USNRC Emergency Operations Center Status Update

March 11, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

Status of NRC and Agreement State Facilities (Region IV Update current as of 1230 EST)

Diablo Canyon Power Plant declared a Notice of Unusual Event at 0423 EST based on receipt of a tsunami warning for the local coastal area. The licensee anticipates a maximum wave surge of approximately 3 feet at the intake structure. The licensee does not expect a surge of this magnitude to impact plant operation. The licensee intends to keep both units at full power through the event. As a precaution, the licensee has provided limited staffing of the Technical Support Center. The licensee also sent all nonessential personnel offsite, and placed the circulating water screen wash system into manual operation to provide continuous flushing of the screens to prevent potential fouling. The resident inspectors are on site and monitoring plant conditions and licensee actions from the control room.

At 0946 EST, the NRC entered Monitoring Mode.

At 1130 EST, the licensee observed potential tsunami effects of one foot based on buoy information. The licensee expects this to build to approximately a three foot surge over the ensuing 1-2 hours. This change is within the normal tidal range and not expected to impact plant operation.

The effects of the tsunami at San Onofre Nuclear Generating Station are expected to be less severe than at Diablo Canyon. San Onofre is under a tsunami advisory and has not reached any EAL thresholds. Both units continue to operate at essentially full power.

Region IV has identified 17 licensees in the states of Hawaii and Alaska that possess Category 1 or 2 sources. All of these are sealed-source users, primarily radiographers and irradiators. There is one NRC licensee at Camp McClellan in Sacramento. Region IV has commenced contacting these licensees.

The decommissioned Humboldt Bay nuclear plant has contacted the NRC and reported that they are staffed onsite and preparing for any tsunami effects. The Humboldt Bay fossil plant observed a one foot surge from the tsunami.

Region IV has been in contact with the Radiation Control Program Director for California. He has identified no Category 1 or 2 licensees that would be threatened. California has fully activated its coastal and southern Regional Operations Centers. The California Emergency Operations Center is partially activated. Region IV has contacted Radiation Control Program Directors in Washington and Oregon. Washington does not currently anticipate activating its Emergency Operations Center. Oregon does not currently anticipate activating its Emergency Operations Center.

The state of Hawaii has fully activated its Emergency Operations Center. The state has received Federal support from the Department of Homeland Security, the U.S. Coast Guard and the Federal Emergency Management Agency (FEMA). The highest waves reported in Hawaii were six feet above sea level.

KKH

Status of Japanese Facilities (at 1200 EST)

Background:

14 operational BWRs proximal to earthquake zone (3 at Onagawa, 6 at Fukushima Daiichi, 4 at Fukushima Daini and 1 at Tokai.

Situation:

Magnitude 8.9 earthquake struck 80 miles east of Onagawa, 110 miles east-northeast of Fukushima.

All 3 units at Onagawa were operating, all 3 were automatically shutdown. 3 units at Fukushima Daiichi were operating (Units 1 through 3, with Units 4 through 6 in maintenance outage), all 3 were automatically shutdown. All 4 units at Fukushima Daini were operating, all 4 were automatically shutdown. 1 unit operating at Tokai was automatically shutdown.

A fire was confirmed to have occurred in the turbine building (turbine building common to all 3 units) at Onagawa. This fire was extinguished.

Tokyo Electric Power Company (TEPCO) reports that at Fukushima Daiichi Units 1 and 2, "there is a possibility of a release of radioactive materials due to decrease in reactor water level. Therefore, the national government has instructed evacuation for those local residents within 3km radius of the periphery and indoor standby for those local residents between 3km and 10km radius of the periphery."

There are no reports of radiation leakage from any affected facilities.

There are no NRC staff currently in Japan on official travel.

Federal Liaison Status (at 1300 EST)

The NOC Crisis Action Team is fully activated. We are working to try to send an NRC representative to the NOC. We will be sending situational reports to the NOC via the Federal Liaison as requested by the NOC.

