:33 Regarding Units 1, 2 and 4 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of Act on Special Measures Concerning Nuclear Emergency Preparedness.

19:03 The Government declared the state of nuclear emergency. (Establishment of the Government Nuclear Emergency Response Headquarters and the Local Nuclear Emergency Response Headquarters)

20:50 Fukushima Prefecture's Emergency Response Headquarters issued a direction for the residents within 2 km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate. (The population of this area is 1,864.)

21:23 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayor of Okuma Town and the Mayor of Futaba Town were issued regarding the event occurred at Fukushima

Dai-ichi NPS, TEPCO, in accordance with the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate
- Direction for the residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS to stay in-house

24:00 Vice Minister of Economy, Trade and Industry, Ikeda arrived at the Local Nuclear Emergency Response Headquarters

(March12th)

0:49 Regarding Units 1 TEPCO Fukushima Dai-ichi NPS, TEPCO recognized the event (Unusual rise of the pressure in PCV) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 01:20)

05:22 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 06:27)

05:32 Regarding Unit 2 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

05:44 Residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS shall evacuate by the Prime Minister Directive.

06:07 Regarding of Unit 4 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

06:50 In accordance with the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued by <u>the Minister of Economy, Trade and Industry</u> to control the internal pressure of PCV of Units 1 and 2 of Fukushima Dai-ichi NPS.

07:45 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayors of Hirono Town, Naraha Town , Tomioka

Town and Okuma Town were issued regarding the event occurred at Fukushima Dai-ni NPS, TEPCO, pursuant to the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Fukushima Dai-ni NPS to evacuate
- Direction for the residents within 10km radius from Fukushima Dai-ni NPS to stay in-house

17:00 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

17:39 The Prime Minister directed evacuation of the residents within the 10 km radius from Fukushima Dai-ni NPS.

18:25 The Prime Minister directed evacuation of the residents within the 20km radius from Fukushima Dai-ichi NPS.

19:55 Directives from the Prime Minister was issued regarding seawater injection to Unit 1 of Fukushima Dai-ichi NPS.

20:05 Considering the Directives from the Prime Minister and pursuant to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued by the Minister of Economy, Trade and Industry to inject seawater to Unit 1 of Fukushima Dai-ichi NPS and so on.

20:20 At Unit 1 of Fukushima Dai-ichi NPS, seawater injection was started.

(March 13th)

05:38 TEPCO reported to NISA the event (Total loss of coolant injection function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS. Recovering efforts by TEPCO of the power source and coolant injection function and the work on venting were under way.

09:01 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

09:08 Pressure suppression and fresh water injection was started for Unit 3 of Fukushima Dai-ichi NPS.

09:20 The Pressure Vent Valve of Unit 3 of Fukushima Dai-ichi NPS was opened.

09:30 Directive was issued for the Governor of Fukushima Prefecture, the Mayors of Okuma Town, Futaba Town, Tomioka Town and Namie Town in accordance with the Act on Special Measures Concerning Nuclear Emergency Preparedness on the contents of radioactivity decontamination screening.

13:09 Tohoku Electric Power Co. reported to NISA that Onagawa NPS reached a situation specified in the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

13:12 Fresh water injection was switched to seawater injection for Unit 3 of Fukushima Dai-ichi NPS.

14:36 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 14th)

01:10 Seawater injection for Units 1 and 3 of Fukushima Dai-ichi NPS were temporarily interrupted due to the lack of seawater in pit.

03:20 Seawater injection for Unit 3 of Fukushima Dai-ichi NPS was resumed.

04:40 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

05:38 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:52 TEPCO reported to NISA the event (Unusual rise of the pressure in PCV) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS.

13:25 Regarding Unit 2 of Fukushima Dai-ichi NPS, TEPCO recognised the event (Loss of reactor cooling function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

22:13 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ni NPS.

22:35 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 15th)

00:00: The acceptance of experts from International Atomic Energy Agency (IAEA) was decided. NISA agreed to accept the offer of dispatching of the expert on NPS damage from IAEA considering the intention by Mr. Amano, Director General of IAEA. Therefore, the schedule of expert acceptance will be planned from now on according to the situation.

00:00: NISA also decided the acceptance of experts dispatched from U.S. Nuclear Regulatory Commission (NRC).

07:21 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:24 Incorporated Administration Agency, Japan Atomic Energy Agency (JAEA) reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre.

07:44 JAEA reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Science Research Institute.

08:54 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

10:30 According to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the directions as follows.

For Unit 4: To extinguish fire and to prevent the occurrence of re-criticality

For Unit 2: To inject water to reactor vessel promptly and to vent Drywell.

10:59 Considering the possibility of lingering situation, it was decided that the function of the Local Nuclear Emergency Response Headquarters was moved to the Fukushima Prefectural Office.

11:00 The Prime Minister directed the in-house stay area.

In-house stay was additionally directed to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS considering in-reactor situation.

16:30 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

22:00 According to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the following direction.

For Unit 4: To implement the water injection to the Spent Fuel Pool.

23:46 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 18th)

13:00 Ministry of Education, Culture, Sports, Science and Technology decided to reinforce the nation-wide monitoring survey in the emergency of Fukushima Dai-ichi and Dai-ni NPS.

15:55 TEPCO reported to NISA on the accidents and failure at Units 1, 2, 3 and 4 of Fukushima Dai-ichi NPS (Leakage of the radioactive materials inside of the reactor buildings to non-controlled area of radiation) pursuant to the Article 62-3 of the Nuclear Regulation Act.

16:48 Japan Atomic Power Co. reported to NISA accidents and failures in

Tokai NPS (Failure of the seawater pump motor of the Emergency Diesel Generator 2C) pursuant to the Article 62-3 of the Nuclear Regulation Act.

(March 19th)

07:44 The second unit of Emergency Diesel Generator (A) for Unit 6 started up.

TEPCO reported to NISA that the pump for RHR (C) for Unit 5 started up and started to cooling Spent Fuel Storage Pool. (Power supply: Emergency Diesel Generator for Unit 6)

08:58 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 20th)

23:30 Directive from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisoma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village) was issued regarding the change of the reference value for the screening level for decontamination of radioactivity.

(March 21st)

07:45 Directive titled as “Administration of the stable Iodine” was issued from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and the heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

16:45 Directive titled as “Ventilation for using heating equipments within the in-house evacuation zone” was issued from the Director-General of

Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

17:50 Directive from the Director-general of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Gunma was issued, which direct the above-mentioned governors to issue a request to relevant businesses and people to suspend shipment of spinach, *Kakina* (a green vegetable) and raw milk for the time being.

(March 22nd)

16:00 NISA received the response (Advice) from Nuclear Safety Commission Emergency Technical Advisory Body to the request for advice made by NISA, regarding the report from TEPCO titled as "The Results of Analysis of Seawater" dated March 22nd.

(March 25th)

NISA directed orally to the TEPCO regarding the exposure of workers at the turbine building of Unit 3 of Fukushima Dai-ichi Nuclear Power Station occurred on March 24th, to review immediately and to improve its radiation control measures from the viewpoint of preventing a recurrence.

(March 28th)

Regarding the mistake in the evaluation of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, NISA directed TEPCO orally to prevent the recurrence of such a mistake.

13:50 Receiving the suggestion by the special meeting of Nuclear Safety Commission (NSC) (Stagnant water on the underground floor of the turbine building at Fukushima Dai-ichi Plant Unit 2), NISA directed TEPCO orally to add the sea water monitoring points and carry out the groundwater monitoring.

Regarding the delay in the reporting of the water confirmed outside of the turbine buildings, NISA directed TEPCO to accomplish the communication in the company on significant information in a timely manner and to report it in a timely and appropriate manner.

(March 29th)

11:16 The report was received, regarding the accident and trouble etc. in Onagawa NPS of Tohoku Electric Power Co. Inc. (the trouble of pump of component cooling water system etc. in Unit 2 and the fall of heavy oil tank for auxiliary boiler of Unit 1 by tsunami), pursuant to the Article 62-3 of the Nuclear Regulation Act and the Article 3 of the Ministerial Ordinance for the Reports related to Electricity.

In order to strengthen the system to assist the nuclear accident sufferers, the "Team to Assist the Lives of the Nuclear Accident Sufferers" headed by the Minister of Economy, Trade and Industry was established and the visits, etc. by the team to relevant cities, towns and villages were carried out.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.1 for the residents within the area from 20 km to 30 km radius.

(March 30th)

Directions as to the implementation of the emergency safety measures for the other power stations considering the accident of Fukushima Dai-ichi and Dai-ni NPSs in 2011 was issued and handed to each electric power company and the relevant organization.

(March 31st)

Regarding the break-in of the propaganda vehicle to Fukushima Dai-ni NPS on 31 March, NISA directed TEPCO orally to take the carefully thought-out measures regarding physical protection, etc.

NISA alerted TEPCO to taking the carefully though-out measures regarding radiation control for workers.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.2 for the residents within the area from 20 km to 30 km radius.

(April 1st)

NISA strictly alerted TEPCO to taking appropriate measures concerning the following three matters regarding the mistake in the result of nuclide analysis.

- Regarding the past evaluation results on nuclide analysis, all the nuclides erroneously evaluated should be identified and the re-evaluation on them should be promptly carried out.
- The causes for the erroneous evaluation should be investigated and the thorough measures for preventing the recurrence should be taken.
- Immediate notification should be done in the stage when any erroneous evaluation results, etc. are identified.

(April 2nd)

Regarding the outflow of the liquid including radioactive materials from the area around the Intake Channel of Unit 2 of Fukushima Dai-ichi NPS, NISA directed TEPCO orally to carry out nuclide analysis of the liquid sampled, to confirm whether there are other outflows from the same parts of the facilities as the one, from which the outflow was confirmed around the Unit 2, and to strengthen monitoring through sampling water at more points around the facilities concerned.

(April 4th)

On the imperative execution of the discharge to the sea as an emergency measure, NISA requested the technical advice of NSC and directed TEPCO to survey and confirm the impact of the spread of radioactive materials caused by the discharge, by ensuring continuity of the sea monitoring currently underway and enhancing it (Increase of the frequency of measuring as well as the number of monitoring points), disclose required information, as well as to enhance the strategy to minimize the discharge amount.

(April 5th)

Directions as to the implementation of advance notification and contact to the local governments with regard to taking measures related to discharge of radioactive materials from Fukushima Dai-ichi NPS, which have a possible impact on the environment, was issued.

(April 6th)

On the implementation of the nitrogen injection to PCV of Unit 1, NISA directed TEPCO on the following three points. (12:40 April 6th) ① Properly control the plant parameters, and take measures appropriately to ensure safety in response to changes in the parameters. ②Establish and implement an organizational structure and so on that will ensure the safety of the workers who will engage in the operation. ③As the possibility of leakage of the air in PCV to the outside due to the nitrogen injection cannot be ruled out, through the judicious and further enhanced monitoring, TEPCO shall survey and confirm the impact of the release and spreading of radioactive materials due to the nitrogen injection, and strive to disclose information.

(April 7th)

The Local Nuclear Emergency Response Headquarters issued the News Letter No.3 for the residents within the area from 20km to 30km radius. (April 7th)

(April 9th)

Due to the earthquake off the coast of Miyagi Prefecture occurred around 23:32 April 7th, all the Emergency Diesel Generators for Unit 1 of the Higashidori NPS of Tohoku Electric Power Co., Inc. were not workable. Considering this event, NISA issued the letters of direction titled "Regarding the Treatment of Emergency Power Generating

Facilities in Terms of Safety Regulations (Directions)" to each Electricity Utility and other organizations concerned.

In accordance with the Paragraph 1, the Article 67 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the evaluation of necessity and safety, and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 10th)

In accordance with Article 67, paragraph 1 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the necessity, the evaluation of safety and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 13th)

- In accordance with paragraph 1, Article 67 of the Nuclear Regulation Act, NISA directed TEPCO to report the result of implementation on seismic safety evaluation as well as the result of consideration on the measurement of effective seismic reinforcement work, etc., regarding the buildings of Fukushima Dai-ichi NPS.
- NISA directed TEPCO to implement detailed analysis and consideration regarding the tsunami caused by the 2011 Tohoku District - off the Pacific Ocean Earthquake.
- NISA directed Tohoku Electric Power Co. Inc. to report the analysis of seismic data observed when the 2011 Earthquake off the Coast of Miyagi Prefecture occurred around 23:32 on 7 April and the assessment on seismic impact on the facilities that are important from the seismic safety viewpoints.

(April 14th)

- NISA directed TEPCO orally to strengthen the monitoring of the Sub Drain (the groundwater collected and controlled in the facilities) of Units 1 and 2, because the radioactive concentration of the water sampled on 13 April rose one digit up in comparison with the preceding result.

(April 15th)

- NISA strictly alerted TEPCO and directed it orally to prepare the measures for preventing the recurrence regarding the delay in the notification of the dismissal of Nuclear Emergency Preparedness Manager, accompanied with the personnel changes dated on 1 April, in accordance with Article 9, paragraph 5 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.
- NISA directed General Electricity Utilities and other organizations concerned to consider the measures to ensure reliability on external power supply due to the temporary loss of external power supply at NPSs, etc., caused by ground faults in part of electric power system when the earthquake off the coast of Miyagi Prefecture occurred on April 7, 2011.

(April 18th)

- NISA accepted (18 April) and confirmed (19 April) the report from TEPCO, in accordance with the direction for the collection of report issued on 10 April, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

< Possibility on radiation exposure (As of 15:30 April 20th) >

1. Exposure of residents

(1) Including the about 60 evacuees from Futaba Public Welfare Hospital to Nihonmatsu City Fukushima Gender Equality Centre, as the result of measurement of 133 persons at the Centre, 23 persons counted more than 13,000 cpm were decontaminated.

(2) The 35 residents transferred from Futaba Public Welfare Hospital to Kawamata Town Saiseikai Kawamata Hospital by private bus arranged by Fukushima Prefecture were judged to be not contaminated by the Prefectural Response Centre.

(3) As for the about 100 residents in Futaba Town evacuated by bus, the results of measurement for 9 of the 100 residents were as follows. The evacuees, moving outside the Prefecture (Miyagi Prefecture), were divided into two groups, which joined later to Nihonmatsu City Fukushima Gender Equality Centre.

No. of Counts	No. of Persons
18,000 cpm	1
30,000-36,000 cpm	1
40,000 cpm	1
little less than 40,000 cpm*	1
very small counts	5

*(These results were measured without shoes, though the first measurement exceeded 100,000 cpm.)

