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はじめよう。
Future From Fukushima.

Response to the Fukushima Daiichi Nuclear Power Station Accident

Fukushima Prefecture

Contents

Overview of the Fukushima Daiichi Nuclear Power Station(F1NPS) Accident

The Great East Japan Earthquake occurred on 11 March, 2011. A massive earthquake triggered tsunami which damaged the coastal areas of the Tohoku District, including Fukushima Prefecture.

F1NPS Accident

Damage at the Power Station

Earthquake Damage

- The Earthquake triggered the emergency stop of the operating reactors(1 – 3)
- Emergency power supplies were triggered, starting fuel cooling operations for reactors 1-6

Tsunami Damage

- Tsunami caused flooding of the emergency power supplies including batteries, which lead to a loss of power for reactors 1-5
- Fuel melted in reactors 1-3 and radioactive substances were released into the air
- Hydrogen explosions caused damage to the buildings containing reactors 1, 3, and 4.
- Cooling function was lost for the spent fuel pools of reactors 1-6.

Power Station struck by tsunami

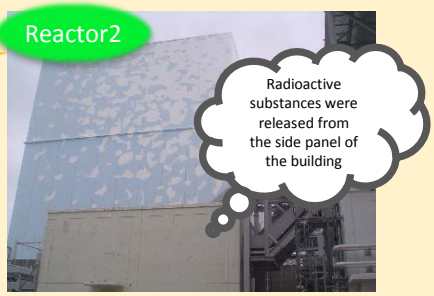
Damage Response

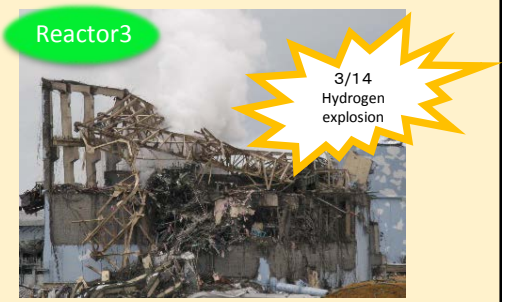
- Fuel in Reactors 1-3 were cooled using water injection, and reached a stable condition
- Reactor 5 resumed cooling operations using the emergency power facilities of Reactor 6.
- Cooling of the spent fuel pools was resumed using pumping vehicles and other temporary equipment.

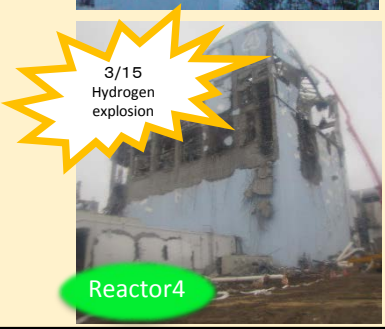
F1NPS - Situation after Tsunami Disaster

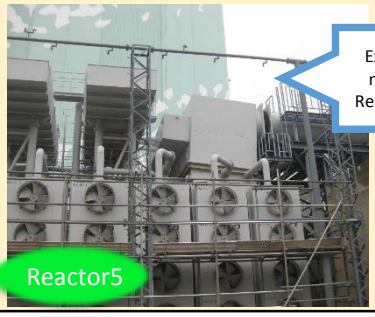
Reactor No.	Operational Condition	Reactor fuel (Unit: rod)	Fuel in Pool (Unit: rod)	AC Power Source	DC Power Source	Emergency AC Power Source
1	Operating	400	392	Unusable	Unusable	Unusable
2	Operating	548	615	Unusable	Unusable	Unusable
3	Operating	548	566	Unusable	Partially usable	Unusable
4	Suspended	0	1,535	Unusable	Unusable	Unusable
5	Suspended	548	994	Unusable	Usable	Unusable
6	Suspended	764	940	Unusable	Usable	Usable

Reactors 1-6 after the accident









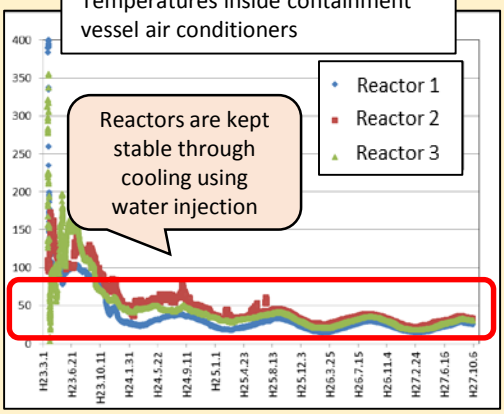
Decommissioning operations are currently underway for reactors 1 – 6 at the F1NPS.