FEMA NRCC is staffed. NRC staff is reporting to the NRCC.

FEMA HQ (REPP) has offered to send liaison to NRC. NRC will request FEMA assistance should the need arise.

Congressional Liaison has informed Oversight Committees on status of NRC activities.

NRC issued news release at 1215 EST providing overview of NRC activities.

USNRC Emergency Operations Center Status Update

March 11, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

Status of NRC and Agreement State Facilities (Region IV Update current as of 1600 EST)

Diablo Canyon Power Plant declared a Notice of Unusual Event at 0423 EST based on receipt of a tsunami warning for the local coastal area. The licensee anticipates a maximum wave surge of approximately 3 feet at the intake structure. The licensee does not expect a surge of this magnitude to impact plant operation. The licensee intends to keep both units at full power through the event. As a precaution, the licensee has provided limited staffing of the Technical Support Center. The licensee also sent all nonessential personnel offsite, and placed the circulating water screen wash system into manual operation to provide continuous flushing of the screens to prevent potential fouling. The resident inspectors are on site and monitoring plant conditions and licensee actions from the control room.

At 0946 EST, the NRC entered Monitoring Mode.

At 1130 EST, the licensee observed potential tsunami effects of one foot based on buoy information. The surge expanded to approximately a three foot surge at its peak. This change is within the normal tidal range and did not impact plant operation. The area of the California coast near the plant remains under a tsunami warning.

The effects of the tsunami at San Onofre Nuclear Generating Station were negligible. San Onofre is under a tsunami advisory and has not reached any EAL thresholds. Both units continue to operate at essentially full power.

Region IV has identified 17 licensees in the states of Hawaii and Alaska that possess Category 1 or 2 sources. All of these are sealed-source users, primarily radiographers and irradiators. There is one NRC licensee at Camp McClellan in Sacramento. Region IV has commenced contacting these licensees.

The decommissioned Humboldt Bay nuclear plant has contacted the NRC and reported that they are staffed onsite and preparing for any tsunami effects. The Humboldt Bay fossil plant did shut down in advance of the tsunami arrival. This plant observed a one foot surge from the tsunami. The fossil plant was subsequently restarted once the tsunami passed.

Region IV has been in contact with the Radiation Control Program Director for California. He has identified no Category 1 or 2 licensees that would be threatened. California has fully activated its coastal and southern Regional Operations Centers. The California Emergency Operations Center is partially activated. Region IV has contacted Radiation Control Program Directors in Washington and Oregon. Washington and Oregon did not activate their Emergency Operations Centers.

KK2

Earthquake/Tsunami Status Update March 11, 2011 1600 EST

The state of Hawaii has fully activated its Emergency Operations Center. The state has received Federal support from the Department of Homeland Security, the U.S. Coast Guard and the Federal Emergency Management Agency (FEMA). The highest waves reported in Hawaii were six feet above sea level.

Status of Japanese Facilities

Background:

14 operational BWRs proximal to earthquake zone (3 at Onagawa, 6 at Fukushima Daiichi, 4 at Fukushima Daini and 1 at Tokai.

Situation:

Magnitude 8.9 earthquake struck 80 miles east of Onagawa, 110 miles east-northeast of Fukushima.

All 3 units at Onagawa were operating, all 3 were automatically shutdown. 3 units at Fukushima Daiichi were operating (Units 1 through 3, with Units 4 through 6 in maintenance outage), all 3 were automatically shutdown. All 4 units at Fukushima Daini were operating, all 4 were automatically shutdown. 1 unit operating at Tokai was automatically shutdown.

A fire was confirmed to have occurred in the turbine building (turbine building common to all 3 units) at Onagawa. This fire was extinguished.