(4) The screening was started at the Off site Centre in Okuma Town from March 12th to 15th. 162 people received examination until now. At the beginning, the reference value was set at 6,000 cpm. 110 people were at the level below 6,000 cpm and 41 people were at the level of 6,000 cpm or more. When the reference value was increased to 13,000 cpm afterward, 8 people were at the level below 13,000 cpm and 3 people are at the level of 13,000 cpm or more.

The 5 out of 162 people examined were transported to hospital after being decontaminated.

(5) The Fukushima Prefecture carried out the evacuation of patients and personnel of the hospitals located within 10km area. The screening of all the members showed that 3 persons have the high counting rate. These members were transported to the secondary medical institute of exposure. As a result of the screening on 60 fire fighting personnel involved in the transportation activities,. the radioactivity higher than

twice of the back ground was detected on 3 members. Therefore, all the 60 members were decontaminated.

(6) Fukushima Prefecture has started the screening from 13 March. It is carried out at the evacuation sites and the 11 places (set up permanently) such as health offices. Up until April 18th, the screening was done to 161,181 people. Among them, 102 people were above the 100,000 cpm, but when measured these people again without clothes, etc., the counts decreased to 100,000 cpm and below, and there was no case which affects health.

2. Exposure of workers

As for the workers conducting operations in Fukushima Dai-ichi NPS, the total number of people who were at the level of exposure more than 100 mSv becomes 29.

For two out of the three workers who were confirmed to be at the level of exposure more than 170 mSv on March 24, the attachment of radioactive material on the skin of both legs was confirmed. As the two workers were judged to have a possibility of beta ray burn, they were transferred to the Fukushima Medical University Hospital, and after that, on March 25th, all of the three workers arrived at the National Institute of Radiological Sciences in the Chiba Prefecture. As the result of examination, the level of exposure of their legs was estimated to be from 2 to 3 Sv. The level of exposure of both legs and internal did not require medical treatment, but they decided to monitor the progress of all three workers in the hospital. All the three workers have been discharged from the hospital around the noon on 28 March. The three workers had the second medical examination at the National Institute of Radiological Sciences on 11 April, as a result, there was no problem regarding the condition of their health. The two workers who had been partially exposed to radiation on their skin of both legs were judged that any conditions of burn or red spots were not found on their skin.

At around 11:35 April 1st, a worker fell into the sea when he went on board the barge of the US Armed forces in order to adjust the hose. He was rescued immediately by other workers around without any injury and external contamination. In order to make double sure, the measurement by a whole-body counter was implemented. As a result, it was evaluated that there was no internal radionuclide contaminant on April 12th.

3. Others

(1) 4 members of Self-Defence Force who worked in Fukushima Dai-ichi NPS were injured by explosion. One member was transferred to National Institute of Radiological Sciences. After the examination, judged that there were wounds but no risk for health from the exposure, the one was released from the hospital on March 17th. No other exposure of the Self-Defence Force member was confirmed at the Ministry of Defence.

(2) As for policeman, the decontaminations of two policemen were confirmed by the National Police Agency. Nothing unusual was reported.

(3) On March 24th, examinations of thyroid gland for 66 children aged from 1 to 15 years old were carried out at the Kawamata Town public health Center. The result was at not at the level of having harmful influence.

(4) From March 26th to 27th, examinations of thyroid gland for 137 children aged from 0 to 15 years old were carried out at the Iwaki City Public Health Center. The result was not at the level of having harmful influence.

(5) From March 28th to 30th, examinations of thyroid gland for 946 children aged from 0 to 15 years old were carried out at the Kawamata Town Community Center and the Iitate Village Office. The result was not at the level of having harmful influence.

<Directive of screening levels for decontamination of radioactivity>

(1) On March 20th, the Local Nuclear Emergency Response Headquarters issued the directive to change the reference value for the screening level for decontamination of radioactivity as the following to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

Old: 40 Bq/cm^2 measured by a gamma-ray survey meter or 6,000 cpm

New: 1 μ Sv/hour (dose rate at 10cm distance) or 100,000cpm equivalent

<Directives of administrating stable Iodine during evacuation>

(1) On March 16th, the Local Nuclear Emergency Response Headquarters issued "Directive to administer the stable Iodine during evacuation from the evacuation area (20 km radius)" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

(2) On March 21st, the Local Nuclear Emergency Response Headquarters issued Directive titled as "Administration of the stable Iodine" to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

<Situation of the injured (As of 15:30 April 20th)>

1. Injury in Unit 1 of Fukushima Dai-ichi NPS due to earthquake on 11 March
   - Two employees (slightly, have already returned to work)
   - Two employees (a cut by a broken glass by earthquake and tsunami, have already returned to work)
   - One employee (a scratch when evacuating, has already returned to work)
   - One subcontract employee (fracture in both legs, be in hospital)
   - Two died (After the earthquake, two TEPCO's employees missed and had been searched continuously. In the afternoon of March 30th, the two employees were found on the basement floor of the turbine building of Unit 4 and were confirmed dead by April 2nd.)

2. Injury due to the explosion of Unit 1 of Fukushima Dai-ichi NPS on 12 March
   - Four employees (two TEPCO's employees and two subcontractor's employees) were injured at the explosion and smoke of Unit 1 around the turbine building (non-controlled area of radiation) and were

examined by Kawauchi Clinic. Two TEPCO's employees return to work again and two subcontractors' employees are under home treatment.

3. Injury due to the explosion of Unit 3 of Fukushima Dai-ichi NPS on 14 March.
   - Four TEPCO's employees (They have already returned to work.)
   - Three subcontractor's employees (They have already returned to work.)
   - Four members of Self-Defence Force (one of them was transported to National Institute of Radiological Sciences considering internal possible exposure. The examination resulted in no internal exposure. The member was discharged from the institute on March 17th.)

4. Other injuries
   - On the earthquake on 11 March, one subcontractor's employees (a crane operator) died in Fukushima Dai-ni NPS. (It seems that the tower crane broke and the operator room was crushed and the person was hit on the head.)
   - One subcontractor's employee was transported to the hospital on March 11th. (Later, turned out a cerebral infarction)
   - One emergency patient on 12 March. (a cerebral stroke, transported by the ambulance, be in hospital)
   - Ambulance was requested for one employee complaining the pain at left chest outside of control area on March 12. (Conscious, under home treatment)
   - One employee suffered lacerations on his left arm and was transported to the hospital for treatment on March 12th. (Has already returned to work)
   - Two employees complaining discomfort wearing full-face mask in the main control room were transported to Fukushima Dai-ni NPS for a consultation with an industrial doctor on 13 March. (One employee has already returned to work and the other is under home treatment.)
   - Two subcontractor's employees were injured during working at temporary control panel of power source in the Common Spent Fuel Pool, transported to where were industrial medical doctors the Fukushima Dai-ni NPS on 22 and 23 March. (One employee has already returned to work and the other is under home treatment.)

- On the afternoon of 7 April, a worker who was making sandbags at the soil disposal yard (spoil bank) on the north side of Fukushima Dai-ichi NPS got sick and was transported to J-Village for the body survey of contamination of radioactive materials. Being confirmed to be free from contamination, the worker was taken to the Iwaki City Kyouritsu Hospital by ambulance. On 8 April, the worker was diagnosed as dehydration and transient unconsciousness.
- At 09:19 April 9th, one subcontractor's employee was transported to a hospital as the worker wearing full-face mask felt discomfort during the work for cable processing in the Building of Water Processing, stepped on the manhole outside the building, which lid was shifted, and injured. As a result of medical examination, the worker was diagnosed as a right knee contusion and suspect of right knee medial collateral ligament injury. Furthermore, as a result of the body survey, it was confirmed that the worker was free from contamination of radioactive materials.
- Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body

<Situation of resident evacuation (As of 15:30 April 20th)>

At 11:00 March 15th, the Prime Minister directed in-house stay to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS. The directive was conveyed to Fukushima Prefecture and related municipalities.

Regarding the evacuation as far as 20-km from Fukushima Dai-ichi NPS and 10-km from Fukushima Dai-ni NPS, necessary measures have already been taken.

- The in-house stay in the area from 20 km to 30 km from Fukushima Dai-ichi NPS is made fully known to the residents concerned.
- Cooperating with Fukushima Prefecture, livelihood support to the residents in the in-house stay area are implemented.

- On March 28th, Chief Cabinet Secretary mentioned the continuation of the limited-access within the area of 20 km from Fukushima Dai-ichi NPS. On the same day, the Local Nuclear Emergency Response Headquarters notified the related municipalities of forbidding entry to the evacuation area within the 20 km zone.

<Directives regarding foods and drinks>

Directive from the Director-General of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Chiba was issued, which directed above-mentioned governors to suspend shipment and so on of the following products for the time being.

The Government Nuclear Emergency Response Headquarters organized the thoughts of imposing and lifting restrictions on shipment as follows, considering the NSC's advice.

- The area where restrictions on shipment to be imposed or lifted could be decided in units of the area where a prefecture is divided into, such as cities, towns, villages and so on, considering the spread of the contamination affected area and the actual situation of produce collection, etc.
- The restriction on shipment of the item, of which the result of the sample test exceeded the provisional regulation limits, shall be decided by judging in a comprehensive manner considering the regional spread of the contamination impact.
- Lifting the restrictions on shipment shall be implemented when a series of three results of nearly weekly tests for the item or the area falls below the provisional regulation limits, considering the situation of the Fukushima Dai-ichi NPS.
- However, the tests shall be carried out nearly weekly after the lifting, while the release of the radioactive materials from the NPS continues.

(1) Items under the suspension of shipment and restriction of intake (As of 15:30 April 20th)

Prefectures	Suspension of shipment	Restriction of intake
Fukushima Prefecture	Non-head type leafy vegetables, head type leafy	Non-head type leafy vegetables, head type leafy vegetables,

	vegetables , flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna*, Kukitachina*, Shinobufuyuna**, Rape, *Chijirena, Santouna*, Kousaitai*, Kakina*, etc.*), Turnip, Raw milk (Except some areas**) and Shiitake (only ones grown on raw lumber in an open field of Date-City, Souma-City, Minamisouma-City, Tamura-City, Iwaki-City, Sinchi-Town, Kawamata-Town, Namie-Town, Futaba-Town, Ookuma-Town, Tomioka-Town, Naraha-Town, Hirono-Town, Iitate-Village, Katsurao-Village , Kawauchi-Village and Fukushima-City), <u>Juvenile sand lance (Kounago)</u>	flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna*, Kukitachina*, Shinobufuyuna,* Rape, *Chijirena, Santouna*, Kousaitai*, Kakina*, etc.*) , Shiitake (only ones grown on raw lumber in an open field of Iitate-Village), <u>Juvenile sand lance (Kounago)</u>
Ibaraki Pref.	Spinach (only ones produced in Kitaibaraki City and Takahagi City)	
Tochigi Pref.	Spinach	
Chiba Pref.	- Spinach from Katori-City and Tako-Town - Spinach, Qing-geng-cai, Garland chrysanthemum,	

	Sanchu Asian lettuce, Celery and Parsley from Asahi City	

*a green vegetable

**Kitakata-City, Bandai-Town, Inawashiro-Town, Mishima-Town, Aizumisato-Town, Shimogo-Town, Minamiaizu-Town, Fukushima-City, Nihonmatsu-City, Date-City, Motomiya-City, Koriyama-City, Sukagawa-City, Tamura-City (except former Miyakoji-Village area), Shirakawa-City, Iwaki-City, Kunimi-Town, Kagami-ishi-Town, Ishikawa-Town, Asakawa-Town, Furudono-Town, Miharu-Town, Ono-Town, Yabuki-Town, Yamatsuri-Town, Hanawa-Town, Otama-Village, Hirata-Village, Nishigo-Village, Izumizaki-Village, Nakajima-Village, Samegawa-Village

(2) Request for restriction of drinking for tap-water (As of 15:30 April 20th)

Scope under restriction	Water service (Local governments requested for restriction)
All residents	None
Babies ・Water services that continue to respond to the directive	<Fukushima Prefecture> Iitate small water service (Iitate Village, Fukushima Prefecture)
・Tap-water supply service that continues to respond to the directive	None

<Directive regarding the ventilation when using heating equipments in the aria of indoor evacuation >

On March 21st, Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Iwaki City, Tamura City, Minamisouma City, Hirono Town, Kawauchi Village, Namie Town, Katsurao Village, and Iitate Village) was issued, which directs those governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

< Fire Bureaus' Activities>

- From 11:00 till around 14:00 on March 22nd, Niigata-City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the set up of large decontamination system.
- From 8:30 till 9:30, from 13:30 till 14:30 on March 23rd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the operation of large decontamination system.