Current situation of reactors

Reactor temperature

- Roughly 300㎥ of cooling water is being injected into the reactors every day
- Reactor temperature is stable at below 50°C (As of October, 2015)

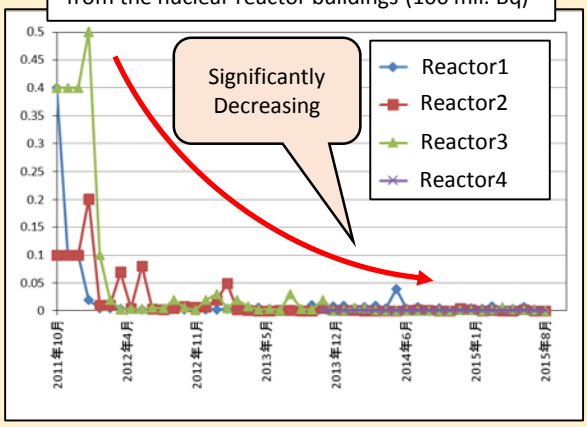
Temperatures inside containment vessel air conditioners



Amount of radioactive substances

- Concentrations of radioactive substances are being monitored and no signs of recriticality have been observed(As of October, 2015)

Amount of radio cesium per hour dispersed from the nuclear reactor buildings (100 mil. Bq)

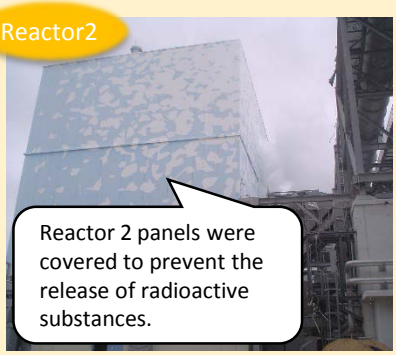


Current Situation (2015.10) of Reactors 1-6

Reactor1

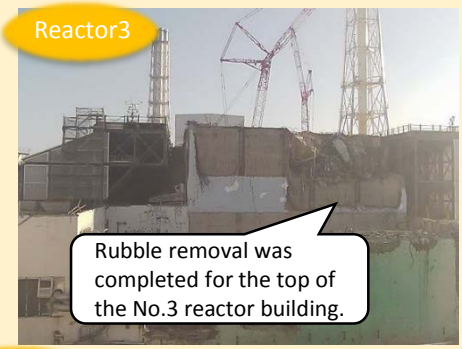
Reactor 1 was furnished with a cover in order to reduce the amount of radioactive substances being released in October, 2011. Currently the cover is being dismantled in preparation for the removal of rubble(October, 2015)

Reactor2



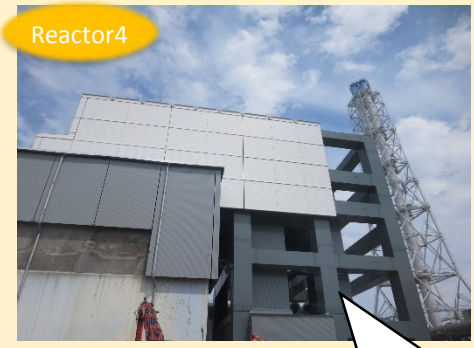
Reactor 2 panels were covered to prevent the release of radioactive substances.

Reactor3



Rubble removal was completed for the top of the No.3 reactor building.

Reactor4



Removal of all fuel was completed for reactor 4 in December, 2014

Reactor5

Reactor6

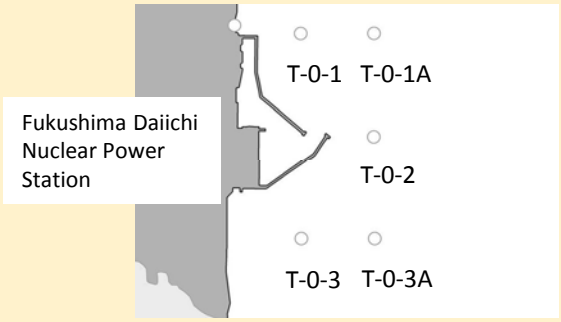
As no explosions occurred, reactor buildings 5 and 6 remain as they were before the accident.