At 1945 UTC (1445 EST), the International Atomic Energy Agency (IAEA) Incident and Emergency Centre released information about the status of the Fukushima Daiichi nuclear power plant. This information was a result of IAEA communications with Japan's Nuclear and Industrial Safety Agency (NISA) and Ministry of Education, Culture, Sports, Science, and Technology (MEXT). The following information comes from the release:

> *"Unit 1*
> *The reactor is being maintained shutdown. However there is no information regarding the status of the supply of power to Unit 1. The reactor water level is reported to be oscillating. At 15:30 UTC the reactor water was approximately 130 cm above the top of the core. Containment is intact in Unit 1, however due to an increase of pressure within containment the decision has been made to perform a limited controlled venting to avoid over pressurization of the containment.*
>
> *Unit 2*
> *The reactor is being maintained shutdown. There is currently no supply of power to Unit 2. Work is currently being undertaken to restore power. At 15:30 UTC the reactor water level is reported to be at approximately 350 cm above the top of the core. Containment is intact in Unit 2.*
>
> *Unit 3*
> *The reactor is being maintained shutdown. Power is being supplied to Unit 3. At 13:00 UTC the reactor water level is reported to be at approximately 450 cm above the top of the core. Containment is intact in Unit 3.*
>
> *A mobile power generator has arrived at the site of the Fukushima Daiichi nuclear power plant."*

Federal Liaison Status (at 1600 EST)

The NOC Crisis Action Team is fully activated. We are working to try to send an NRC representative to the NOC. We will be sending situational reports to the NOC via the Federal Liaison as requested by the NOC.

FEMA NRCC is staffed. NRC staff reported to the NRCC.

NRC will request FEMA REPP assistance should the need arise.

Congressional Liaison continues to inform Oversight Committees on status of NRC activities.

NRC issued a news release at 1215 EST providing overview of NRC activities.

Due to a potential release, by NRC response procedures, NRC is making contact with the US Secret Service and NAVSEA to pass along this information.

What do we know as of 11 pm 3/11/2011

1. TEPCO press release indicates loss of all power at Units 1, 2, and 3 at 1:46 AM Eastern time (3:46 PM local Japan time)
2. TEPCO press release indicates Unit 4 shutdown due to earthquake, Units 5 and 6 were already in an outage and shutdown.
    a. No more information Unit 4 is available.
3. TEPCO press release indicates units 1, 2, and 3 automatically shutdown at 1:46 AM Eastern time (3:46 PM local Japan time)
4. TEPCO press release indicates all three Units offsite power was lost at approximately 1:46 AM Eastern time (3:46 PM local Japan time) leading to automatic startup of emergency diesel generators
5. TEPCO press release indicates at 2:41 AM Eastern time (4:41 PM local Japan time), emergency diesel generators shutdown for Units 1, 2, and 3 resulting a complete loss of Alternating Current for all units.
6. The staff believes that DC power via batteries is all that remains.
    a. These batteries would have been exhausted without mitigation in approximately 4-6 hours which is 6:41 – 8:41 AM Eastern time (8:41 – 10:41 PM local Japan time)
7. IAEA report as of 2:45 PM Eastern time (4:45 AM 03/12/11 local Japan time) indicates that Unit 1 water level was approximately 51 inches above the top of the core. For Unit 2, core coverage was approximately 138 inches. For Unit 3, IAEA indicated that power is being supplied.
8. The staff believes the worst case scenario for the Unit 1 would be core damage in 13 hours or about 4:00 PM Eastern time (6:00 AM 03/12/11 local Japan time).
    a. This assumes immediate loss of AC and no mitigation (apparently not the case for this situation).
9. Based on staff calculations worst case scenario for Unit 1 would lead to significant offsite releases at approximately 20 hours assuming no mitigation.
    a. This assumes immediate loss of AC and loss of Isolation Condenser (apparently not the case for this situation).
    b.. Evacuations were ordered for a two mile radius early in the event.
    c. Given this order, protection of the public is being addressed.
10. As of 10:44 PM Eastern time (12:44 PM 03/12/11 local Japan time), Units 1 and 2 have been without alternating current power for 20 hours.
11. Evacuations extended to 10 km. as of approx. 7:00 PM Eastern time (9:00 AM local Japan time).
12. NRC Phone call with Exelon (VP of Quad Cities Site)
    a. Exelon simulated the Fukushima event with Quad Cities simulator – simulator results significantly different from the Fukushima plant indication (containment pressure predicted by simulator was 2.5 psi vs. approximately 85 psi reported for Unit 1)
    b. Diesel fuel tanks for the diesels were severed by the 35-40 ft tsunami.
    c. Engineering building apparently collapsed.
13. Phone call with GEH (Hernando Madronero)
    a. GEH indicated that there has been no direct contact with TEPCO.
    b. GEH provided similar information as Exelon call.
14. E-Mail from Shunsuke Kondo, Chairman of the Japan Atomic Energy Commission to Daniel Poneman, Deputy Secretary DOE - UPDATE Fukushima Daiichi Unit 1
    a. Information recently obtained is not inconsistent with NRC previous hypothesis which was based on wire reports and public information