(Contact Person)
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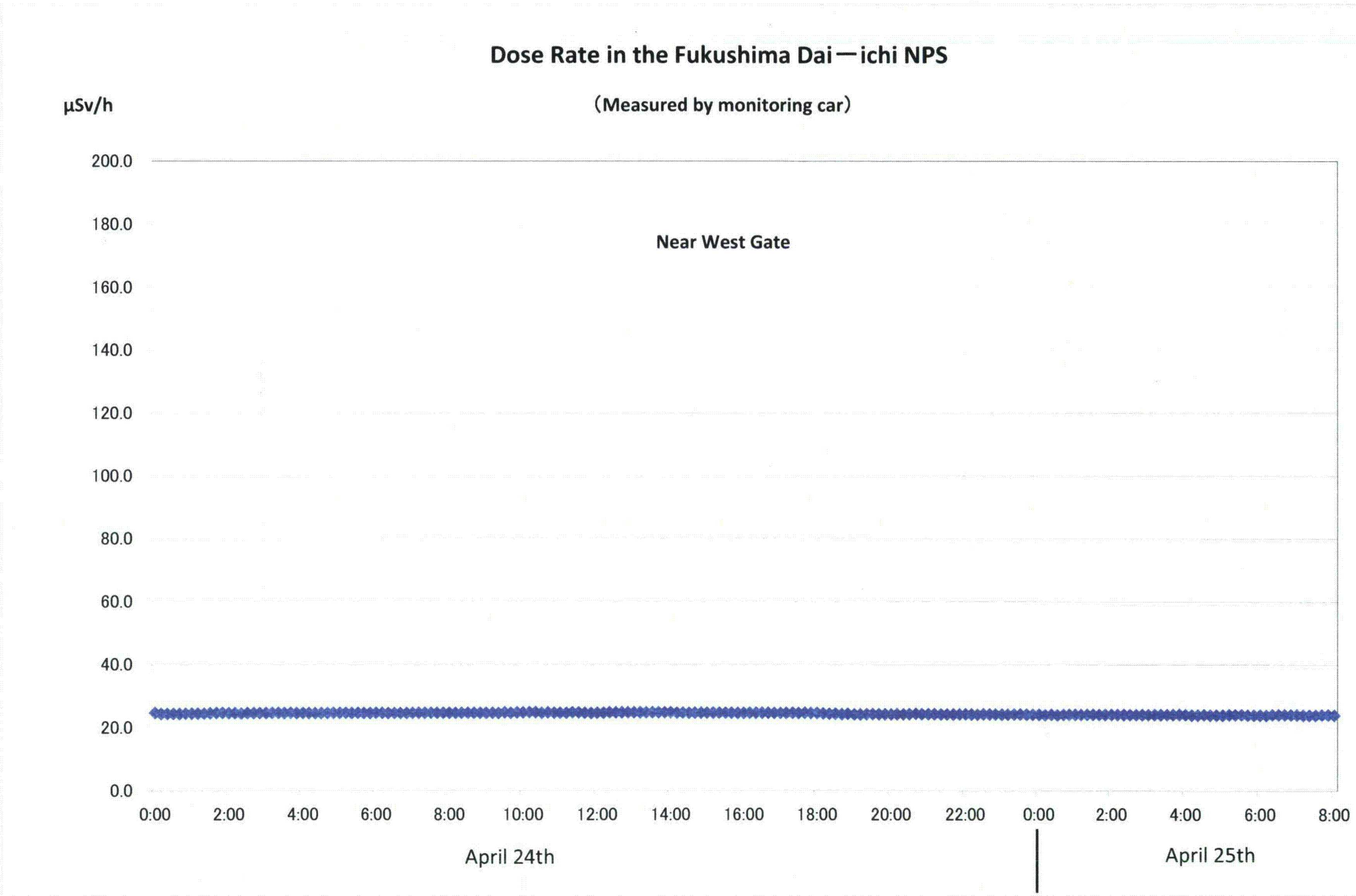
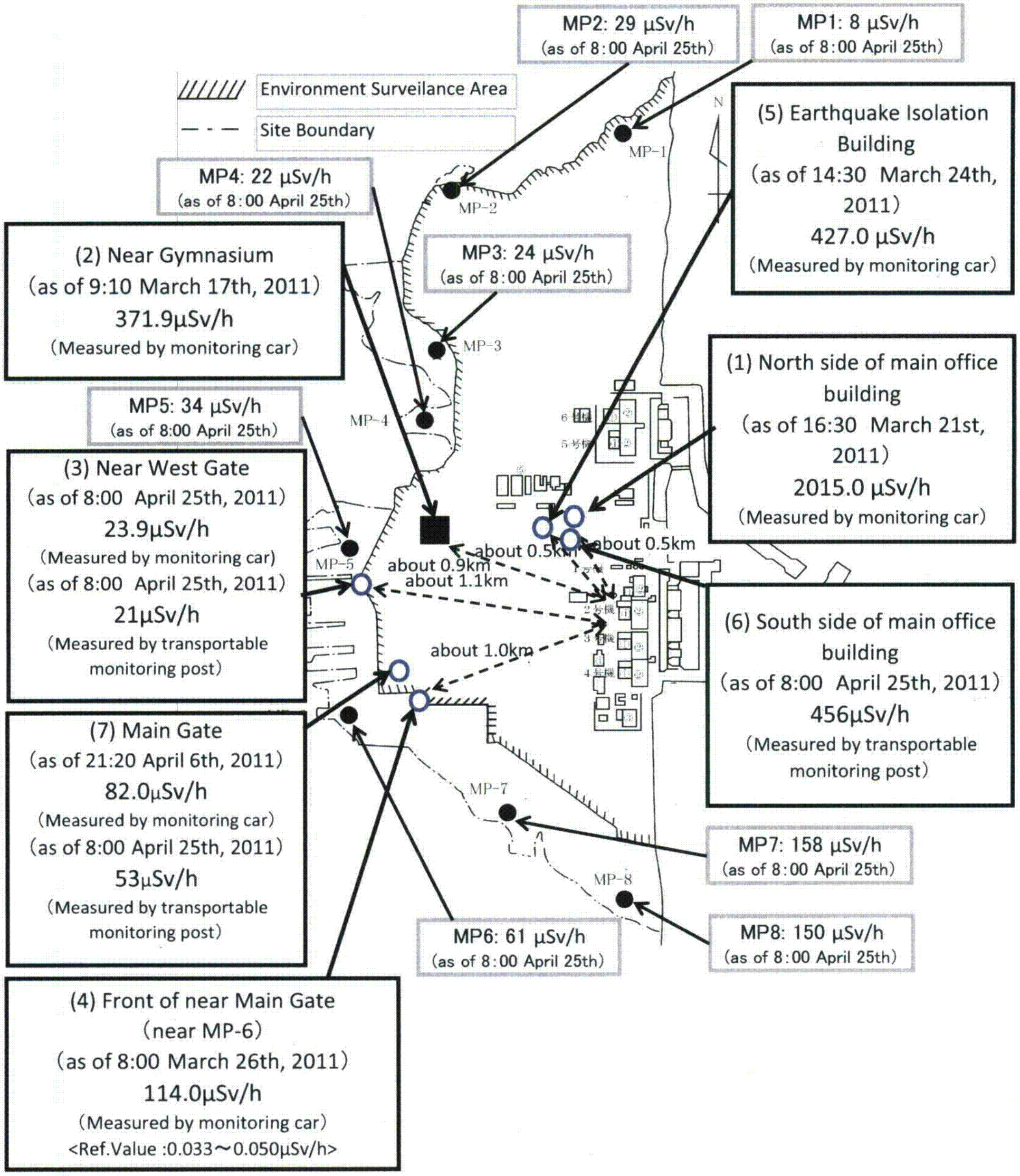
Director, International Affairs Office, NISA/METI
Phone:+81-(0)3-3501-1087



Dose Rate in the Fukushima Dai－ichi NPS
μSv/h
（Measured by monitoring car）
Near West Gate
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
2:00
4:00
6:00
8:00
April 24th
April 25th

Fukushima Dai−ichi NPS

as of 10:00, April 25th, 2011



Fukushima Dai-ni NPS

as of 10:00, April 25th, 2011

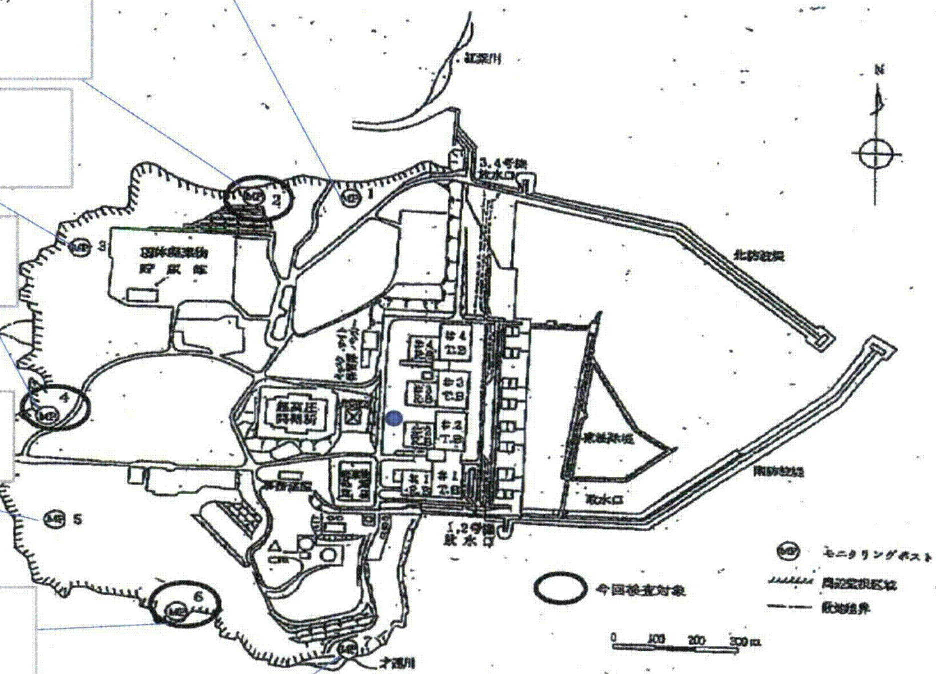
MP1 : 2.2 μSv/h (as of 8:00 April 25th)
(Ref. Value:0.035～0.054 μSv/h)

Location of Monitoring Post

MP2 : 1.7 μSv/h (as of 8:00 April 25th)
(Ref. Value:0.042～0.062 μSv/h)

MP3 : 2.3 μSv/h (as of 8:00 April 25th)
(Ref. Value:0.036～0.052 μSv/h)

MP4 : 1.9 μSv/h (as of 8:00 April 25th)
(Ref. Value: 0.036～0.052 μSv/h)



MP5 : 2.0 μSv/h (as of 8:00 April 25th)
(Ref. Value:0.041～0.058 μSv/h)

MP6 : 1.9 μSv/h (as of 8:00 April 25th)
(Ref. Value:0.044～0.063 μSv/h)

MP7 : 1.4 μSv/h (as of 9:00 April 24th)
(Ref. Value: 0.043～0.062 μSv/h)

添付資料(2)

Results of environmental monitoring at each NPSs etc. (as of 9:00PM, April 24th)

unit: μ Sv/h

Range of normal average value	Company	NPS	April 24, 2011											
			0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00
0.023～0.027	Hokkaido Electric Power Co.	Tomari NPS	0.038	0.038	0.039	0.043	0.044	0.038	0.034	0.032	0.031	0.031	0.032	0.032
0.024～0.060	Tohoku Electric Power Co.	Onagawa NPS	0.27	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
0.012～0.060		Higashidori NPS	0.023	0.023	0.028	0.032	0.036	0.027	0.02	0.018	0.018	0.018	0.018	0.018
0.033～0.050	Tokyo Electric Power Co.	Fukushima Dai-ichi※	(publicized in another place.)											
0.036～0.052		Fukushima Dai-ni												
0.011～0.159		Kashiwazaki kariwa NPS	0.084	0.071	0.073	0.070	0.067	0.065	0.066	0.066	0.065	0.066	0.067	0.065
0.036～0.053	Japan Atomic Power Co.	Tokai Dai-ni NPS	0.324	0.320	0.320	0.325	0.320	0.322	0.321	0.323	0.322	0.322	0.324	0.324
0.039～0.110		Tsuruga NPS	0.073	0.072	0.071	0.072	0.072	0.073	0.072	0.073	0.073	0.072	0.073	0.074
0.064～0.108	Chubu Electric Power Co.	Hamaoka NPS	0.043	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042
0.0207～0.132	Hokuriku Electric Power Co.	Shika NPS	0.033	0.033	0.033	0.034	0.033	0.034	0.034	0.033	0.034	0.033	0.034	0.034
0.028～0.130	Chugoku Electric Power Co.	Shimane NPS	0.031	0.030	0.020	0.031	0.031	0.031	0.029	0.029	0.029	0.030	0.030	0.030
0.070～0.077	Kansai Electric Power Co.	Mihama NPS	0.071	0.072	0.071	0.072	0.073	0.071	0.071	0.072	0.072	0.071	0.072	0.072
0.045～0.047		Takahama NPS	0.043	0.042	0.042	0.042	0.042	0.043	0.043	0.043	0.044	0.043	0.043	0.043
0.036～0.040		Ooi NPS	0.035	0.035	0.035	0.035	0.036	0.035	0.035	0.035	0.035	0.035	0.035	0.035
0.011～0.080	Shikoku Electeic Power Co.	Ikata NPS	0.013	0.014	0.014	0.013	0.014	0.014	0.014	0.014	0.014	0.013	0.014	0.014
0.023～0.087	Kyushu Electric Power Co.	Genkai NPS	0.027	0.026	0.026	0.027	0.026	0.026	0.025	0.026	0.026	0.026	0.027	0.028
0.034～0.120		Sendai NPS	0.036	0.037	0.036	0.037	0.040	0.040	0.040	0.040	0.037	0.036	0.038	0.035
0.009～0.069	Japan Nuclear Fuel Limited	Japan Nuclear Fuel Reprocessing Plant	0.021	0.022	0.023	0.026	0.028	0.021	0.017	0.017	0.017	0.016	0.017	0.017
0.009～0.071		Japan Nuclear Fuel Plant Disposal	0.028	0.028	0.030	0.032	0.034	0.028	0.024	0.022	0.023	0.022	0.023	0.022

※ Chubu Electric Power Co. reported that from 12:00, April 1st, the data did not include the contribution of cosmic rays.

Range of normal average value	Company	NPS	April 24, 2011											
			12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
0.023～0.027	Hokkaido Electric Power Co.	Tomari NPS	0.032	0.032	0.032	0.033	0.032	0.032	0.035	0.037	0.043	0.050		
0.024～0.060	Tohoku Electric Power Co.	Onagawa NPS	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26		
0.012～0.060		Higashidori NPS	0.018	0.018	0.018	0.022	0.019	0.018	0.018	0.018	0.018	0.018		
0.033～0.050	Tokyo Electric Power Co.	Fukushima Dai-ichi※	(publicized in another place.)											
0.036～0.052		Fukushima Dai-ni												
0.011～0.159		Kashiwazaki kariwa NPS	0.066	0.066	0.067	0.066	0.066	0.067	0.065	0.065	0.067	0.065		
0.036～0.053	Japan Atomic Power Co.	Tokai Dai-ni NPS	0.327	0.328	0.328	0.324	0.326	0.334	0.339	0.336	0.324	0.319		
0.039～0.110		Tsuruga NPS	0.072	0.073	0.075	0.074	0.072	0.071	0.072	0.073	0.071	0.072		
0.064～0.108	Chubu Electric Power Co.	Hamaoka NPS	0.042	0.042	0.042	0.042	0.043	0.042	0.042	0.043	0.042	0.042		
0.0207～0.132	Hokuriku Electric Power Co.	Shika NPS	0.033	0.033	0.033	0.033	0.033	0.033	0.032	0.032	0.033	0.033		
0.028～0.130	Chugoku Electric Power Co.	Shimane NPS	0.029	0.029	0.028	0.029	0.030	0.028	0.030	0.030	0.030	0.030		
0.070～0.077	Kansai Electric Power Co.	Mihama NPS	0.072	0.073	0.079	0.076	0.073	0.072	0.073	0.071	0.073	0.073		
0.045～0.047		Takahama NPS	0.043	0.051	0.051	0.048	0.044	0.044	0.045	0.043	0.043	0.043		
0.036～0.040		Ooi NPS	0.035	0.049	0.051	0.047	0.039	0.036	0.038	0.036	0.040	0.038		
0.011～0.080	Shikoku Electeic Power Co.	Ikata NPS	0.013	0.014	0.013	0.013	0.014	0.014	0.013	0.013	0.014	0.014		
0.023～0.087	Kyushu Electric Power Co.	Genkai NPS	0.026	0.027	0.026	0.028	0.026	0.027	0.026	0.026	0.027	0.026		
0.034～0.120		Sendai NPS	0.038	0.037	0.041	0.035	0.036	0.037	0.040	0.039	0.039	0.037		
0.009～0.069	Japan Nuclear Fuel Limited	Japan Nuclear Fuel Reprocessing Plant	0.017	0.017	0.017	0.017	0.017	0.016	0.016	0.017	0.016	0.017		
0.009～0.071		Japan Nuclear Fuel Plant Disposal	0.017	0.017	0.017	0.017	0.017	0.016	0.016	0.017	0.016	0.017		

※ Chubu Electric Power Co. reported that from 12:00, April 1st, the data did not include the contribution of cosmic rays.

