

August 26, 2011

MEMORANDUM TO: Edwin M. Hackett, Executive Director
Advisory Committee on Reactor Safeguards

FROM: R. W. Borchardt */RA/*
Executive Director for Operations

SUBJECT: RECENT EVENTS AT FUKUSHIMA REACTOR SITE IN JAPAN –
INFORMATION REQUESTED DURING APRIL 7, 2011,
ADVISORY COMMITTEE ON REACTOR SAFEGAURDS (ACRS)
MEETING

The purpose of this memorandum is to provide the Advisory Committee on Reactor Safeguards (ACRS) an update of the status of the Fukushima Daiichi Reactor Site in Japan.

On April 7, 2011, Nuclear Regulatory Commission (NRC) staff briefed the ACRS on the status of the response to the events at the Fukushima Daiichi Nuclear Power Plant. The status of the Fukushima Daiichi site has improved significantly since the NRC staff briefed the ACRS on April 7, 2011. This document summarizes the following:

- Status of Progress on the Roadmap for Recovery
- Plans for increasing injection to achieve cold shutdown
- Fukushima Daiichi Plant Status
- Status of the 50-mile evacuation recommendation

The enclosure to this document contains foreign government and official-use-only information not intended for public distribution.

Enclosure:
Fukushima Daiichi Status Update

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Fukushima Daiichi Status Update

1.0 Status of Progress on the Roadmap for Recovery

Over the last four months, the Government of Japan (GOJ) and Tokyo Electric Power Company (TEPCO) have made significant progress on their “roadmap” to recovery from the accident at Fukushima Daiichi plant. On July 19, 2011, the GOJ and TEPCO declared completion of a major milestone, “Step One” of the roadmap, by achieving stable cooling of the reactors and spent fuel pools (SFPs). On August 17, 2011, the GOJ and TEPCO issued their latest revision to the roadmap, calling for a “Step Two” goal of achieving “cold shutdown conditions” in 3 to 6 months from the Step One completion date. The GOJ and TEPCO define cold shutdown conditions as 1) temperature at the lower portion of the reactor pressure vessel (RPV) is largely less than 100 degrees Celsius (°C), and 2) radioactive release from the containment and exposure to the public is significantly suppressed. Notable countermeasures completed by the GOJ and TEPCO include the startup of the circulating cooling and water treatment system, the nitrogen inerting of primary containments, the startup of the SFP closed loop cooling systems, the structural reinforcement of the SFP Unit 4, and the construction of a tsunami wall.

Circulating Cooling and Water Treatment System - The GOJ and TEPCO view the reliability of the circulating cooling system as key to achieving the Step Two goals. The management of radioactive water has been a significant challenge at the Daiichi site. To reduce the volume of waste water, a circulating cooling water injection system to decontaminate and reuse reactor cooling water has been installed and in operation since June 28. While it has been experiencing numerous operational issues, as of August 16, the water treatment system has processed a significant amount of water. A decontamination factor (DF) of greater than the target of one million has been achieved for Cesium-134 and Cesium-137. The reverse osmosis process has reduce the chloride content in the water from 6600 to 20 parts per million (ppm) for reuse as reactor coolant. Work to install an alternate cesium removal system named “SARRY” (Simplified Active Water Retrieve and Recovery System) is underway which will provide redundancy to the existing system and increase capacity. Test operation of SARRY began on August 19.

Nitrogen Injection – To reduce the likelihood of a hydrogen explosion, TEPCO has been injecting nitrogen into the primary containments for Units 1, 2, and 3. TEPCO began injecting nitrogen into the primary containments of Unit 1, Unit 2, and Unit 3 on April 6, June 28 and July 14, respectively.

SFP Closed Loop Cooling – The Unit 1, 2, 3, and 4 SFPs are each being cooled with their own closed loop circulating cooling system. A closed loop cooling system has been in operation for Unit 1 since August 10, for Unit 2 since May 31, for Unit 3 since June 30, and for Unit 4 since July 31. As of August 16, the temperatures for the SFPs are as follows: Unit 1: 34°C, Unit 2: 37°C, Unit 3: 34°C, Unit 4: 43°C.

ENCLOSURE

Unit 4 SFP Reinforcement – To provide additional safety margin against potential seismic events, TEPCO has completed a project to provide additional structural reinforcement underneath the Unit 4 SFP. The installation of the steel pillars was completed on June 20, and concrete filling and grouting was completed on July 30.