b. High radiation associated with containment venting suggest core damage, the extent of which is not known
c. TEPCO appears to be taking extraordinary measures to supply water to the reactor, including using power supply trucks and batteries to supply power. The reactor vessel level is stabilized, possibly indicating a measure of control
d. TEPCO is venting containment under high radiation conditions; wind direction is to see

Summary:

No additional information has been provided to reverse our previous hypothesis. Assuming no mitigation, Unit 1 would lead to core damage in approximately 13 hours after the earthquake and significant offsite releases at [approximately 20 hours.

Allen, Linda

From: Hiltz, Thomas
Sent: Wednesday, April 13, 2011 11:38 AM
To: Allen, Linda
Subject: FW: FOR OFFICIAL USE ONLY : 0700 Talking Points Update
Attachments: Talking Points Two Pager. 031711. 0700 EDT.docx

From: Tschiltz, Michael
Sent: Thursday, March 17, 2011 8:23 AM
To: Smith, Brian; Habighorst, Peter; Hiltz, Thomas; Silva, Patricia; Bailey, Marissa; Johnson, Robert; Campbell, Larry
Subject: FOR OFFICIAL USE ONLY : 0700 Talking Points Update

Attached .. please feel free to share with your staff with the precaution that this is OUO.. Also, inquiries from outside the agency should be referred to the Office of Public Affairs.

Thanks, Mike

From: LIA07 Hoc
Sent: Thursday, March 17, 2011 7:27 AM
To: LIA07 Hoc; Borchardt, Bill; Virgilio, Martin; Weber, Michael; Jaczko, Gregory; Pace, Patti; Speiser, Herald; Gibbs, Catina; Leeds, Eric; Haney, Catherine; Sheron, Brian; Johnson, Michael; Walker, Dwight; Flory, Shirley; Ostendorff, William; Svinicki, Kristine; Apostolakis, George; Magwood, William
Subject: 0700 Talking Points Update

Please find attached a 0700 NRC talking points. This update corrects a statement in the 0600 talking points regarding the US State Department's actions for its employees in Japan.

Please let me know if you have any questions or concerns.

Thank you,

-Jim

Jim Anderson
Office of Nuclear Security and Incident Response
US Nuclear Regulatory Commission
james.anderson@nrc.gov
LIA07.HOC@nrc.gov (Operations Center)

KK/3

NRC "Talking Points" – Current as of March 17, 2011, 0600 EDT

Reactor Status

- Fukushima Daiichi Units 1 - 6
  - TEPCO is working to restore site power and anticipates restoration to Units 2,5, and 6 today and Units 1, 3, and 4 tomorrow.

Unit 1

- Core damage occurred due to insufficient cooling water caused by loss of offsite power and onsite diesel generators following the tsunami
- As of 2200 JST (0900 EDT) on March 14, it is reported that sea water is being injected with reported stable cooling
- Containment described as "functional"
- Hydrogen explosion from overheated fuel-water reaction has damaged reactor building (secondary containment)
- The spent fuel pool level is unknown
- Radiation levels 150-1000 mrem/hour at 1000 EDT on March 16, 2011, at site gate. (Site gate is same for each unit.)
- Core cooling is via the core spray header.