TEPCO is conducting marine monitoring in order to confirm the impact on the environment caused by the radioactive substances released from the F1NPS. There are also many measures in place for the processing and reduction of contaminated water.

Marine monitoring

TEPCO is making efforts to confirm the environmental impact of radioactive substances released from the F1NPS

- Radiation levels inside and outside the power station are being measured.
- In spite of the leak of contaminated water, no significant increase in radiation levels has been observed outside the port.
- Radiation levels of sea water are well below standards for drinking water set by WHO.



As of 2015.9.24

	T-0-1	T-0-1A	T-0-2	T-0-3	T-0-3A
Cs-134	ND	ND	ND	ND	ND
Cs-137	ND	ND	ND	ND	ND
Total β	ND	ND	ND	ND	ND
H-3	ND	ND	ND	ND	0.001

*Total beta activity includes naturally occurring radionuclides such as K-40.

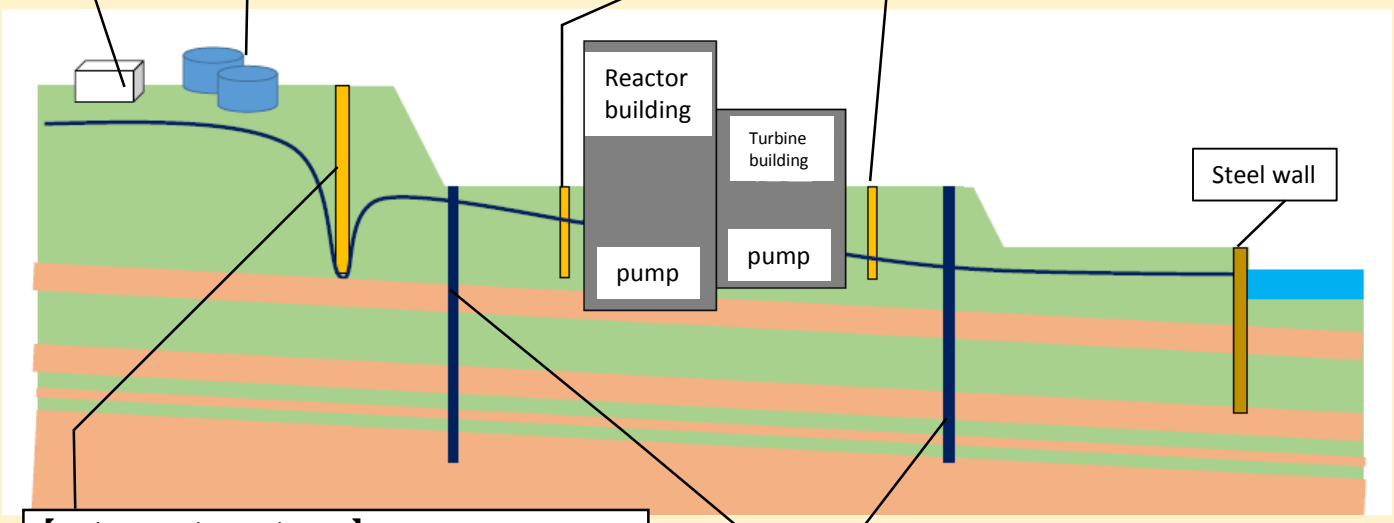
Contaminated Water Countermeasures

Groundwater seeps into the nuclear reactor buildings, causing an increase of 350㎥/day of contaminated water. The following measures are being taken at the F1NPS for the processing and control of the contaminated water.

【ALPS】
Removing radioactive substances(except tritium) from contaminated water.

【Contaminated Water Tanks】

【Sub-drain】
Pumping of groundwater from the wells around the buildings allows control of the amount of water seeping into the buildings. Water pumped will go through the purification process, and be discharged to the sea only if the radiation levels are confirmed to meet discharge standards.



【Underground water bypass】
By pumping up groundwater before it is contaminated using wells located on the mountain side of the site and discharging it into the sea, the amount of groundwater seeping into the buildings can be controlled

【Cryogenic ice wall（under construction）】
By embedding freezing pipes around the building, groundwater and soil can be frozen to make ice walls. This system prevents water from approaching the reactor building and suppresses the flow of groundwater.

