

March 13, 2011

Nuclear Power Stations' Response to the Off the Pacific Coast of Tohoku Earthquake

1. Effects on nuclear power stations immediately after the earthquake
 - (1) Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station (hereafter referred to as "1F")
 - Unit-1~3: Automatic shutdown triggered by the earthquake
(Unit-1 : 460,000kWe, Unit-2 and 3 : 784,000kWe)
 - Unit-4~6: In outage shutdown
(Unit-4 and 5 : 784,000kWe, Unit-6 : 1.1 million kWe)
 - (2) Tokyo Electric Power Company's Fukushima Daini Nuclear Power Station (hereafter referred to as "2F")
 - Unit-1~4: Automatic shutdown triggered by the earthquake
(Unit-1~4 : 1.1 million kWe)
 - (3) Tohoku Electric Power Company's Onagawa Nuclear Power Station (hereafter referred to as "Onagawa NPS")
 - Unit-1~3: Automatic shutdown triggered by the earthquake
(Unit-1 : 524,000kWe, Unit-2 and 3 : 825,000kWe)
 - Acceleration of 567.5 gal was measured.
 - (4) Tohoku Electric Power Company's Higashidori Nuclear Power Station (hereafter referred to as "Higashidori NPS")
 - Unit-1: In outage shutdown (Unit-1 : 1.1 million kWe)
 - Acceleration of 17 gal was measured.
 - (5) Japan Atomic Power Company's Tokai Daini Nuclear Power Station (hereafter referred to as "Tokai No.2")
 - Automatic shutdown triggered by the earthquake (1.1 million kWe)

2. Nuclear power stations' response after the earthquake

- (1) Tokyo Electric Power Company's 1F

March 11 (Fri)

- 14:46 The earthquake automatically shut down the 1F unit-1~3.
- 15:42 Confirmed conditions of unit-1~3 should be reported under Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness (hereafter referred to as "Nuclear Emergency Preparedness Act")
(Due to the complete loss of A/C power; although the loss of off-site power led to the automatic startup of emergency diesel generators, but the generators failed.)
- 15:45 Oil tanks were lost in Tsunami (according to the Prime Minister's office)
- 16:36 Confirmed conditions of unit-1 and 2 should be reported under Article 15 of the Nuclear Emergency Preparedness Act.
(Due to loss of the emergency core cooling system's coolant injection function; coolant injection into unit-1 and 2 could not be confirmed, leading to taking a precautionary report)

- 19:03 Declaration of nuclear emergency
(Nuclear emergency was declared as the reactor water level at unit-1 and 2 could not be confirmed, suggesting the loss of reactor coolant.)
- 20:50 Fukushima Emergency Headquarters: Evacuation was instructed to local residents within 2km radius of 1F (1,864 people in residence within the 2km radius)
- 21:23 According to Article 15 Paragraph 3 of the Nuclear Emergency Preparedness Act, the government instructed the evacuation of local residents within 3km radius of 1F. Residents within 10km radius were instructed to stay in-house.

March 12 (Sat)

- 01:20 Confirmed conditions of 1F unit-1 should be reported under Article 15 of the Nuclear Emergency Preparedness Act. (Due to unusual rise of the pressure in PCV)
- 05:44 The Prime Minister instructed the evacuation of local residents within 10km radius of 1F.
- 06:50 According to Article 64 Paragraph 3 of the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (hereafter referred to as "Nuclear Reactor Regulation Act"), the Nuclear and Industrial Safety Agency (hereafter referred to as "NISA") ordered to implement measures to reduce the pressure of the reactor containment vessel at unit-1 and 2.
- 15:36 Hydrogen explosion was occurred at unit-1.
(Loss of upper external walls and ceiling of the reactor building of unit-1)
- 16:17 Confirmed conditions of 1F should be reported under Article 15 of the Nuclear Emergency Preparedness Act. (Due to the radiation dose near 1F's No.4 monitoring post (hereafter referred to as "MP") exceeded the criteria (500 μ Sv/h)).
- 18:25 The Prime Minister instructed the evacuation of local residents within 20km radius of 1F.
- 20:05 NISA ordered the injection of sea water to 1F unit-1 according to Article 64 Paragraph 3 of the Nuclear Reactor Regulation Act.
- 20:20 The injection of sea water and boric acid to unit-1 was commenced.