Unit 2

- Core damage occurred due to insufficient cooling water caused by loss of offsite power and onsite diesel generators following the tsunami
- Reactor Core Isolation Cooling (RCIC) has failed
- Secondary containment: Cut hole in the side of the reactor building superstructure to reduce likelihood of hydrogen gas buildup
- Sea water injection restarted with core cooling reported as not stable
- Primary containment is intact
- Radiation levels 150-1000 mrem/hour at 1000 EDT on March 16, 2011, at site gate. (Site gate is same for each unit.)
- The spent fuel pool level is unknown. Some water is available as evidenced by steam emanating from hole.

Unit 3

- Core damage due to insufficient cooling water caused by loss of offsite power and onsite diesel generators following the tsunami
- Sea water is being injected with reported stable cooling
- Hydrogen explosion from overheated fuel-water reaction has severely damaged reactor building (secondary containment)
- Primary containment described as "functional"
- The spent fuel pool level is possibly drained – some evidence of steam.
- Radiation levels 150-1000 mrem/hour at 1000 EDT on March 16, 2011, at site gate. (Site gate is same for each unit.)
- Unit 3 is currently TEPCO's priority (unclear whether reactor or spent fuel pool)
- Water cannon should be onsite soon (as of 0400 EDT)

Unit 4

- Unit was in a refueling outage at the time of the event and core was off loaded to the SFP
- First fire in the reactor building was a small generator lube oil fire. IAEA reports that fire was put out at 2200 EDT, March 14.
- Radiation levels 150-1000 mrem/hour at 1000 EDT on March 16, 2011, at site gate. (Site gate is same for each unit.)
- Second fire began at 1645 EDT, March 15, 2011 in reactor building. Fuel reported to be uncovered.
- Radiation level outside Unit 4 reported to be 30R/hour following second fire.

- High radiation dose rates measured between Units 3 and 4, source is suspected to be the Unit 4 spent fuel pool.
- The spent fuel pool's ability to retain water is in doubt, no steam – likely dry.

Unit 5

- The reactor is defueled.
- IAEA Reports Temperature of pool at 64.5 degrees C at 1500 EDT, March 16, 2011.
- Unit 5 diesel generator is providing power to cool Units 5 and 6 spent fuel pools.

Unit 6

- The reactor is defueled.
- IAEA Reports Temperature of pool at 61.0 degrees C at 1300 EDT, March 16, 2011.
- Power to cool the Unit 6 spent fuel pool is being provided by the Unit 5 diesel generator.

Other Japanese Nuclear Sites:

- Fukushima Daini Units 1 - 4: As of 7:15 am on March 15 (Japan), Tepco press release reports reactors in cold shutdown and offsite power available.
- Onagawa Units 1 - 3: shutdown, stable, turbine building basement fire extinguished.
- Kashiwazaki Kariwa Nuclear Power Station (Advanced Reactors): Units 1, 5, 6, 7: normal operation / Units 2 to 4: regular outage
- Rokkasho: all units continue safe operations without malfunctions, impacts from earthquake quickly mitigated (emergency diesel generators used, spilt SFP liquid drained and recovered in liquid waste treatment)

Protective Action Recommendations

- For Fukushima Daiichi site, Japanese national government issued a protective action recommendation that instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30km for residents who stayed behind
- Japan has imposed no-fly zone (30km radius, altitude unlimited) over Daiichi plants.
- A RASCAL run at 06:54AM (EDT) on March 16, 2011 for hypothetical combined core based on the following assumptions: Units 2 & 3 each, 33% core melt & no containment; Unit 4, full core offload 100% melt in the Spent Fuel Pool (SFP) with no roof; wind direction from West Northwest blowing out to the ocean. Results: PAG exceded at 50 miles (80.5 km) with TEDE of 24.0 rem, and CDE thyroid of 130 rem.
- Based upon the degrading situation at the Daiichi plant, the US NRC recommends that Americans within 50 miles of the Daiichi plant to evacuate the area.
- The US State Department has approved voluntary authorized departure of family members at the U.S. Embassy in Tokyo, the U.S. Consulate in Nagoya and the Foreign Service Institute in Yokohama.