Measures Against Tsunami – To plan against future tsunami, TEPCO has staged the necessary pumping equipment and diesel power sources for core cooling on locations 35 meters above sea level. For additional protection, TEPCO has built a 14 meter high barrier along the Units 3 and 4 turbine buildings and the central radioactive waste building.

2.0 Plans for increasing injection to achieve cold shutdown

To achieve the Step Two goal of cold shutdown conditions, TEPCO is developing plans for increasing the core injection flow, while managing the production of waste water. Once the turbine building water level is sufficiently controlled, injection flow may be increased on a trial basis to validate the analytically determined flow rates to achieve the target temperature of 100 percent for each reactor. TEPCO expects that the increased injection flow rates can be implemented by October, once the additional evaporators are installed and in operation. In parallel, TEPCO is also testing an option to use the core spray system to inject coolant into Unit 3.

3.0 Daiichi Plant Status on August 18, 2011

Unit 1 Reactor and SFP – Unit 1's reactor core is likely substantially melted. Water is being injected from the water treatment system into the reactor through the feedwater line at 3.8 cubic meters per hour. RPV bottom temperature is 92.9°C and stable. Unit 1's SFP is intact and the water level is maintained using the installed fuel pool cooling and cleanup system. Unit 1's SFP is being cooled with a recently installed air-fin cooler in the secondary loop. The SFP temperature is 34°C.

Unit 2 Reactor and SFP – Unit 2's reactor core is likely substantially melted. Water is being injected from the water treatment system into the reactor through the feedwater line at 3.8 cubic meters per hour. The RPV bottom temperature is 115°C and stable. Unit 2's SFP is intact and the water level is maintained using the installed fuel pool cooling and cleanup system. Unit 2's SFP is being cooled with a recently installed alternate heat exchanger and a cooling tower in the secondary loop. Unit 2's SFP temperature is 37°C.

Unit 3 Reactor and SFP – Unit 3's reactor core is likely substantially melted. Water is being injected from the water treatment system into the reactor through the feedwater line at 9.1 cubic meters per hour. The RPV bottom temperature is 103.9°C and stable. Unit 3's SFP is intact and the water level is maintained using the installed fuel pool cooling and cleanup system. Unit 3's SFP is being cooled with a recently installed alternate heat exchanger and a cooling tower in the secondary loop. Unit 3's SFP temperature is 34°C.

Unit 4 SFP - Unit 4's SFP is intact and the water level is maintained using the installed fuel pool cooling and cleanup system. Unit 4's SFP is being cooled with a recently installed alternate heat exchanger and an air-fin cooler in the secondary loop. The SFP temperature is 47°C. Current information, including video evidence and water chemistry samples, appear to indicate that the pool did not go dry during the days following the March 11th earthquake and tsunami, as had been previously theorized.

Units 5 and 6 Reactors and SFPs - Units 5 and 6 reactors have been in cold shutdown and have maintained residual heat removal capability since March 20. SFP temperatures for Units 5 and 6 are 28.9°C and 34.5°C, respectively. On June 27, TEPCO verified the availability of emergency diesel generator 5B for Unit 5. On June 24, TEPCO installed an additional seawater pump to allow independent cooling of Unit 5 reactor and SFP using residual heat removal system and fuel pool cooling system.

4.0 Status of the 50-mile evacuation recommendation

During the early stages of this event, NRC recommended to the Department of State that U.S. citizens evacuate from a 50-mile zone around the Fukushima Daiichi facility based on the deteriorating conditions at the site and the uncertainty associated with TEPCO's ability to mitigate the event. As documented above, over the last several months, TEPCO has made significant progress on bringing the damaged units to a more manageable condition by making improvements in sources of power, cooling water, and decontamination of other locations and the Daiichi site. The time has also allowed the GOJ to put sufficient countermeasures in place to support a timely evacuation in case of other abnormal occurrences. This time has also allowed a much better understanding of the status of the units, the recovery actions and the plans of the GOJ.

This information, combined with analyses performed on the damaged Daiichi cores, has allowed a more comprehensive review by the U.S. Government. The results suggest that the likelihood of a further energetic event at the facilities is very small and in the unlikely event that one should occur, members of the public around the Daiichi site would have ample time to evacuate. Efforts are underway by the U.S. Government to issue an updated travel advisory that is in agreement with the GOJ protective measures in the near future.