All fuel needs to be removed from reactors in order to complete the decommissioning of the F1NPS. The current plan is to remove fuel from the spent fuel pools before removing the melted fuel debris from the reactors.

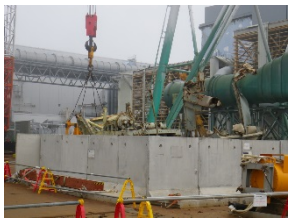
Decommissioning Measures

(1) Removal of spent fuel

The situation of each reactor regarding the removal of spent fuels is as follows:

Reactor No.	Situation
1	Cover of the reactor building is being dismantled.
2	Reviewing of the optimal method to remove fuel is underway.
3	Removal of rubble in the spent fuel pools is underway.
4	Removal of all fuel was completed in December, 2014

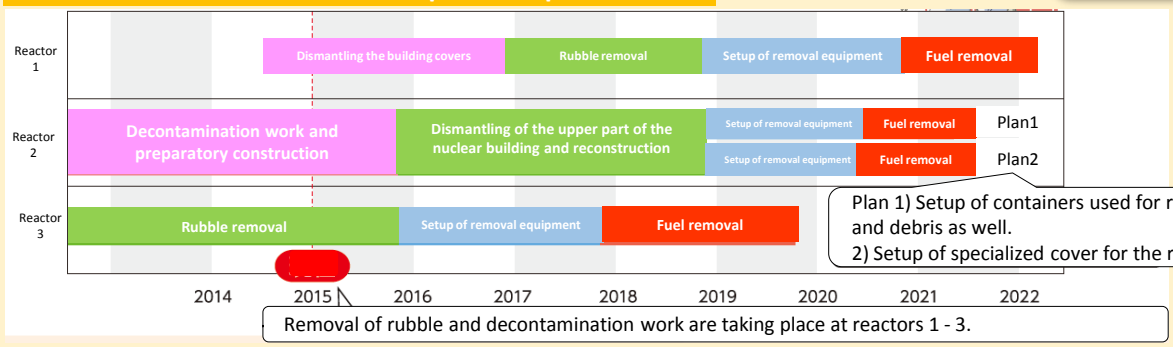
Reactor 1
Dismantling the building cover.



Reactor 3
Removing large rubble

Reactor 4
Removing fuel

≪Timeline of fuel removal from spent fuel pools≫



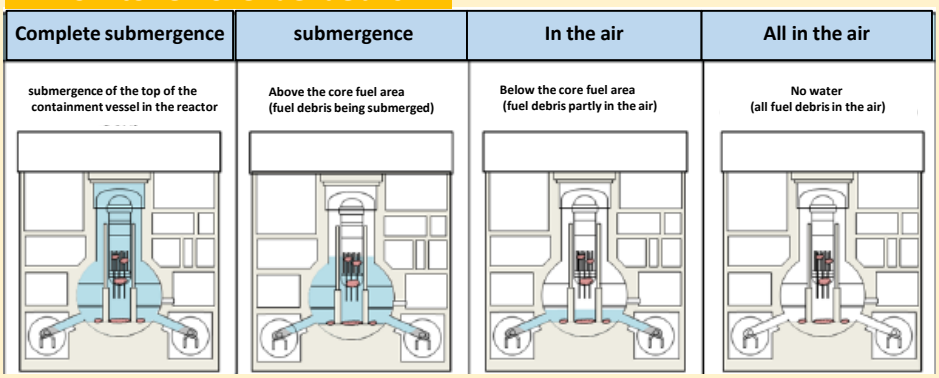
Plan 1) Setup of containers used for removal of fuel and debris as well.
2) Setup of specialized cover for the removal of fuel

Removal of rubble and decontamination work are taking place at reactors 1 - 3.

(2) Removal of fuel debris

◆Submersion methods which can control the impact of radiation are currently being examined.
◆Methods to remove fuel in the air in the event that submersion is not available are also being examined.
◆In order to grasp the condition of fuel debris, the inside of the reactors are undergoing investigation.