経済産業省
Ministry of Economy, Trade and Industry

April 20, 2011
Nuclear and Industrial Safety Agency

Seismic Damage Information (the 103rd Release)
(As of 08:00 April 20th, 2011)

Nuclear and Industrial Safety Agency (NISA) confirmed the current situation of Onagawa NPS, Tohoku Electric Power Co. Inc.; Fukushima Dai-ichi and Fukushima Dai-ni NPSs, Tokyo Electric Power Co. Inc. (TEPCO); Tokai Dai-ni NPS, Japan Atomic Power Co. Inc. as follows:

Major updates are as follows.

1. Nuclear Power Stations (NPSs)
   - Fukushima Dai-ichi NPS
     - Fresh water injection (Around 47t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line of Unit 2 was carried out. (From 16:08 till 17:28 April 19th)
     - Injection of around 17,000L on April 18th and around 7,000L on April 19th of the coagulant (soluble glass) to the Power Cable Trench of Unit 2 was carried out.
     - The stagnant water in the basement floor of the turbine building of Unit 6 (Around 100 m^3) was transferred to the Condenser. (From 11:00 till 15:00 April 19th)
     - Removal of rubble (Amounts equivalent to 3 containers) using remote-control heavy machineries was carried out. (From 9:00 till 15:00 April 19th)

000/329

(Attached sheet)

1. The state of operation at NPS (Number of automatic shutdown units: 10)

- Fukushima Dai-ichi NPS, TEPCO
  (Okuma Town and FutabaTown, Futaba County, Fukushima Prefecture)

(1) The state of operation

Unit 1 (460MWe):	automatic shutdown
Unit 2 (784MWe):	automatic shutdown
Unit 3 (784MWe):	automatic shutdown
Unit 4 (784MWe):	in periodic inspection outage
Unit 5 (784MWe):	in periodic inspection outage, cold shutdown at 14:30 March 20th
Unit 6 (1,100MWe):	in periodic inspection outage, cold shutdown at 19:27 March 20th

(2) Major Plant Parameters (As of 06:00 April 20th)

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure*1 [MPa]	0.524(A) 1.171(B)	0.081(A) 0.074(D)	0.063(A) 0.014(C)	—	0.108	0.111
CV Pressure (D/W) [kPa]	165	80	104.1	—	—	—
Reactor Water Level*2 [mm]	-1,600(A) -1,650(B)	-1,500(A) -2,100 (B)	-1,850(A) -2,250(B)	—	2,074	1,932
Suppression Pool Water Temperature (S/C) [℃]	53.3(A) 53.2B)	74.3(A) 74.6(B)	43.0(A) 43.0(B)	—	—	—
Suppression Pool Pressure (S/C) [kPa]	165	Indicator Failure	173.4	—	—	—
Spent Fuel Pool Water Temperature [℃]	Indicator Failure	72.0	Indicator Failure	Indicator Failure	36.6	31.0
Time of Measurement	00:00 April 20th	00:00 April 20th	00:00 April 20th	April 20th	06:00 April 20th	06:00 April 20th

*1: Converted from reading value to absolute pressure
*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (10:17 March 12th)
- Seawater injection to the Reactor Pressure Vessel (RPV) via the Fire Extinguish Line was started. (20:20 March 12th)
  →Temporary interruption of the injection (01:10 March 14th)
- The sound of explosion in Unit 1 occurred. (15:36 March 12th)
- The amount of injected water to the Reactor Core was increased by utilizing the Feedwater Line in addition to the Fire Extinguish Line. ($2m^3/h \rightarrow 18m^3/h$). (02:33 March 23rd) Later, it was switched to the Feedwater Line only (around $11m^3/h$). (09:00 March 23rd)
- Lighting in the Central Operation Room was recovered. (11:30 March 24th)
- Fresh water injection to RPV was started. (15:37 March 25)
- As the result of concentration measurement in the stagnant water on the basement floor of the turbine building, $2.1 \times 10^5 Bq/cm^3$ of ^{131}I (Iodine) and $1.8 \times 10^6 Bq/cm^3$ of ^{137}Cs (Caesium) were detected as major radioactive nuclides.
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (08:32 March 29th.)
- The Stagnant water on the basement floor of the turbine building was started to be transferred to the Condenser around 17:00 March 24. As the Condenser was confirmed to be almost filled with water, pumping out of the water to the Condenser was stopped. (07:30 March 29th) In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank started to be transferred to the Surge Tank of Suppression Pool Water (A) (12:00 March 31th), after switching the place where the water was to be transferred to the Surge Tank of Suppression Pool Water (B) (15:25 March 31th), the transfer was

resumed and finished. (15:26 April 2nd)

- Water spray of around 90t (fresh water) over the Spent Fuel Pool using Concrete Pump Truck (62m class) was carried out. (From 13:03 till 16:04 March 31st) A test water spray using Concrete Pump Truck (62m class) was carried out in order to confirm the appropriate position for water spray. (From 17:16 till 17:19 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (10:42 to 11:52 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:02 April 3rd)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (13:55 April 3rd)
- Aiming at reducing the possibility of hydrogen combustion in the Primary Containment Vessel (PCV), the operations for the injection of nitrogen to PCV were started. (22:30 April 6th)
- The start of nitrogen injection to PCV was confirmed. (01:31 April 7th)
- The nitrogen injection to PCV was switched to the generator of high purity nitrogen. (04:10 April 9th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (09:30 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost and the fresh water injection to RPV and the nitrogen injection to PVC were suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The nitrogen injection to PCV was started. (23:34 April 11th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 16:00 till 17:30 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 11:50 till 12:12 April 18th)

- White smoke was not confirmed to generate. (As of 06:30 April 20th)
- Fresh water injection to RPV is being carried out. (As of 08:00 April 20th)

<Unit 2>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (16:36 March 11th)
- Started to vent (11:00 March 13th)
- The Blow-out Panel of reactor building was opened due to the explosion in the reactor building of Unit 3. (After 11:00 March 14th)
- Reactor water level tended to decrease. (13:18 March 14th) TEPCO reported to NISA the event (Loss of reactor cooling functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:49 March 14th)
- Seawater injection to RPV via the Fire Extinguish line was started. (16:34 March 14th)
- Water level in RPV tended to decrease. (22:50 March 14th)
- Started to vent (0:02 March 15th)
- A sound of explosion was made in Unit 2. As the pressure in Suppression Pool (Suppression Chamber) decreased (06:10 March 15th), there was a possibility that an incident occurred in the Chamber. (About 06:20 March 15th)
- Electric power receiving at the emergency power source transformer from the external transmission line was completed. The work for laying the electric cable from the facility to the load side was carried out. (13:30 March 19th)
- Seawater injection of 40t to the Spent Fuel Pool was started. (From 15:05 till 17:20 March 20th)
- Power Center received electricity (15:46 March 20th)
- White smoke generated. (18:22 March 21st)
- White smoke was died down and almost invisible. (As of 07:11 March 22nd)
- Seawater injection of 18t to the Spent Fuel Pool was carried out. (From 16:07 till 17:01 March 22nd)

- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:30 till 12:19 March 25th)
- Fresh water injection to RPV was started. (10:10 March 26th)
- Lighting of Central Operation Room was recovered (16:46 March26th)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump.(18:31 March 27th)
- Regarding the result of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, TEPCO reported to NISA that as the result of analysis and evaluation through re-sampling, judging the measured value of ^{134}I (Iodine) was wrong, the concentrations of gamma nuclides including ^{134}I (Iodine) were less than the detection limit. (00:07 March 28).
- Seawater injection to the Spent Fuel Pool using the Fire Pump Truck was switched to the fresh water injection using the temporary motor-driven pump. (From 16:30 till 18:25 March 29th)
- As the malfunction of the temporary motor-driven pump, which had been injecting to the Spent Fuel Pool since 09:25 March 30th, was confirmed at 09:45 March 30th, the injection pump was switched to the Fire Pump Truck. However, because cracks were confirmed in the hose (12:47 and 13:10 March 30th), the injection was suspended. Fresh water injection was resumed. (From 19:05 till 23:50 March 30th)
- Fresh water injection of around 70t to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 14:56 till 17:05 April 1st)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank was transferred to the Surge Tank of Suppression Pool Water. (From 16:45 March 29th till 11:50 April 1st)
- The water, of which the dose rate was at the level of more than 1,000 mSv/h, was confirmed to be collected in the pit (a vertical portion of an underground structure) for laying electric cables, located near the Intake Channel. In addition, the outflow from the crack with a length of around 20 cm in the concrete portion of the lateral surface of the pit into the sea was confirmed. (Around 09:30 April 2nd) In order to stop the

outflow, concrete was poured into the pit. (16:25, 19:02 April 2nd)

- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the transfer of the water in the Condenser to the Condensate Storage Tank was started. (17:10 April 2nd)
- The cameras for monitoring the water levels in the vertical part of the trench outside of the turbine building and on the basement floor of the turbine building were installed. (April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:22 till 12:06 April 3rd)
- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:12 April 3rd)
- As the measure to prevent the outflow of the water accumulated in the Pits for Conduit in the area around the Inlet Bar Screen, the upper part of the Power Cable Trench for power source at Intake Channel was crushed and 20 bags of sawdust (3 kg/bag), 80 bags of high polymer absorbent (100 g/bag) and 3 bags of cutting-processed newspaper (Large garbage bag) were put inside. (From 13:47 till 14:30 April 3rd)
- Approximately 13kg of tracer (milk white bath agent) was put in from the Pit for the Duct for Seawater Pipe. (From 07:08 till 07:11 April 4th)
- Fresh water injection (Around 70t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line using the temporary motor-driven pump was carried out. (From 11:05 till 13:37 April 4th)
- The tracer solution was put in from the two holes dug around the Pit for the Conduit near the Inlet Bar Screen of Unit 2 and was confirmed to be flowed out from the crack to the sea. (14:15 April 5th) The coagulant (soluble glass) started to be injected from the holes around the Pit in order to prevent the outflow of the water. (15:07 April 5th) The outflow of the water was confirmed to stop. (Around 05:38 April 6th) In addition, it was confirmed that the water level in the turbine building did not rise. Furthermore, the measurements to stop water by means of rubber board and jig (prop) were implemented at the outflowing point. (Finished at 13: 15 April 6th)

- One more pump for the transfer of the water in the Condenser to the Condensate Storage Tank was installed. (Two pumps in total: 30 m^3/h) (Around 15:40 April 5th)
- Fresh water injection (Around 36t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 13:39 till 14:34 April 7th)
- The transfer of the water in the Condenser to the Condensate Storage Tank was completed. (13:10 April 9th)
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:37 till 12:38 April 10th)
- Due to the occurrence of earthquake, the external power supply was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- The external power supply was recovered. (17:56 April 11th)
- Fresh water injection to RPV was resumed. (18:04 April 11th)
- The stagnant water in the trench of the turbine building was started to be transferred to the Hot Well of the Condenser using a submersible pump (19:35 April 12th) Thereafter it was confirmed that no leakage was found, the transfer of stagnant water resumed from 15:02 April 13th and was stopped 17:04 April 13th. The amount of transfer was about 660t.
- Fresh water injection (Around 60t) to the Spent Fuel Pool via the Spent Fuel Cooling Line was carried out. (From 13:15 till 14:55 April 13th)
- Fresh water injection (Around 45t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 10:13 till 11:54 April 16th. Due to the occurrence of earthquake at around 11:19, the temporary motor-driven pump was stopped at 11:39. The Spent Fuel Pool was confirmed to be filled with water by the increase of Skimmer Level at 11:54.)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (From 12:13 till 12:37 April 18th)
- Confirmation of situations, etc. using an unmanned robot at the reactor building was carried out. (From 13:42 till 14:33 April 18th)
- Injection of around 17,000L of the coagulant (soluble glass) to the Power Cable Trench was carried out. (April 18th)

- The stagnant water (stagnant water with high-level radioactivity) in the turbine building was started to be transferred to the Radioactive Waste Treatment Facilities (From 10:08 April 19th)
- Fresh water injection (Around 47t) to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 16:08 till 17:28 April 19th)
- Injection of around 7,000L of the coagulant (soluble glass) to the Power Cable Trench was carried out.(April 19th)
- White smoke was confirmed to generate continuously. (As of 06:30 April 20th)
- Fresh water injection to RPV is being carried out. (As of 08:00 April 20th)

<Unit 3>

- TEPCO reported to NISA the event (Inability of water injection of the Emergency Core Cooling System) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (05:10 March 13th)
- Started to vent (08:41 March 13th)
- Fresh water started to be injected to RPV via the Fire Extinguish Line. (11:55 March 13th)
- Seawater started to be injected to RPV via the Fire Extinguish Line. (13:12 March 13th)
- Seawater injection for Units 1 and 3 was suspended due to the lack of seawater in pit. (01:10 March 14th)
- Seawater injection to RPV for Unit 3 was resumed. (03:20 March 14th)
- Started to vent. (05:20 March 14th)
- PCV rose unusually. (07:44 March 14th) TEPCO reported to NISA on the event falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (7:52 March 14th)
- The explosion like Unit 1 occurred around the reactor building (11:01 March 14th)
- The white smoke like steam generated. (08:30 March 16th)
- Because of the possibility that PCV was damaged, the workers evacuated from the main control room (common control room). (10:45 March 16th) Thereafter the operators returned to the room and

resumed the operation of water injection. (11:30 March 16th)

