Regarding the Receipt of the (Continued) Report about the Events Subject to Legal Reporting Requirements for Onagawa Nuclear Power Station, Tohoku Electric Power Co., Inc.

On March 29, 2011, the Nuclear and Industrial Safety Agency (“NISA”) received the report from Tohoku Electric Power Co., Inc. pursuant to the provision of Article 62-3 of the Nuclear Regulation Act, and to Article 3 of the Ministerial Ordinance for Reports Related to Electricity, prescribed in the Electricity Business Act, regarding the failure of the pump (B) of the reactor building closed cooling water system in Unit 2 of Onagawa Nuclear Power Station (NPS), and the destruction of the heavy oil tank for the auxiliary boiler in Unit 1 of Onagawa NPS. (Notification completed on March 29.)

Furthermore, on April 8, 2011, NISA received the report pursuant to Article 62-3 of the Nuclear Regulation Act regarding the damage to the emergency diesel generator (A) in Unit 1 of Onagawa NPS. (Notification completed on April 8.)

There is no external impact of radioactive material accompanied by the occurrence of these events.

NISA received the (continued) report from Tohoku Electric today (May 30) regarding this matter pursuant to Article 62-3 of the Nuclear Regulation Act and to Article 3 of the Ministerial Ordinance for Reports Related to Electricity prescribed in the Electricity Business Act.

NISA will confirm whether the content of today’s report is reasonable, as well as summarize its evaluation from now.

I. Main Points of the Report from Tohoku Electric

1. Nuclear Power Station’s Condition after the Earthquake

   Units 1 and 3 of Onagawa NPS were in regular operation at rated thermal power while the reactor of Unit 2 was starting up, when the reactors for all units were automatically shutdown by
Tohoku District-Off the Pacific Ocean Earthquake, which occurred at 14:46 on March 11, 2011.

It is acknowledged that part of the facilities was damaged by the impact of the earthquake and tsunami, and there were no problems with cooling the reactor cores after the automatic shutdown of the reactors for all units because external power supply and emergency power supply were secured, and because the necessary functions to cool the reactors and the spent fuel pool were also secured, etc., whereby cold shutdown was immediately brought.

For all units, there is no unusual change in the values on each type of radiation monitor and there was no impact on the radiation outside the station.

2. Fire on Unit 1’s high voltage normal power distribution panel 6-1A
   ① Outline of Event

      After the earthquake at 14:47 on March 11, because the fire alarm in the main control room went off and because it was confirmed that smoke was emitting from the basement floor of the turbine building when facing the scene, fire fighting started on the main oil tank room by the carbon dioxide fire extinguishers together with a message being sent to the fire department via 119.

      Thereafter, when observing the scene, because Unit Nos. 7 and 8 of the high voltage normal power distribution panel 6-1A located on the basement first floor of the turbine building were burnt out and inside of the building was heated, fire fighting was undertaken by powder fire extinguishers, and at 22:55 on the same day, it was confirmed that the fire was extinguished.

      Consequently, by the impact of this event, although the transformer of starter receiving electricity from an external power supply at 14:55 on the same day was shutdown by the operation of the overcurrent relay, the emergency diesel generators started up normally, and the power supply was successful for the station’s emergency facilities.

      Moreover, there was no external impact by radioactive materials accompanied by the occurrence of this event.

   ② Presumed Cause
In the high voltage normal power distribution panel 6-1A, the overhang type breaker, which swayed a great deal due to the earthquake tremors, and the disconnecting switch of the breaker was damaged, whereby the connecting conductor and the peripheral structural material came into contact causing a short-circuit/ground. The heat from the arc discharge arising from this event melted the insulation coating of the panel cable, which is the presumed cause for the emitted smoke.

3) Counter-measures

Regarding the high voltage normal power distribution panel 6-1A where the fire occurred, the facilities will be renewed by replacing the overhang type breaker with a horizontal-type panel using a vacuum breaker that is a high earthquake-resistant structure.