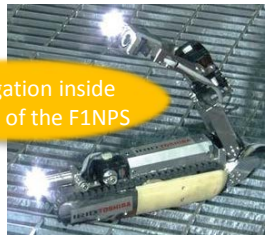
≪How to remove fuel debris≫



Measuring the location of fuel debris in reactor 1 using cosmic ray muon scanning.

Investigation robot for the inside of the reactor 1 containment vessel

Picture inside of the reactor 1 containment vessel. Taken by the investigation root.



Investigation robot in side the reactor 2 containment vessel.

Fukushima Prefecture Safety Confirmation Framework

Fukushima Prefecture has established a framework to confirm the safety of F1NPS decommissioning measures taken by the national government and TEPCO, and is strictly watching over the entire process to ensure safe and steady progress.

Fukushima Safety Confirmation Framework

①Association for monitoring of safety in decommissioning

- Prefectural officials
- Municipal officials from 13 municipalities
- Experts (18 persons)…Experts of nuclear power engineering

Collaboration / information sharing

②Citizens' Council for securing of safety in decommissioning

- Citizen…1 person from 13 municipalities
- Various organizations …1 person from 15 organizations
- Academic experts (3 persons)

Administration

13 municipalities※
- Power station-located 4 towns
- Adjacent 9 municipalities

Agreement to secure safety
Agreement for reporting and communication

Prefecture
- ③Onsite representative
- ④Senior Advisor, Advisor
- ⑤Monitoring

Onsite inspection of the power station

Proposals to the national government and TEPCO

Reflecting opinions in the proposal

Citizens

Opinions from the viewpoint of citizens

Opinions from various fields and groups

Publications on policies of the prefecture and decommissioning efforts to citizens
- Prefecture's Website
- Publicity booklets
- E-bulletin board

TEPCO
(Decommissioning work at the Fukushima Daiichi NPS)

Ministry of Economy, Trade and Industry
(progress management of decommissioning process)

Nuclear Regulation Authority
(safety regulation)

※13 municipalities
…4 nuclear-located towns : Naraha Town, Tomioka Town, Okuma Town and Futaba Town
…9 adjacent municipalities : Iwaki City, Tamura City, Minami Soma City, Kawamata Town, Hirono Town, Kawauchi Village, Namie Town, Katsurao Village, Iitate Village

①Association for monitoring of safety in decommissioning

Activities

This association consists of prefectural and municipal officials, and experts of nuclear power engineering.
Decommissioning progress made by the national government and TEPCO is confirmed through onsite inspections of the F1NPS and meetings.
Based on the results, the prefecture makes proposals to the national government and TEPCO.

Confirmation by onsite inspection

Onsite inspection (2015.6.27)

Confirmation through meetings

Meetings (2015.7.15)

Proposals by the governor

Proposal (2015.8.28)

The Association for monitoring of safety in decommissioning established two working groups for the discussion of specific matters.

Confirmation by working groups

Working group for workers' safety and health	Discussions on matters related to management of radiation exposure, safety and health and employment for decommissioning workers
Working group for the evaluation of environmental monitoring	Discussions on matters related to planning for monitoring around the power station and the evaluation of monitoring results

②Citizens' Council for securing of safety in decommissioning

○Activities

Council consisting of representatives of residents from 13 relevant municipalities and fishery associations as well as academic experts confirms the decommissioning progress.

A wide range of public opinions are reflected in the proposals to the national government and TEPCO made by the Association for monitoring of safety in decommissioning.

Meeting（2015.9.1）

Observation tour of the F1NPS.
（2015.5.30）

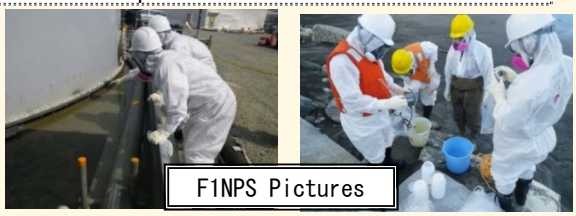
Members join observation tours of the F1NPS.