- Seawater was discharged 4 times to Unit 3 by the helicopters of the Self-Defence Force. (9:48, 9:52, 9:58 and 10:01 March 17th)
- The riot police arrived at the site for the water spray from the grand. (16:10 March 17th)
- The Self-Defence Force started the water spray using a fire engine. (19:35 March 17th)
- The water spray from the ground was carried out by the riot police. (From 19:05 till 19:13 March 17th)
- The water spray from the ground was carried out by the Self-Defense Force using 5 fire engines. (19:35, 19:45, 19:53, 20:00 and 20:07 March 17th)
- The water spray from the ground using 6 fire engines (6 tons of water spray per engine) was carried out by the Self-Defence Force. (From before 14:00 till 14:38 March 18th)
- The water spray from the ground using a fire engine provided by the US Military was carried out. (Finished at 14:45 March 18th)
- Hyper Rescue Unit of Tokyo Fire Department carried out the water spray. (Finished at 03:40 March 20th)
- The pressure in PCV rose (320 kPa at 11:00 March 20th). Preparation to lower the pressure was carried out. Judging from the situation, immediate pressure relief was not required. Monitoring the pressure continues. (120 kPa at 12:15 March 21st)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool of Unit 3 by Hyper Rescue Unit of Tokyo Fire Department was carried out. (From 21:30 March 20th till 03:58 March 21st)
- Grayish smoke generated. (Around 15:55 March 21st)
- The smoke was confirmed to be died down. (17:55 March 21st)
- Grayish smoke changed to be whitish and seems to be ceasing. (As of 07:11 March 22nd)
- Water spray (Around 180t) by Tokyo Fire Department and Osaka City Fire Bureau was carried out. (From 15:10 till 16:00 March 22nd)
- Lighting was recovered in the Central Operation Room. (22:43 March 22nd)

- Seawater injection of 35t to the Spent Fuel Pool via the Fuel Pool Cooling Line was carried out. (From 11:03 till 13:20 March 23rd) Around 120t of seawater was injected. (From around 5:35 till around 16:05 March 24th)
- Slightly blackish smoke generated from the reactor building. (Around 16:20 March 23rd) Around 23:30 March 23rd and around 4:50 March 24th, it was reported that the smoke seemed to cease.
- As the results of the survey of the stagnant water, into which workers who were laying electric cable on the ground floor and the basement floor of the turbine building walked, the dose rate on the water surface was around 400mSv/h, and as the result of gamma-ray analysis of the sampling water, the totaled concentration of each nuclide of the sampling water was around 3.9×10^{6} Bq/cm^{3}.
- Water spray by Kawasaki City Fire Bureau supported by Tokyo Fire Department was carried out. (From 13:28 till 16:00 March 25th)
- Fresh water injection to RPV was started. (18:02 March 25th)
- Seawater spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 12:34 till 14:36 March 27th)
- In order to prepare to transfer the stagnant water on the basement floor of the turbine building to the Condenser, the water in the Condensate Storage Tank is being transferred to the Surge Tank of Suppression Pool Water. (From 17:40 March 28th till around 8:40 March 31st)
- The pump for the fresh water injection to RPV was switched from the Fire Pump Truck to the temporary motor-driven pump. (20:30 March 28th)
- Fresh water spray of around 100t using Concrete Pump Truck (52m class) was carried out. (From 14:17 till 18:18 March 29th)
- Fresh water spray of around 105t using Concrete Pump Truck (52m class) was carried out. (From 16:30 till 19:33 March 31st)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 09:52 till 12:54 April 2nd)
- Lighting in the turbine building was partially turned on. (April 2nd)
- The camera for monitoring the water level in the vertical part of the trench outside of the turbine building was installed. (April 2nd)
- In order to switch the power supply to the motor-driven pump injecting fresh water to RPV from the temporary power supply to the external

power supply, the injection to the reactor was temporarily carried out using the Fire Pump Truck. (From 10:03 till 12:16 April 3rd)

- The power supply for the fresh water injection to RPV was switched to the external power supply. (12:18 April 3rd)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 17:03 till 19:19 April 4th)
- Fresh water spray of around 70t using Concrete Pump Truck (52m class) was carried out. (From 06:53 till 08:53 April 7th)
- Fresh water spray of around 75t using Concrete Pump Truck (52m class) was carried out. (From 17:06 till 20:00 April 8th)
- Fresh water spray of around 80t using Concrete Pump Truck (52m class) was carried out. (From 17:15 till 19:15 April 10th)
- Due to the occurrence of earthquake, the external power supply for Units 1 and 2 was lost, and the fresh water injection to RPV was suspended. (Around 17:16 April 11th)
- Because the external power supply for Units 1 and 2 was recovered (17:56 April 11th), fresh water injection to RPV was resumed. (18:04 April 11th)
- Fresh water spray of around 35t using Concrete Pump Truck (62m class) was carried out. (From 16:26 till 17:16 April 12th)
- Fresh water spray around 25t using Concrete Pump Truck (62m class) was started. (From 15:56 till 16:32 April 14th)
- Confirmation of situation, etc. using an unmanned robot at the reactor building was carried out. (From 11:30 till 14:00 April 17th)
- In order to replace the hose used for water injection to the reactor with a new one, the pump for water injection was stopped. (12:38 till 13:05 April 18th)
- Fresh water spray of around 30t over the Spent Fuel Pool using Concrete Pump Truck (62m class) was started. (From 14:17 till 15:02 April 18th)
- White smoke was confirmed to generate continuously (As of 06:30 April 20th)
- Fresh water injection to RPV is being carried out. (As of 08:00 April 20th)

<Unit 4>

- Because of the replacement work of the Shroud of RPV, no fuel was inside the RPV.
- The temperature of water in the Spent Fuel Pool had increased. (84 ℃ at 04:08 March 14th)
- It was confirmed that a part of wall in the operation area was damaged. (06:14 March 15th)
- The fire occurred. (09:38 March 15th) TEPCO reported that the fire was extinguished spontaneously. (Around 11:00 March 15th)
- The fire occurred. (05:45 March 16th) TEPCO reported that no fire could be confirmed on the ground.(Around 06:15 March 16th)
- The Self-Defence Force started water spray over the Spent Fuel Pool.(09:43 March 20th)
- On-site survey for leading electric cable (From 11:00 till 16:00 March 20th)
- Water spray over the Spent Fuel Pool by Self-Defense Force was started. (From around 18:30 till 19:46 March 20th).
- Water spray over the Spent Fuel Pool by Self-Defence Force using 13 fire engines was started (From 06:37 till 08:41 March 21st).
- Works for laying electric cable to the Power Center was completed. (Around 15:00 March 21st)
- Power Center received electricity. (10:35 March 22nd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 17:17 till 20:32 March 22nd)
- Seawater spray of around 130t using Concrete Pump Truck (58m class) was carried out. (From 10:00 till 13:02 March 23rd)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 14:36 till 17:30 March 24th)
- Seawater spray of around 150t using Concrete Pump Truck (58m class) was carried out. (From 19:05 till 22:07 March 25th)
- Seawater injection to the Spent Fuel Pool via the Spent Fuel Pool Cooling Line was carried out. (From 06:05 till 10:20 March 25th)
- Seawater spray of around 125t using Concrete Pump Truck (58m class) was carried out. (From 16:55 till 19:25 March 27th)
- Lighting of Central Operation Room was recovered. (11:50 March 29th)
- Fresh water spray of around 140t using Concrete Pump Truck (58m class) was carried out. (From 14:04 till 18:33 March 30th)

- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 08:28 till 14:14 April 1st)
- Lighting in the turbine building was partially turned on. (April 2nd)
- From 2 April, the stagnant water in the Main Building of Radioactive Waste Treatment Facilities was being transferred to the turbine building of Unit 4. As the water level in the vertical portion of the trench for Unit 3 rose from 3 April, by way of precaution, the transfer was suspended notwithstanding that the path of the water was not clear. (09:22 April 4th)
- Fresh water spray of around 180t using Concrete Pump Truck (58m class) was carried out. (From 17:14 till 22:16 April 3rd)
- Fresh water spray of around 20t using Concrete Pump Truck (58m class) was carried out. (From 17:35 till 18:22 April 5th)
- Fresh water spray of around 38t using Concrete Pump Truck (58m class) was carried out. (From 18:23 till 19:40 April 7th)
- Fresh water spray of around 90t using Concrete Pump Truck (58m class) was carried out. (From 17:07 till 19:24 April 9th)
- The work for sampling water in the Spent Fuel Pool was carried out in order to grasp the conditions of the fuels that are kept in the pool. (From 12:00 till 13:04 April 12th) Nuclide analysis of radio active materials was carried out regarding the sampled water of the Spent Fuel Pool. (April 13th) As a result of nuclide analysis, 2.2×10^{2}Bq/cm^{3} of ^{131}I (Iodine), 8.8×10^{1}Bq/cm^{3} of ^{134}Cs (Caesium), 9.3×10^{1}Bq/cm^{3} of ^{137}Cs (Caesium) were detected. (April 14th)
- Fresh water spray of around 195t using Concrete Pump Truck (62m class) was carried out. (From 0:30 till 6:57 April 13th)
- Fresh water spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 14:30 till 18:29 April 15th)
- Fresh waster spray of around 140t using Concrete Pump Truck (62m class) was carried out. (From 17:39 till 21:22 April 17th)
- Fresh water spray of around 40t using Concrete Pump Truck (62m class) was carried out. (From 10:17 till 11:35 April 19th)
- White smoke was confirmed to generate. (As of <u>06:30</u> April <u>20th</u>)

<Units 5 and 6>

- The first unit of Emergency Diesel Generator (D/G) (B) for Unit 6 is

operating and supplying electricity. Water injection to RPV and the Spent Fuel Pool through the system of Make up Water Condensate (MUWC) is being carried out.

- The second unit of Emergency Diesel Generator (D/G) (A) for Unit 6 started up. (04:22 March 19th)
- The pumps for Residual Heat Removal (RHR) (C) for Unit 5 (05:00 March 19th) and RHR (B) for Unit 6 (22:14 March 19th) started up and recovered heat removal function. It cools Spent Fuel Pool with priority. (Power supply : Emergency Diesel Generator for Unit 6) (05:00 March 19th)
- Unit 5 under cold shut down (14:30 March 20th)
- Unit 6 under cold shut down (19:27 March 20th)
- Receiving electricity reached to the transformer of starter. (19:52 March 20th)
- Power supply to Unit 5 was switched from the Emergency Diesel Generator to external power supply. (11:36 March 21st)
- Power supply to Unit 6 was switched from the Emergency Diesel Generator to external power supply. (19:17 March 22nd)
- The temporary pump for RHR Seawater System (RHRS) of Unit 5 was automatically stopped when the power supply was switched from the temporary to the permanent. (17:24 March 23rd)
- Repair of the temporary pump for RHRS of Unit 5 was completed (16:14 March 24th) and cooling was started again. (16:35 March 24th)
- Power supply for the temporary pump for RHRS of Unit 6 was switched from the temporary to the permanent. (15:38 and 15:42 March 25th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was started to be discharged through the Water Discharge Canal to the sea. (21:00 April 4th)
- The groundwater which was received and managed in the low-level radioactivity facilities in the Sub Drain Pit of Units 5 and 6 (Around 1,500t) was discharged through the Water Discharge Canal to the sea. (Unit5 from 21:00 April 4th till 12:14 April 8th (Around 950t), Unit6 from 21:00 April 4th till 18:52 April 9th (Around 373t))
- <u>The stagnant water in the basement floor of the turbine building of Unit 6 (Around 100 m^3) was transferred to the Condenser. (From 11:00</u>

till 15:00 April 19th)

<Common Spent Fuel Pool>

- It was confirmed that the water level of Spent Fuel Pool was maintained almost full at after 06:00 March 18th.
- Water spray over the Common Spent Fuel Pool was started. (From 10:37 till 15:30 March 21st)
- The power was started to be supplied (15:37 March 24th) and cooling was also started.(18:05 March 24th)
- The power supply was stopped due to short-circuiting of the end of the power supply circuit. (14:34 April 17th) Thereafter the facility inspection was carried out and the power supply was recovered. (17:30 April 17th)
- As of 07:30 April 19th, water temperature of the pool was around 32℃.

<Seawater and Soil Monitoring>

- As the result of nuclide analysis at around the Southern Water Discharge Canal, 7.4×10^{1}Bq/cm^3 of ^{131}I (Iodine) (1,850.5 times higher than the concentration limit in water outside the Environmental Monitoring Area) was detected. (14:30 March 26th)
  (As the result of measurement on 29 March, it was detected as 3,355.0 times higher than the limit in water (13:55 March 29th). On the other hand, as the result of the analysis at the northern side of the Water Discharge Canal of the NPS, 4.6×10^{1}Bq/cm^3 of ^{131}I (Iodine) (1,262.5 times higher than the limit in water) was detected. (14:10 March 29th)
- In the samples of soil collected on 21 and 22 March on the site (at 5 points) of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (23:45 March 28th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- As the result of nuclide analysis at around the Southern Water Discharge Canal, 1.8×10^{2} Bq/cm^3 of ^{131}I (Iodine) (4,385.0 times higher than the

concentration limit in water outside the Environmental Monitoring Area) was detected (13:55 March 30th).

- The permanent monitoring posts (No.1 to 8) installed near the Site Boundary were recovered. (March 31st) They are measuring once a day.
- In the samples of soil (7 samples in total) collected on 25 March (at 4 points) and 28 March (at 3 points) on the site of Fukushima Dai-ichi NPS, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected (18:30 April 6th announced by TEPCO). The concentration of the detected plutonium was, in the same as the last one (Announced on 28 March), at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.
- In the 3 soil samples (6 samples in total) collected on 31 March and 4 April from the soil at the 3 points on the site of Fukushima Dai-ichi NPS where the regular sampling is to be carried out, ^{238}Pu (Plutonium), ^{239}Pu (Plutonium) and ^{240}Pu (Plutonium) were detected. (18:30 April 14th announced by TEPCO). The concentration of the detected plutonium was at the equivalent level of the fallout (radioactive fallout) that was observed in Japan concerning the past atmospheric nuclear testing, i.e. at the equivalent level of the normal condition of environment, and was not at the level of having harmful influence on human body.