3. (Continued) Report of the Events Subject to Legal Reporting Requirements

(1) Destruction of the heavy oil tank for the auxiliary boiler in Unit 1

① Outline of Event

During the patrol after the Tohoku District-off the Pacific Ocean Earthquake, it was confirmed that the heavy oil tank for the auxiliary boiler installed outside was destroyed and heavy oil was flowing out.

When this event occurred, no heavy oil was supplied to the auxiliary boiler.

Moreover, there was no external impact by radioactive materials accompanied by the occurrence of this event.

② Presumed Cause

The subject tank was installed less than O.P + 2.5 of the height of the land (O.P. + 13.8m) where the main equipment inside the power station was installed, and so, the presumed cause is that the destruction to the heavy oil storage tank was due to the earthquake and tsunami on March 11.

③ Counter-measures

We will consider counter-measures to prevent a reoccurrence such as installation of the heavy oil storage tank on higher
grounds in consideration of tsunami waves, etc.

(2) Failure of the pump of the reactor building closed cooling water system in Unit 2

① Outline of Event

When the reactor was starting up at 14:00 on March 11, Unit 2 of Onagawa NPS automatically shut down due to the Tohoku District-Off the Pacific Ocean Earthquake which occurred at 14:46 on the same day. Furthermore, emergency diesel generator (A) (“DG (A)”), emergency diesel generator (B) (“DG (B)”), and high pressure core spray diesel generator (“DG (H)”) were automatically started up.

As the state right before the earthquake occurred was subcritical and the reactor’s water temperature was less than 100℃, it reached in cold shutdown at 14:49 on the same day.

Thereafter, together with the shutdown of the reactor building closed cooling water system (“RCW”) pump (B) and RCW pump (D), as well as the high pressure core spray cooling water system (“HPCW”) pump, DG (B) and DG (H) were automatically shutdown.

The results of confirming the scene found that seawater was flowing into the heat exchanger (B) room on the non-controlled area on the third basement floor of the reactor buildings and into the HPCW heat exchanger room; and it was confirmed that RCW (B)’s RCW pump (B) and RCW pump (D), as well as the HPCW pump were flooded. In addition, the reactor seawater system (“RSW”) pump (B) area outside the buildings was also flooded, and it was confirmed that RSW (B)’s RSW pump (B) and RSW pump (D) might have been flooded.

However, as the functions of RSW (A) system and RCW (A) system were secured, there was no impact on the cooling function of the reactor.

Moreover, there was no external impact by radioactive materials accompanied by the occurrence of this event.

② Presumed Cause

When adding the installation of the water gauge for the automatic shutdown of the with respect to the effect of circulating
water pump in the seawater pump room of RSW pump (B)’s area, the consideration for selecting the installation site and the treatment of the water-tightness with respect to the impact of a tsunami’s leading waves were insufficient. Consequently, it can be presumed that the collapse of the function loss for the RSW (B) system, RCW (B) system, and the HPCW was a result of the partial influx into the reactor buildings via the underground trench together with the influx of seawater by the earthquake and accompanying tsunami into the seawater pump room from the side of the intake channel via the subject water gauge installed box and the flooding of the RSW pump (B) area.

③ Counter-measures

The subject water gauge was detached and the watertight treatment at the opening was conducted. As an aside, the subject water gauge will be reinstalled after transferring it to an area in consideration of preventing flooding by seawater. Moreover, the piping penetrating portion and the cable tray penetrating portion from the seawater pump room to the trench were repaired.

As the mid to long-term counter-measures, we will implement improvements to the water-tightness of the building doors as well as build tide embankments and seawalls as counter-measures to prevent flooding by tsunami.