③Onsite stationed officials

○Activities

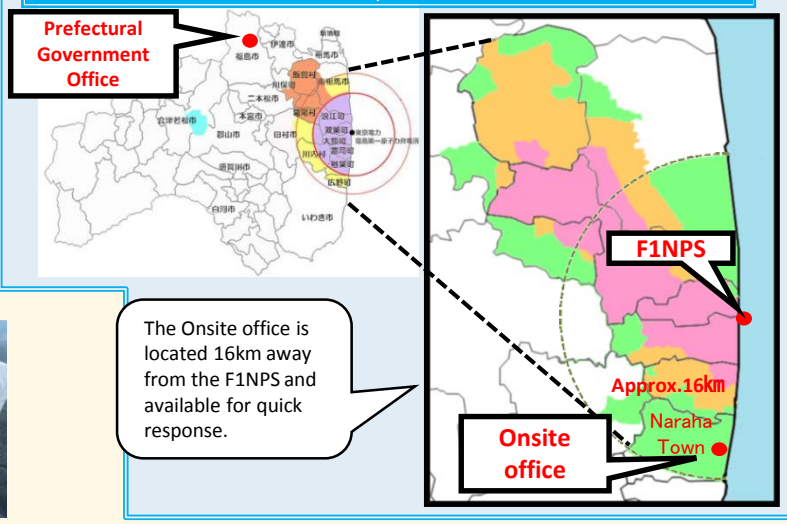
To strengthen the surveillance system on TEPCO's decommissioning measures, the prefecture allocated onsite stationed officials in Naraha Town, Futaba County, Fukushima Prefecture on April 1, 2014.

Onsite officials work to confirm the situation of the F1NPS through onsite inspection, and head for the site to collect information in the event trouble occurs at the power station.



F1NPS Pictures

Location of the Fukushima Prefectural Government, Onsite office, and the F1NPS



The Onsite office is located 16km away from the F1NPS and available for quick response.

④Senior Nuclear Power Response Adviser • Nuclear Power Adviser

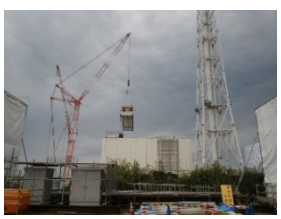
○Actions: With the aim to confirm decommissioning progress from an expert standing, the prefecture allocated the Nuclear Power Adviser on April 1, 2013 and Senior Nuclear Power Response Adviser on October 1, 2013. Two more Nuclear Power Advisers were added on April 1, 2014 and the surveillance system has been enhanced.

▪ **Senior Nuclear Power Response Adviser (1 person)**	◆Making policy recommendations to the prefecture concerning the safety surveillance of the F1NPS ◆Providing opinions from an expert's viewpoint when attending the Citizens' Council for securing of safety in decommissioning.
▪ **Chief Nuclear Power Adviser (1 person)** ▪ **Nuclear Power Adviser (2 persons)**	◆Providing opinions from an expert's viewpoint by participating in the Association for monitoring of safety in decommissioning (meetings and onsite inspections) and the Citizens' Council for securing of safety in decommissioning. ◆Attending national meetings concerning decommissioning and contaminated water as an observer.

⑤Monitoring

Additional installation of dust monitors

Removal of rubble from reactor 1 will require the dismantling of the building cover. In preparation for this the prefecture installed an additional 16 monitors, strengthening the system to monitor the dispersal of radioactive substances in real time.



Observation tour of the F1NPS（2015.9.29）

Release of information to citizens

Fukushima publishes monitoring results on the prefectural website as needed. If by any chance, any monitoring result should show abnormal values, we will conduct additional monitoring and upload the results on the website as well as provide municipalities and media with information.

Initial Response in Fukushima Prefecture
Initial Response in Municipalities

	March 11, 2011	March 12
Fukushima Disaster Response Headquarters	・(14:46) Established 'Disaster Response Headquarters' Nuclear Group was set up in the Response Headquarters. ・Started to measure the air radiation levels in 7 districts in the prefecture. ・(20:50) Evacuation order was issued to residents within a 2km radius of the F1NPS.	・Conducted emergency monitoring. ・Started radiation exposure screening.
Fire department	・(15:12) Decided to dispatch Emergency Fire Response Team ・Started relief operation	・Arrival of fire helicopter of each prefecture ・Operation started
Police	・Setup of the Disaster Response Headquarters ・Guiding of evacuation started. ・Started relief operation	・Guiding of residents' evacuation started.
Self-Defense Forces	・(18:00) Ordered to dispatch for large-scale earthquake disaster ・Started relief operation ・(19:30) Ordered to dispatch for the nuclear disaster	・Started the transportation of supplies and evacuees.