<Prevention of the Spread of Contaminated Water>

- In order to prevent the outflow of the contaminated water from the exclusive port, the work for stopping water by means of large-sized sandbags was implemented around the seawall on the south side of the NPS. (From 15:00 till 16:30 April 5th)
- The silt fences to prevent the spread of the contaminated water were completed to be doubly installed at the appropriate part of the seawall on the south side of the NPS.(10:45 April 11th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary board to stop water (one of the 7 steel plates) was installed. (From 12:00 till 13:00 April 12th)
- On the ocean-side of the Inlet Bar Screen of Unit 2, the temporary boards to stop water (2 of the 7 steel plates) was installed. (From around 8:30

till around 10:00 April 13th)

- The silt fence to prevent the spread of the contaminated water was completed to be installed in front of the Screen of Units 3 and 4. (13:50 April 13th)
- The silt fences to prevent the spread of the contaminated water were installed at the Curtain Wall and in front of the Screen of Units 1 and 2. (12:20 April 14th)
- 3 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 3 and the Inlet Screen Pump Room of Unit 4. (From 14:30 till 15:45 April 15th)
- Temporary boards to stop water (4 steel plates out of 7) were installed on the ocean-side of the Inlet Bar Screen of Unit 2. (From 9:00 till 14:15 April 15th)
- 2 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 1 and the Inlet Screen Pump Room of Unit 2 and 5 sandbags filled with Zeolite were placed between the Inlet Screen Pump Room of Unit 2 and the Inlet Screen Pump room of Unit 3. (From 9:00 till 11:15 April 17th)

<Spray of Anti-scattering Agent>

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 500 m^2 on the mountain-side of the Common Pool. (From 15:00 till 16:05 April 1st)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 600 m^2 on the mountain-side of the Common Pool. (From 13:00 till 16:30 April 5th, From 12:30 till 14:30 April 6th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 680 m^2 on the mountain-side of the Common Pool. (From 11:00 till 14:00 April 8th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 550 m^2 on the mountain-side of the Common Pool. (From 13:00 till 14:00 April 10th)

- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,200 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 11th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 700 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:00 April 12th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 400 m^2 on the mountain-side of the Common Pool. (From 11:00 till 11:30 April 13th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,600 m^2 on the mountain-side of the Common Pool. (From 12:00 till 13:30 April 14th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 on the mountain-side of the Common Pool. (From 11:30 till 13:00 April 15th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,800 m^2 on the mountain-side of the Surge Tank of Suppression Pool Water. (From 11:00 till 13:00 April 16th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1,900 m^2 around the Radioactive Waste Treatment Facilities.(From 10:00 till 13:30 April 17th)
- The test implementation of spraying anti-scattering agent to prevent the spread of radioactive materials on the ground surface was carried out in the area of about 1200 m^2 around the Radioactive Waste Treatment Facilities. (From 09:00 till 14:30 April 18th)

<Situation of Removal of the Rubble>

- Removal of the rubble using remote-control heavy machineries was carried out. (April 10th)

- Removal of rubble (Amounts equivalent to 6 containers) using remote-control heavy machineries was carried out. (From 11:00 till 16:10 April 13th)
- Removal of rubble (Amount equivalent to a container) using remote-control heavy machineries was carried out. (From 09:00 till 15:45 April 15th)
- Removal of rubble (Amount equivalent to 8 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 16th)
- Removal of rubble (Amount equivalent to 2 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 17th)
- Removal of rubble (Amount equivalent to 4 containers) using remote-control heavy machineries was carried out. (From 9:00 till 16:00 April 18th)
- Removal of rubble (Amounts equivalent to 3 containers) using remote-control heavy machineries was carried out. (From 9:00 till 15:00 April 19th)

<Other>

- The water was confirmed to be collected in the vertical parts of the trenches (an underground structure for laying pipes, shaped like a tunnel) outside of the turbine building of Units 1 to 3. The dose rates on the water surface were 0.4 mSv/h of the Unit 1's trench and 1,000 mSv/h of the Unit 2's trench. The rate of the Unit 3's trench could not measure because of the rubble. (Around 15:30 March 27th) The collected water in the vertical part of the trench outside of the turbine building of Unit 1 was transferred to the storage tank in the Main Building of Radioactive Waste Treatment Facilities by the temporary pump. Thereafter the water level from the top of the vertical part went down from approximately -0.14m to approximately -1.14m. (From 09:20 till 11:25 March 31st)
- When removing the flange of pipes of Residual Heat Removal Seawater System outside the building of Unit 3, three subcontractor's employees were wetted by the water remaining in the pipe. However, as the result of wiping the water off, no radioactive materials were attached to their

bodies. (12:03 March 29th)

- On March 28th, the stagnant water was confirmed in the Main Building of Radioactive Waste Treatment Facilities. As the result of analysis of radioactivity, the total amount of the radioactivity 1.2×10^{1} Bq/cm^{3} in the controlled area and that of 2.2×10^{1} Bq/cm^{3} in the non-controlled area were detected in March 29th.
- The barge (the first ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (15:42 March 31st) The transfer of fresh water from the barge (the first ship) to the Filtrate Tank was started. (15:58 April 1st) Thereafter it was suspended due to the malfunction of the hose (16:25 April 1st), but was resumed on April 2nd. (From 10:20 till 16:40 April 2nd)
- The barge (the second ship) of the US armed forces carrying fresh water for cooling reactors, etc. landed in the exclusive port of the power station, being towed by the ships of Maritime Self-Defense Force. (9:10 April 2nd)
- The freshwater was transferred from the barge (the second ship) of the US armed force to the barge (the first ship). (From 09:52 till 11:15 April 3rd)
- The stagnant water with low-level radioactivity in the Main Building of Radioactive Waste Treatment Facilities was started to be discharged from the southern side of the Water Discharge Canal to the sea, using the first pump. (19:03 April 4th) Further, the discharge using 10 pumps in total was carried out (19:07 April 4th) and stopped discharging to the sea using submersible pumps at 17:40 April 10th. Confirmation of the remaining water is being carried out. (Total amount of discharged water is around 9,070t.)
- The stagnant water with low-level radioactivity in the Building of Miscellaneous Solid Waste Volume Reduction Processing was discharged from the southern side of the Water Discharge Canal to the sea using 5 pumps.(From 17:20 April 6th till 18:20 April 7th)
- In order to prepare to transfer the stagnant water in the turbine buildings to the Radioactive Waste Treatment Facilities, drilling the outer walls of the turbine buildings of Units 2 to 4 was carried out. (April 7th)
- The pumping out of the water in the Radioactive Waste Treatment

Facilities, which was suspended by the earthquake off the coast of Miyagi Prefecture occurred at 11:32 April 7th, was resumed. (14:30 April 8th)

- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 15:59 till 16:28 April 10th)
- It was confirmed that a fire occurred at the Building for Water Discharge Canal Sampling for Units 1 to 4. (Around 6:38 April 12th) It was confirmed that there were no fire and smoke as a result of the initial activity of fire fighting. (Just before 07:00 on the same day) The fire was then confirmed to be completely under control. (09:12 on the same day)
- Videotaping using a wireless helicopter was carried out in order to grasp the situations of reactor buildings for Units 3 and 4. (From 10:17 till 12:25 April 14th)
- Videotaping using an unmanned helicopter was carried out in order to grasp the situations of reactor buildings for Units 1 to 4. (From 08:02 till 09:55 April 15th)
- As a countermeasure for tsunami, the distribution boards, etc. for the pumps injecting water to the reactors of Units 1 to 3 were transferred to a hill. (From 10:19 till 17:00 April 15th)
- The watertight measures in the buildings of the Radioactive Waste Treatment Facilities were completed. (April 18th)
- Work of strengthening connection of the power supplies between Units 1, 2 and Units 3, 4 was completed. (10:23 April 19th)

● Fukushima Dai-ni NPS (TEPCO)
(Naraha Town / Tomioka Town, Futaba County, Fukushima Prefecture.)

(1) The state of operation

Unit1 (1,100MWe):	automatic shutdown, cold shut down at 17:00, March 14th
Unit2 (1,100MWe):	automatic shutdown, cold shut down at 18:00, March 14th
Unit3 (1,100MWe):	automatic shutdown, cold shut down at 12:15, March 12th
Unit4 (1,100MWe):	automatic shutdown, cold shut down at 07:15, March 15th

(2) Major plant parameters (As of 06:00 April 20th)

	Unit	Unit 1	Unit 2	Unit 3	Unit 4

Reactor Pressure*1	MPa	0.15	0.14	0.10	0.17
Reactor water temperature	℃	24.6	24.4	32.9	28.6
Reactor water level*2	mm	9,346	10,296	7,792	8,785
Suppression pool water temperature	℃	24	24	26	29
Suppression pool pressure	kPa (abs)	105	104	110	107
Remarks		cold shutdown	cold shutdown	cold shutdown	cold shutdown

*1: Converted from reading value to absolute pressure

*2: Distance from the top of fuel

(3) Situation of Each Unit

<Unit 1>

- Around 17:56 March 30th, smoke was rising from the power distribution panel on the first floor of the turbine building of Unit 1. However, when the power supply was turned off, the smoke stopped to generate. It was judged by the fire station at 19:15 that this event was caused by the malfunction of the power distribution panel and was not a fire.
- The Residual Heat Removal System (B) to cool the reactor of Unit 1 became to be able to receive power from the emergency power supply as well as the external power supply. This resulted in securing the backup power supplies (emergency power supplies) of Residual Heat Removal System (B) for all Units. (14:30 March 30th)

(4) Report concerning other incidents

- TEPCO reported to NISA the event in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (18:08 March 11th)
- TEPCO reported to NISA the events in accordance with the Article 10 regarding Units 1, 2 and 4. (18:33 March 11th)
- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 1. (5:22

March 12th)

- TEPCO reported to NISA the event (Loss of pressure suppression functions) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 2. (5:32 March 12th)
- TEPCO reported to NISA the event (Loss of pressure suppression function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 4 of Fukushima Dai-ni NPS. (6:07 March 12th)

● Onagawa NPS (Tohoku Electric Power Co. Inc.)
(Onagawa Town, Oga County and Ishinomaki City, Miyagi Prefecture)

(1) The state of operation

Unit 1 (524MWe): automatic shutdown, cold shut down at 0:58, March 12th
Unit 2 (825MWe): automatic shutdown, cold shut down at earthquake
Unit 3 (825MWe): automatic shutdown, cold shut down at 1:17, March 12th

(2) Readings of monitoring post, etc.

MP2 (Monitoring at the Northern End of Site Boundary)
Approx. 0.29 μ SV/h (16:00 April 19th) (Approx. 0.30 μ SV/h (16:00 April 18th))

(3) Report concerning other incidents

- Fire Smoke on the first basement of the Turbine Building was confirmed to be extinguished. (22:55 on March 11th)
- Tohoku Electric Power Co. reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (13:09 March 13th)

2. Action taken by NISA

(March 11th)

14:46 Set up of the NISA Emergency Preparedness Headquarters (Tokyo) immediately after the earthquake

15:42 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

16:36 TEPCO recognized the event (Inability of water injection of the Emergency Core Cooling System) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Units 1 and 2 of Fukushima Dai-ichi NPS. (Reported to NISA at 16:45)

18:08 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

18:33 Regarding Units 1, 2 and 4 of Fukushima Dai-ni NPS, TEPCO reported to NISA in accordance with the Article 10 of Act on Special Measures Concerning Nuclear Emergency Preparedness.

19:03 The Government declared the state of nuclear emergency. (Establishment of the Government Nuclear Emergency Response Headquarters and the Local Nuclear Emergency Response Headquarters)

20:50 Fukushima Prefecture's Emergency Response Headquarters issued a direction for the residents within 2 km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate. (The population of this area is 1,864.)

21:23 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayor of Okuma Town and the Mayor of Futaba Town were issued regarding the event occurred at Fukushima Dai-ichi NPS, TEPCO, in accordance with the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Unit 1 of Fukushima Dai-ichi NPS to evacuate
- Direction for the residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS to stay in-house

24:00 Vice Minister of Economy, Trade and Industry, Ikeda arrived at the Local Nuclear Emergency Response Headquarters

(March12th)

0:49 Regarding Units 1 TEPCO Fukushima Dai-ichi NPS, TEPCO recognized the event (Unusual rise of the pressure in PCV) in accordance with the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 01:20)

05:22 Regarding Unit 1 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness. (Reported to NISA at 06:27)

05:32 Regarding Unit 2 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

05:44 Residents within 10km radius from Unit 1 of Fukushima Dai-ichi NPS shall evacuate by the Prime Minister Directive.

06:07 Regarding of Unit 4 of Fukushima Dai-ni NPS, TEPCO recognized the event (Loss of pressure suppression function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

06:50 In accordance with the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to control the internal pressure of PCV of Units 1 and 2 of Fukushima Dai-ichi NPS.

07:45 Directives from the Prime Minister to the Governor of Fukushima Prefecture, the Mayors of Hirono Town, Naraha Town , Tomioka Town and Okuma Town were issued regarding the event occurred at Fukushima Dai-ni NPS, TEPCO, pursuant to the Paragraph 3, the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness as follows:

- Direction for the residents within 3km radius from Fukushima Dai-ni NPS to evacuate
- Direction for the residents within 10km radius from Fukushima Dai-ni NPS to stay in-house

17:00 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

17:39 The Prime Minister directed evacuation of the residents within the 10 km radius from Fukushima Dai-ni NPS.

18:25 The Prime Minister directed evacuation of the residents within the 20km radius from Fukushima Dai-ichi NPS.

19:55 Directives from the Prime Minister was issued regarding seawater injection to Unit 1 of Fukushima Dai-ichi NPS.

20:05 Considering the Directives from the Prime Minister and pursuant to the Paragraph 3, the Article 64 of the Nuclear Regulation Act, the order was issued to inject seawater to Unit 1 of Fukushima Dai-ichi NPS and so on.

20:20 At Unit 1 of Fukushima Dai-ichi NPS, seawater injection was started.

(March 13th)

05:38 TEPCO reported to NISA the event (Total loss of coolant injection function) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS. Recovering efforts by TEPCO of the power source and coolant injection function and the work on venting were under way.

09:01 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

09:08 Pressure suppression and fresh water injection was started for Unit 3 of Fukushima Dai-ichi NPS.

09:20 The Pressure Vent Valve of Unit 3 of Fukushima Dai-ichi NPS was opened.

09:30 Directive was issued for the Governor of Fukushima Prefecture, the Mayors of Okuma Town, Futaba Town, Tomioka Town and Namie Town in accordance with the Act on Special Measures Concerning Nuclear Emergency Preparedness on the contents of radioactivity decontamination screening.

13:09 Tohoku Electric Power Co. reported to NISA that Onagawa NPS reached a situation specified in the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

13:12 Fresh water injection was switched to seawater injection for Unit 3 of Fukushima Dai-ichi NPS.