Meteorological Conditions:

Forecast meteorological data for the 24 hour period (until 1200 EDT on March 17, 2011) indicates wind headed offshore (from NW).

General Talking Points

- TEPCO and US Forces in Japan (USFJ) are working together to allocate firefighting and heavy equipment capable of pumping seawater from the ocean into containment.
  - TEPCO appears to be supplying water by helicopter and water cannon.
  - A list of additional equipment to provide for accident mitigation has been developed by NRC and provided to USAID.
  - Five portable pumps arrived at the Daiichi facility Thursday (1130 SST) from Yokota Air Force Base. Additional equipment to connect pumps is being coordinated.
- Disaster Assistance Response Team arrived Sunday:

- 11 NRC staff are in Tokyo with the Ambassador and getting information from Japanese officials.

- NRC continues to develop projections of the accident's progression, dose estimates and Q&As, including those addressing the safety of reactors in operation in the US.
- Government of Japan has accepted US offer to conduct aerial/ground monitoring and also requested potassium iodide tablets. DOE Aerial Measurement Teams have completed fly over the Daiichi site. Awaiting results.
- The NRC has been asked to provide recommendations for solutions to the spent fuel pool issues during conference call with NISA and TEPCO.

USNRC Emergency Operations Center Status Update

March 19, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Facilitate a March 19, 2011 meeting between government and industry to discuss potential options to support the Japanese. Industry participants expected to attend include representatives from: INPO, GE Hitachi, Bechtel, AREVA, Exelon, EPRI, and Babcock. DOE and Naval Reactors are also attending.

2) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 10 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. Four buses were provided for what Department of State

(DOS) call "voluntary departure" from Japan. Two buses already left; two buses are loading currently in Sendai and will leave around 6:00 p.m. today in Japan. All four buses are headed to Tokyo (13 hour bus ride). DOS believes all U.S. citizens interested in evacuating have done so and there are no plans for additional buses.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

Commission Meeting scheduled for Monday, March 21. (Public/Media expected) Bill Borchardt presenting – supporting activities in Japan; justification for continued operation of U.S. facilities; path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 17, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants"

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

NHK media report on March 17, 0100 EDT stated that helicopter crews dumping water on Unit 3 reactor building reported dose rates at 375 R/hr at 300 ft. above the building.

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 19 – 21, 2011) indicates wind headed offshore until Sunday, with a shift counter clockwise to onshore. This onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

Fukushima Daiichi
STATUS as of 0600 EDT, March 19, 2011 - (1900 Japan)

Unit 1 – (NRC priority: 4)

Core Status: Damaged, extent undetermined
Core Cooling: RCS depressurized (Source: FEPC); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF)
Secondary Containment: lost (visual)
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF)

Unit 2 – (NRC priority: 3)

Core Status: damaged, extent undetermined
Core Cooling: RCS pressures unknown (Source: IAEA, March 19); sea water injected to cool core (Source: NISA)
Primary Containment: Possible Torus damage
Secondary Containment: Hole cut in side of fuel floor metal to reduce H_2 buildup. Steam coming from hole (visual).
Spent Fuel Pool: 587 bundles in pool (Source: GEH)
Other: TEPCO has outside power to Auxiliary Transformer (TEPCO)

Unit 3 – (NRC priority: 1)

Core Status: Damaged, extent undetermined
Core Cooling: RCS depressurized (Source: FEPC); radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: status unknown
Secondary Containment: lost (visual); white smoke (Source: IAEA – Interpreted by NRC as steam)