Response by the Fukushima Disaster Response Headquarters

Enhancement of the disaster response headquarters system

In the wake of the disaster, the Fukushima Disaster Response Headquarters consisted of 10 response groups that acted as secretariats. However, the scale of damage caused by the Great East Japan Earthquake was far greater than expected, and project teams were established under the response groups in order to take proper measures.

Fukushima Disaster Response Headquarters

Response groups and their actions in the wake of the disaster

Name of groups	Main actions
○General Management Group	Cross-sectional adjustment among groups of secretariat, departments and bureaus, the national government and municipalities Communication and adjustment with the recovery and reconstruction headquarters
Life reconstruciton support team	Interpretation of Disaster Relief Act, Act concerning support for reconstructing livelihoods of disaster victims and Act on disaster condolence money, and operation of reconstruction fund
○Information collection group	Organization of disaster flash reports of damage situation, provision of disaster flash reports to relevant organizations inside and outside the prefecture, and roundup of accepting number of evacuees
○Action support group	Assurance and occupational management of disaster response staff, assurance of food and accommodation, operation of prefectural vehicles
○Liaison group	Drawing up of written request and adjustment of accepting observation groups.
○Rescue group	Provision of medical assistance for evacuation centers, measures for persons in need of help in the disaster, screening and payment of burial cost
○Supply group	Stock management of food, daily commodities, and distribution of supply from the Japanese Red Cross and NGO
○Public Relations group	Response to interviews by media
○Residents' evacuation and safety group	Support for operation of primary evacuation centers, publication of wall papers
○Nuclear group	Grasping of damage to the power station and provision of information to disaster related organs
○Communication group	Management of disaster radio and collection & reporting of weather information

Initial response by municipalities

Evacuation guidance for residents

Securing transportation means

We needed to secure buses and such for supply of gasoline and persons who could hardly secure means of evacuation. It was extremely hard for us to secure buses because there were too many residents aimed to evacuate due to the designation of the whole-area evacuation order and many municipalities required to evacuate.

Evacuation orders-Communicating orders

In the wake of the Great East Japan Earthquake evacuation orders covered wide areas, and the prefectural and local governments took various measures to communicate with residents.

◆Communications through disaster-prevention administrative radios, outdoor speakers, IP Voice announcements.

◆Communications through human power, such as PR cars and door-to-door visits by jurisdictional fire departments, police officers and volunteer firefighters

◆Guidance by municipal government officials, police officers, firefighters and volunteer firefighters.

Support for persons in need of assistance in the disaster , such as elderly persons

Support was provided for residents who were unable to evacuate by themselves or with the help of family. Fire department officials, social workers and officials of welfare departments of municipal governments confirmed their safety and guided evacuation.

Opening and operation of evacuation centers

Request to accept evacuees

As many municipalities were designated to evacuate completely, municipalities in and out of the prefecture mainly dealt with the requests. There are many cases where municipal heads requested other municipalities to accept evacuees.

Support by municipalities accepting evacuees

Although the accepting municipalities were greatly affected by the earthquake, they provided significant help to evacuees of the nuclear power accident. Instead of severely damaged municipalities which were evacuated, municipalities that accepted evacuees managed the evacuation centers.

Evacuation Center (Azuma Sports Park in Fukushima City)

Initial response by the fire authorities, police and self-defense forces

	March,13 to 16	March,17 to 25	March,26to31
Fukushima Disaster Response Headquarters	・(March 14) Started to provide English and Chinese disaster information through website. ・(March 16) Requested emergency monitoring of agricultural produce and drinking water.	・(March 17) Opened a service for inquiries concerning radiation.	
Fire department		・(March 17) Flushing of water using water cannon trucks started for reactor 3 of the Fukushima Daiichi NPS ・(March 18) Search operation started.	・Search operation continued.
Police	・(March 14) Evacuation started for hospital patients and institutionalized persons. ・(March 15) Publicity and patrol to request the indoor evacuation.		・(March 29) Patrol team started operation.
Self Defense Forces	・(March 13) Supplied water to the Fukushima Daini NPS	・(March 17) water sprinkling and flushing for reactor 3 of the Daiichi NPS ・(March 18) Search operation started.	・Search operation continued.