14:36 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 14th)

01:10 Seawater injection for Units 1 and 3 of Fukushima Dai-ichi NPS were temporarily interrupted due to the lack of seawater in pit.

03:20 Seawater injection for Unit 3 of Fukushima Dai-ichi NPS was resumed.

04:40 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

05:38 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:52 TEPCO reported to NISA the event (Unusual rise of the pressure in PCV) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Unit 3 of Fukushima Dai-ichi NPS.

13:25 Regarding Unit 2 of Fukushima Dai-ichi NPS, TEPCO recognised the event (Loss of reactor cooling function) to fall under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.

22:13 TEPCO reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ni NPS.

22:35 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 15th)

00:00: The acceptance of experts from International Atomic Energy Agency

(IAEA) was decided. NISA agreed to accept the offer of dispatching of the expert on NPS damage from IAEA considering the intention by Mr. Amano, Director General of IAEA. Therefore, the schedule of expert acceptance will be planned from now on according to the situation.

00:00: NISA also decided the acceptance of experts dispatched from U.S. Nuclear Regulatory Commission (NRC).

07:21 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

07:24 Incorporated Administration Agency, Japan Atomic Energy Agency (JAEA) reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Fuel Cycle Engineering Laboratories, Tokai Research and Development Centre.

07:44 JAEA reported to NISA in accordance with the Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Nuclear Science Research Institute.

08:54 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

10:30 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the directions as follows.

For Unit 4: To extinguish fire and to prevent the occurrence of re-criticality

For Unit 2: To inject water to reactor vessel promptly and to vent Drywell.

10:59 Considering the possibility of lingering situation, it was decided that the function of the Local Nuclear Emergency Response Headquarters was moved to the Fukushima Prefectural Office.

11:00 The Prime Minister directed the in-house stay area.

In-house stay was additionally directed to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS considering in-reactor situation.

16:30 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

22:00 According to the Nuclear Regulation Act, the Minister of Economy, Trade and Industry issued the following direction.
For Unit 4: To implement the water injection to the Spent Fuel Pool.

23:46 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 18th)

13:00 Ministry of Education, Culture, Sports, Science and Technology decided to reinforce the nation-wide monitoring survey in the emergency of Fukushima Dai-ichi and Dai-ni NPS.

15:55 TEPCO reported to NISA on the accidents and failure at Units 1, 2, 3 and 4 of Fukushima Dai-ichi NPS (Leakage of the radioactive materials inside of the reactor buildings to non-controlled area of radiation) pursuant to the Article 62-3 of the Nuclear Regulation Act.

16:48 Japan Atomic Power Co. reported to NISA accidents and failures in Tokai NPS (Failure of the seawater pump motor of the Emergency Diesel Generator 2C) pursuant to the Article 62-3 of the Nuclear Regulation Act.

(March 19th)

07:44 The second unit of Emergency Diesel Generator (A) for Unit 6 started up.
TEPCO reported to NISA that the pump for RHR (C) for Unit 5 started up and started to cooling Spent Fuel Storage Pool. (Power supply: Emergency Diesel Generator for Unit 6)

08:58 TEPCO reported to NISA the event (Unusual increase of radiation dose at the site boundary) falling under the Article 15 of the Act on Special Measures Concerning Nuclear Emergency Preparedness regarding Fukushima Dai-ichi NPS.

(March 20th)

23:30 Directive from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisoma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village) was issued regarding the change of the reference value for the screening level for decontamination of radioactivity.

(March 21st)

07:45 Directive titled as "Administration of the stable Iodine" was issued from Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and the heads to administer stable Iodine under the direction of the headquarters and in the presence of medical experts, and not to administer it on personal judgements.

16:45 Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" was issued from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

17:50 Directive from the Director-general of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Gunma was issued, which direct the above-mentioned governors to issue a request to relevant businesses and people to suspend shipment of spinach, *Kakina* (a green vegetable) and raw milk for the time being.

(March 22nd)

16:00 NISA received the response (Advice) from Nuclear Safety Commission Emergency Technical Advisory Body to the request for advice made by NISA, regarding the report from TEPCO titled as "The Results of Analysis of Seawater" dated March 22nd.

(March 25th)

NISA directed orally to the TEPCO regarding the exposure of workers at the turbine building of Unit 3 of Fukushima Dai-ichi Nuclear Power Station occurred on March 24th, to review immediately and to improve its radiation control measures from the viewpoint of preventing a recurrence.

(March 28th)

Regarding the mistake in the evaluation of the concentration measurement in the stagnant water on the basement floor of the turbine building of Unit 2 of Fukushima Dai-ichi NPS announced by TEPCO on 27 March, NISA directed TEPCO orally to prevent the recurrence of such a mistake.

13:50 Receiving the suggestion by the special meeting of Nuclear Safety Commission (NSC) (Stagnant water on the underground floor of the turbine building at Fukushima Dai-ichi Plant Unit 2), NISA directed TEPCO orally to add the sea water monitoring points and carry out the groundwater monitoring.

Regarding the delay in the reporting of the water confirmed outside of the turbine buildings, NISA directed TEPCO to accomplish the communication in the company on significant information in a timely manner and to report it in a timely and appropriate manner.

(March 29th)

11:16 The report was received, regarding the accident and trouble etc. in Onagawa NPS of Tohoku Electric Power Co. Inc. (the trouble of pump of component cooling water system etc. in Unit 2 and the fall of heavy oil tank for auxiliary boiler of Unit 1 by tsunami), pursuant to the Article 62-3 of the Nuclear Regulation Act and the Article 3 of the Ministerial Ordinance for the Reports related to Electricity.

In order to strengthen the system to assist the nuclear accident sufferers, the "Team to Assist the Lives of the Nuclear Accident Sufferers" headed by the Minister of Economy, Trade and Industry was established and the visits, etc. by the team to relevant cities, towns and villages were carried out.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.1 for the residents within the area from 20 km to 30 km radius.

(March 30th)

Directions as to the implementation of the emergency safety measures for the other power stations considering the accident of Fukushima Dai-ichi and Dai-ni NPSs in 2011 was issued and handed to each electric power company and the relevant organization.

(March 31st)

Regarding the break-in of the propaganda vehicle to Fukushima Dai-ni NPS on 31 March, NISA directed TEPCO orally to take the carefully thought-out measures regarding physical protection, etc.

NISA alerted TEPCO to taking the carefully though-out measures regarding radiation control for workers.

The Local Nuclear Emergency Response Headquarters issued the News Letter No.2 for the residents within the area from 20 km to 30 km radius.

(April 1st)

NISA strictly alerted TEPCO to taking appropriate measures concerning the following three matters regarding the mistake in the result of nuclide analysis.

- Regarding the past evaluation results on nuclide analysis, all the nuclides erroneously evaluated should be identified and the re-evaluation on them should be promptly carried out.

- The causes for the erroneous evaluation should be investigated and the thorough measures for preventing the recurrence should be taken.
- Immediate notification should be done in the stage when any erroneous evaluation results, etc. are identified.

(April 2nd)

Regarding the outflow of the liquid including radioactive materials from the area around the Intake Channel of Unit 2 of Fukushima Dai-ichi NPS, NISA directed TEPCO orally to carry out nuclide analysis of the liquid sampled, to confirm whether there are other outflows from the same parts of the facilities as the one, from which the outflow was confirmed around the Unit 2, and to strengthen monitoring through sampling water at more points around the facilities concerned.

(April 4th)

On the imperative execution of the discharge to the sea as an emergency measure, NISA requested the technical advice of NSC and directed TEPCO to survey and confirm the impact of the spread of radioactive materials caused by the discharge, by ensuring continuity of the sea monitoring currently underway and enhancing it (Increase of the frequency of measuring as well as the number of monitoring points), disclose required information, as well as to enhance the strategy to minimize the discharge amount.

(April 5th)

Directions as to the implementation of advance notification and contact to the local governments with regard to taking measures related to discharge of radioactive materials from Fukushima Dai-ichi NPS, which have a possible impact on the environment, was issued.

(April 6th)

On the implementation of the nitrogen injection to PCV of Unit 1, NISA directed TEPCO on the following three points. (12:40 April 6th)

① Properly control the plant parameters, and take measures appropriately to ensure safety in response to changes in the parameters. ②Establish and implement an organizational structure and so on that will ensure the safety of the workers who will engage in the operation. ③As the possibility of leakage of the air in PCV to the outside due to the nitrogen injection cannot be ruled out, through the judicious and further enhanced monitoring, TEPCO shall survey and confirm the impact of the release and spreading of radioactive materials due to the nitrogen injection, and strive to disclose information.

(April 7th)

The Local Nuclear Emergency Response Headquarters issued the News Letter No.3 for the residents within the area from 20km to 30km radius. (April 7th)

(April 9th)

Due to the earthquake off the coast of Miyagi Prefecture occurred around 23:32 April 7th, all the Emergency Diesel Generators for Unit 1 of the Higashidori NPS of Tohoku Electric Power Co., Inc. were not workable. Considering this event, NISA issued the letters of direction titled "Regarding the Treatment of Emergency Power Generating Facilities in Terms of Safety Regulations (Directions)" to each Electricity Utility and other organizations concerned.

In accordance with the Paragraph 1, the Article 67 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the evaluation of necessity and safety, and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 10th)

In accordance with Article 67, paragraph 1 of the Nuclear Regulation Act, NISA issued the direction regarding collection of report that should include the necessity, the evaluation of safety and the policy of ensuring the permanent storage and treatment facilities for the waste water and so on, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

(April 13th)

- In accordance with paragraph 1, Article 67 of the Nuclear Regulation Act, NISA directed TEPCO to report the result of implementation on seismic safety evaluation as well as the result of consideration on the measurement of effective seismic reinforcement work, etc., regarding the buildings of Fukushima Dai-ichi NPS.
- NISA directed TEPCO to implement detailed analysis and consideration regarding the tsunami caused by the 2011 Tohoku District - off the Pacific Ocean Earthquake.
- NISA directed Tohoku Electric Power Co. Inc. to report the analysis of seismic data observed when the 2011 Earthquake off the Coast of Miyagi Prefecture occurred around 23:32 on 7 April and the assessment on seismic impact on the facilities that are important from the seismic safety viewpoints.

(April 14th)

- NISA directed TEPCO orally to strengthen the monitoring of the Sub Drain (the groundwater collected and controlled in the facilities) of Units 1 and 2, because the radioactive concentration of the water sampled on 13 April rose one digit up in comparison with the preceding result.

(April 15th)

- NISA strictly alerted TEPCO and directed it orally to prepare the measures for preventing the recurrence regarding the delay in the notification of the dismissal of Nuclear Emergency Preparedness Manager, accompanied with the personnel changes dated on 1 April, in accordance with Article 9, paragraph 5 of the Act on Special Measures Concerning Nuclear Emergency Preparedness.
- NISA directed General Electricity Utilities and other organizations

concerned to consider the measures to ensure reliability on external power supply due to the temporary loss of external power supply at NPSs, etc., caused by ground faults in part of electric power system when the earthquake off the coast of Miyagi Prefecture occurred on April 7, 2011.

(April 18th)

- NISA accepted (18 April) and confirmed (19 April) the report from TEPCO, in accordance with the direction for the collection of report issued on 10 April, concerning the transfer of the stagnant water with high-level radioactivity in Fukushima Dai-ichi NPS to the Radioactive Waste Treatment Facilities.

< Possibility on radiation exposure (As of 08:00 April 20th) >

1. Exposure of residents

(1) Including the about 60 evacuees from Futaba Public Welfare Hospital to Nihonmatsu City Fukushima Gender Equality Centre, as the result of measurement of 133 persons at the Centre, 23 persons counted more than 13,000 cpm were decontaminated.

(2) The 35 residents transferred from Futaba Public Welfare Hospital to Kawamata Town Saiseikai Kawamata Hospital by private bus arranged by Fukushima Prefecture were judged to be not contaminated by the Prefectural Response Centre.

(3) As for the about 100 residents in Futaba Town evacuated by bus, the results of measurement for 9 of the 100 residents were as follows. The evacuees, moving outside the Prefecture (Miyagi Prefecture), were divided into two groups, which joined later to Nihonmatsu City Fukushima Gender Equality Centre.

No. of Counts	No. of Persons
18,000 cpm	1
30,000-36,000 cpm	1
40,000 cpm	1

little less than 40,000 cpm*	1
very small counts	5

*(These results were measured without shoes, though the first measurement exceeded 100,000 cpm.)

(4) The screening was started at the Off site Centre in Okuma Town from March 12th to 15th. 162 people received examination until now. At the beginning, the reference value was set at 6,000 cpm. 110 people were at the level below 6,000 cpm and 41 people were at the level of 6,000 cpm or more. When the reference value was increased to 13,000 cpm afterward, 8 people were at the level below 13,000 cpm and 3 people are at the level of 13,000 cpm or more.

The 5 out of 162 people examined were transported to hospital after being decontaminated.

(5) The Fukushima Prefecture carried out the evacuation of patients and personnel of the hospitals located within 10km area. The screening of all the members showed that 3 persons have the high counting rate. These members were transported to the secondary medical institute of exposure. As a result of the screening on 60 fire fighting personnel involved in the transportation activities, the radioactivity higher than twice of the back ground was detected on 3 members. Therefore, all the 60 members were decontaminated.

(6) Fukushima Prefecture has started the screening from 13 March. It is carried out at the evacuation sites and the 11 places (set up permanently) such as health offices. Up until April 17th, the screening was done to 159,269 people. Among them, 102 people were above the 100,000 cpm, but when measured these people again without clothes, etc., the counts decreased to 100,000 cpm and below, and there was no case which affects health.

2. Exposure of workers

As for the workers conducting operations in Fukushima Dai-ichi NPS, the total number of people who were at the level of exposure more than 100 mSv becomes 29.

For two out of the three workers who were confirmed to be at the level of exposure more than 170 mSv on March 24, the attachment of radioactive material on the skin of both legs was confirmed. As the two workers were judged to have a possibility of beta ray burn, they were transferred to the Fukushima Medical University Hospital, and after that, on March 25th, all of the three workers arrived at the National Institute of Radiological Sciences in the Chiba Prefecture. As the result of examination, the level of exposure of their legs was estimated to be from 2 to 3 Sv. The level of exposure of both legs and internal did not require medical treatment, but they decided to monitor the progress of all three workers in the hospital. All the three workers have been discharged from the hospital around the noon on 28 March. The three workers had the second medical examination at the National Institute of Radiological Sciences on 11 April, as a result, there was no problem regarding the condition of their health. The two workers who had been partially exposed to radiation on their skin of both legs were judged that any conditions of burn or red spots were not found on their skin.