March 13 (Sun)

- 05:10 Confirmed conditions of 1F unit-3 should be reported under Article 15 of the Nuclear Emergency Preparedness Act.
(Due to loss of the emergency core cooling system's coolant injection function; the complete loss of the coolant injection function at unit-3)
- 08:56 Confirmed conditions of 1F should be reported under Article 15 of the Nuclear Emergency Preparedness Act.
(Due to the radiation dose at the site's boundary exceeding the criteria [500 μ Sv/h])
- 09:20 Ventilation was achieved at unit-3. (Ventilation valves were operated to complete the depressurization measure at 8:41.)

- 09:25 Unit-3 Began injecting fresh water containing boron into reactor from fire extinguishing system line.
- 09:30 The Prime Minister instructed the content of decontamination screening according to the Nuclear Emergency Preparedness Act.
- 13:12 Injection was switched from fresh water to sea water and began boron injection at unit-3.
- 14:15 Confirmed conditions of 1F should be reported under Article 15 of the Nuclear Emergency Preparedness Act. (MP4)(Due to the radiation dose at the site's boundary exceeding the criteria [500 μ Sv/h])

(2) Tokyo Electric Power Company's 2F

March 11 (Fri)

- 14:48 The earthquake automatically shut down the unit-1~4.
- 17:35 Confirmed conditions of unit-1 should be reported under Article 10 of the Nuclear Emergency Preparedness Act.
(Potential leakage of reactor coolant)
- 18:33 Confirmed conditions of unit-1,2 and 4 should be reported under Article 10 of the Nuclear Emergency Preparedness Act.
(Loss of the residual heat removal function)

March 12 (Sat)

- 05:22 Confirmed conditions of unit-1 should be reported under Article 15 of the Nuclear Emergency Preparedness Act.
(Loss of the reactor pressure control function)
- 05:32 Confirmed conditions of unit-2 should be reported under Article 15 of the Nuclear Emergency Preparedness Act.
(Loss of the reactor pressure control function)
- 06:07 Confirmed conditions of unit-4 should be reported under Article 15 of the Nuclear Emergency Preparedness Act.
(Loss of the reactor pressure control function)
- 07:45 According to Article 15 Paragraph 3 of the Nuclear Emergency Preparedness Act, the Prime Minister instructed the evacuation of local residents within 3km radius of 2F. Residents within 10km radius were instructed to stay indoors.
- As of 12:15 Unit-3 was being cold shutdown.
- 17:39 The Prime Minister instructed the evacuation of local residents within 10km radius of 2F.

(3) Tohoku Electric Power Company's Onagawa NPS

March 11 (Fri)

- 14:46 The earthquake automatically shut down Onagawa NPS unit-1~3.
Unit-1: The loss of off-site power led to the startup of emergency diesel generators (failure of start-up transformer)
Unit-2 and 3: Receiving off-site power
(Unit-2 was just after reactor start-up, being cold shut down)

15:30 Smoke was seen from the first basement floor of the turbine building.
17:15 CO2 fire extinguishers commenced.
22:55 Fire extinguishment was confirmed.

March 12 (Sat)

00:58 Unit-2 reaches the state of cold shutdown.(under 100C)
01:17 Unit-3 reaches the state of cold shutdown.(under 100C)
As of 22:00 Unit-1 restored the start-up transformer and off-site power.

March 13 (Sun)

12:50 Reported conditions of Onagawa NPS under Article 10 of the Nuclear
Emergency Preparedness Act.
(Although the radiation is not from Onagawa NPS, radiation level of the
station's boundary reached the criteria (5 μ Sv/h). Temporally, it reached up
to 21 μ Sv/h.)

(4) Tohoku Electric Power Company's Higashidori NPS

March 11 (Fri)

14:46 Loss of off-site power led to the startup of emergency diesel generators
while being in outage shutdown.
23:50 Off-site power was restored.

(5) Japan Atomic Power Company's Tokai No.2

March 11 (Fri)

14:46 The earthquake automatically shut down Tokai No.2.
As of 18:30 The loss of off-site power led to the startup of emergency diesel
generators. The reactor core isolation cooling system was used to secure a
sufficient water level. The reactor water level reached L2 to start up the
high pressure core spray system, which has brought the level to L8 at
present.

March 13 (Sun)

19:37 Back up power supply is restored.
Work to switch the station power supply was commenced.

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