Ⅰ. Quick response by the fire department

What is the emergency fire response team?

It is a relief team that operates fire extinguishment and relief operations in the event of large-scale disaster and special disasters upon request of affected areas.
In the wake of the disaster, the commissioner of the fire and disaster management agency ordered to respond to the request for the emergency fire response team at 15:12, March 11, 2011. Accordingly, the Fukushima Headquarters for coordination of fire rescue teams was set up in the Fukushima Autonomous Hall


Fukushima Disaster Response Headquarters

Relief request

◆Relief from other prefectures
We accepted ground teams (1 metropolitan area, 9 prefectures and 3 cities) and air teams (9 prefectures and 6 cities), and requested relief operations by 4,230 rescue teams and 15,241 rescue officers in 88 days from March 11 to June 6.
◆Relief within the prefecture
We requested relief operation by 126 rescue teams and 397 rescue officers in 88 days from March 11 to June 6.They conducted search and rescue operations and transported patients between hospitals.

Operation of the Fukushima Headquarters for coordination of fire rescue teams

◆Support, communication and coordination of emergency fire rescue teams
◆Communication and coordination with the Fire and Disaster Management Agency
◆Communication and coordination with fire department in the prefecture
◆Communication and coordination with police department and self-defense forces.
◆Coordination of dispatch calls for the air rescue team and the emergency fire rescue team.
◆Provision and lending of equipment for nuclear disaster response

Ⅱ. Quick response by the prefectural police department

Establishment of the Fukushima Headquarters of Disaster Security

On Mar. 11, Fukushima Headquarters of Disaster Security was established and Fukushima Police Station Disaster Security Headquarters was setup at 22 police stations in the prefecture. On the 12, 'Consultation section for missing persons and policy security' through satellite phone and free dial was set up at the Disaster Security Headquarters.

Rescue call

Called for dispatch of rescue aid team for wide area to the National Police Agency on Mar. 11. 390,000 police officers were dispatched from the National Police Agency and police departments in 45 prefectures for aid and security operations for disaster relief.


Fukushima Disaster Response Headquarters

Guiding evacuation and patrol

◆March 12, following the evacuation order, police started instructing residents to evacuate to areas outside the 20 km radius zone from the Fukushima Daiichi NPS, and areas outside the 10km radius zone from the Fukushima Daini NPS.
◆March 14, Started instructing the evacuation of patients of hospitals and nursing care facilities for elderly people in areas within a 20 km radius from the F1NPS.
◆March 15, Advised residents within 20 to 30km from the F1NPS to stay inside their houses and patrolled for them.
◆March 29, Deployed patrol teams to areas within 10 to 30 km from the Fukushima Daiichi NPS, and reinforced policing in the affected areas.


Evacuation operations

Ⅲ. Quick response of the Self Defense Forces

Establishment of the Response Headquarters

2:50 p.m. March 11, Ministry of Defense established the Disaster Response Headquarters (head: Defense Minister).

Call for dispatch

◆Call for dispatch in response to the disaster. Call by the governor of Fukushima Prefecture.
(4:47 p.m., March 11)
◆Call for dispatch in response to the nuclear disaster. Call by the head of the Nuclear Disaster Response Headquarters (Prime Minister).
(7:30p.m.)


Fukushima Disaster Response Headquarters

Call for dispatch in response to the nuclear disaster

(March 11, 2011 to December 26, 2011)
Central Readiness Force played a key role in the operation. (Mobile operation group under the direct control of the Defense Minister)
◆March 13 to 14 They supplied condensate tanks to the NPS with 400 tons of water taken from the river using 10 water tank vehicles.
◆March 17 to 21 Dumping of sea water by SDF helicopters from the air and water flushing using pump vehicles on the ground to cool the nuclear reactors.
◆They conducted the rescue of injured persons, support for hospital patients' evacuation and opened of the decontamination center (area extending 100km to north and south and 60km to east and west of the NPS.)

Call for dispatch in response to the large scale disaster

(March 11, 2011 to August 31, 2011)
◆Information collection by aircraft and search and rescue operations for affected persons.
◆Fire fighting and transportation of personnel and supplies
◆Support for school lunches, water supply, bathing and medical services
◆Resumption of roads, removal of debris and support for epidemic prevention
◆Acceptance of evacuees at SDF facilities

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