At around 11:35 April 1st, a worker fell into the sea when he went on board the barge of the US Armed forces in order to adjust the hose. He was rescued immediately by other workers around without any injury and external contamination. In order to make double sure, the measurement by a whole-body counter was implemented. As a result, it was evaluated that there was no internal radionuclide contaminant on April 12th.

3. Others

(1) 4 members of Self-Defence Force who worked in Fukushima Dai-ichi NPS were injured by explosion. One member was transferred to National Institute of Radiological Sciences. After the examination, judged that there were wounds but no risk for health from the exposure, the one was released from the hospital on March 17th. No other exposure of the Self-Defence Force member was confirmed at the Ministry of Defence.

(2) As for policeman, the decontaminations of two policemen were confirmed by the National Police Agency. Nothing unusual was reported.

(3) On March 24th, examinations of thyroid gland for 66 children aged from 1 to 15 years old were carried out at the Kawamata Town public health Center. The result was at not at the level of having harmful influence.

(4) From March 26th to 27th, examinations of thyroid gland for 137 children aged from 0 to 15 years old were carried out at the Iwaki City Public Health Center. The result was not at the level of having harmful influence.

(5) From March 28th to 30th, examinations of thyroid gland for 946 children aged from 0 to 15 years old were carried out at the Kawamata Town Community Center and the Iitate Village Office. The result was not at the level of having harmful influence.

<Directive of screening levels for decontamination of radioactivity>

(1) On March 20th, the Local Nuclear Emergency Response Headquarters issued the directive to change the reference value for the screening level for decontamination of radioactivity as the following to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

Old: 40 Bq/cm^2 measured by a gamma-ray survey meter or 6,000 cpm

New: 1 μ Sv/hour (dose rate at 10cm distance) or 100,000cpm equivalent

<Directives of administrating stable Iodine during evacuation>

(1) On March 16th, the Local Nuclear Emergency Response Headquarters issued “Directive to administer the stable Iodine during evacuation from the evacuation area (20 km radius)” to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village).

(2) On March 21st, the Local Nuclear Emergency Response Headquarters issued Directive titled as “Administration of the stable Iodine” to the Prefectural Governor and the heads of cities, towns and villages (Tomioka Town, Futaba Town, Okuma Town, Namie Town, Kawauchi Village, Naraha Town, Minamisouma City, Tamura City, Katsurao Village, Hirono Town, Iwaki City and Iitate Village), which directs the above-mentioned governor and heads to administer stable Iodine under the direction of the

headquarters and in the presence of medical experts, and not to administer it on personal judgements.

<Situation of the injured (As of 08:00 April 20th)>

1. Injury in Unit 1 of Fukushima Dai-ichi NPS due to earthquake on 11 March
   - Two employees (slightly, have already returned to work)
   - Two employees (a cut by a broken glass by earthquake and tsunami, have already returned to work)
   - One employee (a scratch when evacuating, has already returned to work)
   - One subcontract employee (fracture in both legs, be in hospital)
   - Two died (After the earthquake, two TEPCO's employees missed and had been searched continuously. In the afternoon of March 30th, the two employees were found on the basement floor of the turbine building of Unit 4 and were confirmed dead by April 2nd.)

2. Injury due to the explosion of Unit 1 of Fukushima Dai-ichi NPS on 12 March
   - Four employees (two TEPCO's employees and two subcontractor's employees) were injured at the explosion and smoke of Unit 1 around the turbine building (non-controlled area of radiation) and were examined by Kawauchi Clinic. Two TEPCO's employees return to work again and two subcontractors' employees are under home treatment.

3. Injury due to the explosion of Unit 3 of Fukushima Dai-ichi NPS on 14 March.
   - Four TEPCO's employees (They have already returned to work.)
   - Three subcontractor's employees (They have already returned to work.)
   - Four members of Self-Defence Force (one of them was transported to National Institute of Radiological Sciences considering internal possible exposure. The examination resulted in no internal exposure. The member was discharged from the institute on March 17th.)

4. Other injuries
   - On the earthquake on 11 March, one subcontractor's employees (a crane operator) died in Fukushima Dai-ni NPS. (It seems that the tower crane

broke and the operator room was crushed and the person was hit on the head.)

- One subcontractor's employee was transported to the hospital on March 11th. (Later, turned out a cerebral infarction)
- One emergency patient on 12 March. (a cerebral stroke, transported by the ambulance, be in hospital)
- Ambulance was requested for one employee complaining the pain at left chest outside of control area on March 12. (Conscious, under home treatment)
- One employee suffered lacerations on his left arm and was transported to the hospital for treatment on March 12th. (Has already returned to work)
- Two employees complaining discomfort wearing full-face mask in the main control room were transported to Fukushima Dai-ni NPS for a consultation with an industrial doctor on 13 March. (One employee has already returned to work and the other is under home treatment.)
- Two subcontractor's employees were injured during working at temporary control panel of power source in the Common Spent Fuel Pool, transported to where were industrial medical doctors the Fukushima Dai-ni NPS on 22 and 23 March. (One employee has already returned to work and the other is under home treatment.)
- On the afternoon of 7 April, a worker who was making sandbags at the soil disposal yard (spoil bank) on the north side of Fukushima Dai-ichi NPS got sick and was transported to J-Village for the body survey of contamination of radioactive materials. Being confirmed to be free from contamination, the worker was taken to the Iwaki City Kyouritsu Hospital by ambulance. On 8 April, the worker was diagnosed as dehydration and transient unconsciousness.
- At 09:19 April 9th, one subcontractor's employee was transported to a hospital as the worker wearing full-face mask felt discomfort during the work for cable processing in the Building of Water Processing, stepped on the manhole outside the building, which lid was shifted, and injured. As a result of medical examination, the worker was diagnosed as a right knee contusion and suspect of right knee medial collateral ligament injury. Furthermore, as a result of the body survey, it was confirmed that the worker was free from contamination of radioactive materials.

- Around 11:10 April 10th, a subcontractor's employee who was conducting the operations of laying drain hoses in the yard of Unit 2 got sick and was transported to J-Village. Thereafter the employee was taken to the Iwaki City Kyouritsu Hospital by ambulance at 14:27 on the same day. It was confirmed that the employee was free from adhesion of radioactive materials to his body

<Situation of resident evacuation (As of 08:00 April 20th)>

At 11:00 March 15th, the Prime Minister directed in-house stay to the residents in the area from 20 km to 30 km radius from Fukushima Dai-ichi NPS. The directive was conveyed to Fukushima Prefecture and related municipalities.

Regarding the evacuation as far as 20-km from Fukushima Dai-ichi NPS and 10-km from Fukushima Dai-ni NPS, necessary measures have already been taken.

- The in-house stay in the area from 20 km to 30 km from Fukushima Dai-ichi NPS is made fully known to the residents concerned.
- Cooperating with Fukushima Prefecture, livelihood support to the residents in the in-house stay area are implemented.
- On March 28th, Chief Cabinet Secretary mentioned the continuation of the limited-access within the area of 20 km from Fukushima Dai-ichi NPS. On the same day, the Local Nuclear Emergency Response Headquarters notified the related municipalities of forbidding entry to the evacuation area within the 20 km zone.

<Directives regarding foods and drinks>

Directive from the Director-General of the Government Nuclear Emergency Response Headquarters to the Prefectural Governors of Fukushima, Ibaraki, Tochigi and Chiba was issued, which directed above-mentioned governors to suspend shipment and so on of the following products for the time being.

The Government Nuclear Emergency Response Headquarters organized the thoughts of imposing and lifting restrictions on shipment as follows, considering the NSC's advice.

- The area where restrictions on shipment to be imposed or lifted could be decided in units of the area where a prefecture is divided into, such as cities, towns, villages and so on, considering the spread of the contamination affected area and the actual situation of produce collection, etc.
- The restriction on shipment of the item, of which the result of the sample test exceeded the provisional regulation limits, shall be decided by judging in a comprehensive manner considering the regional spread of the contamination impact.
- Lifting the restrictions on shipment shall be implemented when a series of three results of nearly weekly tests for the item or the area falls below the provisional regulation limits, considering the situation of the Fukushima Dai-ichi NPS.
- However, the tests shall be carried out nearly weekly after the lifting, while the release of the radioactive materials from the NPS continues.

(1) Items under the suspension of shipment and restriction of intake (As of 08:00 April 20th)

Prefectures	Suspension of shipment	Restriction of intake
Fukushima Prefecture	Non-head type leafy vegetables, head type leafy vegetables , flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna**, Rape, *Chijirena*, *Santouna**, *Kousaitai**, *Kakina**, *etc.*), Turnip, Raw milk (Except some areas**) and Shiitake (only ones grown on raw lumber in an open field of Date-City, Souma-City, Minamisouma-City, Tamura-City, Iwaki-City, Sinchi-Town,	Non-head type leafy vegetables, head type leafy vegetables, flowerhead brassicas (Spinach, Cabbage, Broccoli, Cauliflower, *Komatsuna**, *Kukitachina**, *Shinobufuyuna*, Rape, *Chijirena*, *Santouna**, *Kousaitai**, *Kakina**, *etc.*) , Shiitake (only ones grown on raw lumber in an open field of Iitate-Village)

	Kawamata-Town, Namie-Town, Futaba-Town, Ookuma-Town, Tomioka-Town, Naraha-Town, Hirono-Town, Iitate-Village, Katsurao-Village , Kawauchi-Village and Fukushima-City)	
Ibaraki Pref.	Spinach (only ones produced in Kitaibaraki City and Takahagi City)	
Tochigi Pref.	Spinach	
Chiba Pref.	- Spinach from Katori-City and Tako-Town - Spinach, Qing-geng-cai, Garland chrysanthemum, Sanchu Asian lettuce, Celery and Parsley from Asahi City	

*a green vegetable

**Kitakata-City, Bandai-Town, Inawashiro-Town, Mishima-Town, Aizumisato-Town, Shimogo-Town, Minamiaizu-Town, Fukushima-City, Nihonmatsu-City, Date-City, Motomiya-City, Koriyama-City, Sukagawa-City, Tamura-City (except former Miyakoji-Village area), Shirakawa-City, Iwaki-City, Kunimi-Town, Kagami-ishi-Town, Ishikawa-Town, Asakawa-Town, Furudono-Town, Miharu-Town, Ono-Town, Yabuki-Town, Yamatsuri-Town, Hanawa-Town, Otama-Village, Hirata-Village, Nishigo-Village, Izumizaki-Village, Nakajima-Village, Samegawa-Village

(2) Request for restriction of drinking for tap-water (As of 08:00 April 20th)

Scope under restriction	Water service (Local governments requested for restriction)

All residents	None
Babies ・Water services that continue to respond to the directive ・Tap-water supply service that continues to respond to the directive	<Fukushima Prefecture> Iitate small water service (Iitate Village, Fukushima Prefecture) None

<Directive regarding the ventilation when using heating equipments in the aria of indoor evacuation >

On March 21st, Directive titled as "Ventilation for using heating equipments within the in-house evacuation zone" from the Director-General of Local Nuclear Emergency Response Headquarters to the Prefectural Governor and the heads of cities, towns and villages (Iwaki City, Tamura City, Minamisouma City, Hirono Town, Kawauchi Village, Namie Town, Katsurao Village, and Iitate Village) was issued, which directs those governor and heads to publicly announce the guidance to the residents within the in-house evacuation zone, concerning the indoor use of heating equipments that require ventilation, in order to avoid poisoning from carbon monoxide and to reduce exposure.

< Fire Bureaus' Activities>

- From 11:00 till around 14:00 on March 22nd, Niigata-City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the set up of large decontamination system.
- From 8:30 till 9:30, from 13:30 till 14:30 on March 23rd, Niigata City Fire Bureau and Hamamatsu City Fire Bureau gave guidance to TEPCO as to the operation of large decontamination system.

News Release

経済産業省
Ministry of Economy, Trade and Industry

(Contact Person)
Mr. Toshihiro Bannai
Director, International Affairs Office, NISA/METI
Phone:+81-(0)3-3501-1087

From: Pace, Patti
Sent: Wednesday, April 20, 2011 3:08 PM
To: RST01 Hoc
Subject: RE: April 19 - 1500 EDT One-Pager Fukushima Daiichi

Follow Up Flag: Follow up
Flag Status: Flagged

Yes, someone called. Thanks. I got the SitRep. Will look for the 3:00pm one pager. Thanks!

Patti Pace
Assistant to Chairman Gregory B. Jaczko
U.S. Nuclear Regulatory Commission
301-415-1820 (office)
301-415-3504 (fax)

From: RST01 Hoc
Sent: Wednesday, April 20, 2011 3:07 PM
To: Pace, Patti
Subject: RE: April 19 - 1500 EDT One-Pager Fukushima Daiichi

Did anybody get back to you on this? Sorry, I got caught up with the 11am call.

Let me know, I think we are getting ready to put out another update.

There really wasn't much difference between the SITREP and the 0700 update.

Mike

Mike Brown
Reactor Safety Team

From: Pace, Patti
Sent: Wednesday, April 20, 2011 9:48 AM
To: RST01 Hoc; OST01 HOC
Subject: FW: April 19 - 1500 EDT One-Pager Fukushima Daiichi
Importance: High

Good Morning,

Has this document been updated since yesterday at 1500 EDT? Has the frequency of updating and circulating it been changed? Attached is the last one I received. Please advise.

Thank you,

Patti Pace
Assistant to Chairman Gregory B. Jaczko
U.S. Nuclear Regulatory Commission
301-415-1820 (office)

QQQ/330

301-415-3504 (fax)

From: OST01 HOC
Sent: Tuesday, April 19, 2011 3:03 PM
To: Zimmerman, Roy; Batkin, Joshua; Boger, Bruce; Carpenter, Cynthia; Castleman, Patrick; Franovich, Mike; Gibbs, Catina; Hipschman, Thomas; Hoc, PMT12; Jaczko, Gregory; Johnson, Michael; LIA08 Hoc; Marshall, Michael; Moore, Scott; Orders, William; Pace, Patti; RST01 Hoc; Snodderly, Michael; Speiser, Herald; Tracy, Glenn; Uhle, Jennifer; Virgilio, Martin; Weber, Michael; Wiggins, Jim
Subject: April 19 - 1500 EDT One-Pager Fukushima Daiichi

Attached, please find the April 19 – 1500 EDT One-Pager – Fukushima Daiichi.

************Please note, all attachments are "Official Use Only"***********