(3) Damage to the Emergency Diesel Generator (A) in Unit 1

① Outline of Event

With regard to Unit 1 of Onagawa Nuclear Power Station with its reactor having automatically shut down and being in cold shutdown accompanied by Tohoku District-Off the Pacific Ocean Earthquake, in the periodical testing of DG (A) on April 1, 2011, the synchroscope (*1) for connecting to the internal power supply system of DG (A) could not be operated and manual connection to the internal power supply system was also not possible.

Accordingly, Tohoku electric determined that the limiting condition of operation of the Operational Safety Program “Acceptable actions in connecting for the bus of the emergency AC high voltage power supply” was not met, and it declared a
deviation of the limiting condition of operation of the Operational Safety Program at 10:40 on the same day.

Thereafter, the start-up test for DG (B) was completed, and it was confirmed that the one line of the emergency diesel generator could be connected to the internal power supply system, and furthermore, since the RHR Seawater (RHRS) System could be changed from A system to B system, it was declared that the limiting condition of operation of the Operational Safety Program could be reinstated by 21:18 on the same day.

- When conducting the checks of the synchroscope during DG (A) shutdown on April 1, the state of the machine body of DG (A) could not be started up, and so, the breaker of DG (A) was automatically made the event occurred with the connection to the internal power supply system, and so, from April 5, when the checks on the body of DG (A) and the control panel were conducted, it was confirmed that the damage to the protective element (varistor) protected the field winding on DG (A)’s field circuit (*2) from a transitional high electric voltage, and that a partial element of the rectifier (diode) short circuited.

Accordingly, control of the electrical voltage could not be conducted accurately, and thus it was determined that there was no required function of DG (A).

As an aside, the power station’s power supply is being received from an external power supply; in addition, as DG (B) is now stand-by, there are fundamentally no safety problems.

Moreover, there was no external impact by radioactive materials accompanied by the occurrence of this event.

*1 This apparatus confirms the consistency of the electric voltage and frequency because the shock is reduced when connecting the system manually,

*2 This circuit has a winding wire around an iron core to create a stronger magnetic pole for generating electricity.

② Presumed Cause

a. Cause for the defective behavior in the synchroscope

The cable connected to the synchroscope electric relay
installed in the high voltage normal power distribution panel 6-1A is the ground by the impact of the fire that occurred in the high voltage normal power distribution panel 6-1A.

When turning on the “on” switch for the subject synchroscope, since the ground electric current runs through the synchroscope circuit and the circuit fuse was cut, it can be presumed that this caused the defective behavior in the synchroscope.

b. Cause for the damage to the varistor and rectifier

By the impact of the fire which occurred in the high voltage normal power distribution panel 6-1A, the circuit cable at the output connection point of the synchroscope electric relay of the DG (A) breaker was the ground, and so, the action of detaching the subject cable during operations and the DC electric voltage of the controlling circuit of the high voltage normal power distribution panel 6-1A was impressed from the cable damaged by melting due to the fire, and the making of a coil for the breaker became excited, and so, in the state of the DG (A) not being started up, the breaker was automatically made. As a result, DG (A) was connected to the internal electric power supply system and from the internal electric power supply system additional electric voltage is taken for the field winding of DG (A) and the rectifier. Therefore, it can be presumed that this event caused the damage.

3) Counter-measures

Regarding the high voltage normal power distribution panel 6-1A where the fire occurred, the facilities will be renewed by replacing the overhang type breaker with a panel using a vacuum breaker with a horizontal installation that is a high earthquake-resistant structure and further occurrence of fires can be suppressed.

In addition, from the viewpoint of improving the reliability of the DG, the output circuits of the synchroscope electric relay will be usually separated, and a switch for connecting the testing of the DG by manual starting up only when required will be arranged, and the circuitry will be improved.
II. NISA’s Response

NISA will request nuclear power operators who have any breakers with a suspended installation as in the present report and any breakers with a similar structure to undertake the necessary measures in a written direction.

NISA will confirm whether the content of today’s report is reasonable, as well as summarize its evaluation from now.

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