Spent Fuel Pool: 514 bundles in pool (Source: GEH); **Pool Dry (Source: NRC Team)**; helicopters flew to drop water and water cannon truck sprayed water on March 17 (Source: METI); 7 fire trucks are supplying seawater for cooling spray periodically

Unit 4 – (NRC priority: 2)
Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 bundles in pool (Source: GEH); pool may be dry; damage to fuel rods suspected (Source: JAIF); water was dumped on site with water cannons

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)
Core Status: Core in RPV (Source: INPO)
Spent Fuel Pool: 950 bundles (Source: GEH); (temperature 69C) Unit 6 emergency diesel generator is available; fire truck spray has been staged

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)
Core Status: Core in RPV (Source: INPO)
Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 66C) Unit's emergency diesel generator is available.

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) located on land side of Unit 4 (visual)
Electrical Power (NRC priority: 7): Restoration from switchyard to Unit 2 480V in progress
Dry Cask Storage: Visual inspection didn't reveal any problems.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Protective Measures Team (PMT)

The PMT is working with DOE/NARAC to refine source term models in an effort to develop dose projections beyond 50 miles. The 50 mile distinction is made because NRC RASCAL modeling is only capable to estimate dose values out to 50 miles. Therefore, NRC has the responsibility to develop source terms and dose projections within Japan, up to 50 miles from the reactor site, while DOE has the lead for dose projections beyond 50 miles and for the United States and territories.
The PMT has received information from several various sources regarding radiological conditions around the reactors. Some information (from March 17) around the plant indicates dose rates between 36 mr/hr and 65 mr/hr at approximately ½ mile from the site (over land). Information recorded onsite on March 16, 2011 indicated approximately 10 R/h next to U-3 reactor building and 40 R/h next to U-4 reactor building, and an unconfirmed dose rate of 375 R/hr approximately 300 feet above the Unit 3 reactor (during a helicopter fly over). Department of Energy Aerial Monitoring System (AMS) fly over data on March 18, 2011 generally agrees with MESA supplied field monitoring team data out to approximately 30 km (18 miles) west of the site. Data shows that ground level dose rates from deposition are highest in the NW quadrant, with 20 – 40 mr/hr readings (recorded by AMS) and 18 mr/hr (field team) readings between 20km and 30 km in that quadrant.

Department of Energy Aerial Monitoring operations were conducted on March 17-18, 2011. Two missions using fixed wing (C-12 aircraft) conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials.

AMS information shows that dose rates from ground deposition exist between 20 and 30 km that would result in a whole body dose of greater than 1 REM over continuous exposure for 4 days. This information agrees with Ministry of Education, Culture, Sports, Science and Technology (MEXT) field measurements in the same area.

The PMT has received information
Department of Energy Aerial Monitoring operations were conducted on March 17-18, 2011. Two missions using fixed wing (C-12 aircraft) conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials.

International Response

- IAEA sent a two person team to conduct coordination activities and to take measurements. NRC communicated with IAEA to discuss the status and concerns. The

team's updates have been added to the IAEA Early Notification and Assistance Conventions Website (ENAC) website and NRC has this information.

- France has shared technical data with the NRC and publicly posted its assessment of projected doses in Tokyo on the IRSN website.
- Spain Parliament is still reviewing and deciding on support levels.
- Italy is interested in discussing what the USG is doing, and might be interested in helping in some way.
- China has offered to help.
- Russia has sent a team to Tokyo. The U.S. team has met with the Russians. We believe the Russians are departing.

USNRC Emergency Operations Center Status Update

March 19, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Facilitate a March 19, 2011 meeting between government and industry to discuss potential options to support the Japanese. Industry participants expected to attend include representatives from: INPO, GE Hitachi, Bechtel, AREVA, Exelon, EPRI, and Babcock. DOE and Naval Reactors are also attending.

2) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 10 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff. One NRC staff is returning to the US due to illness and should arrive in the afternoon (EDT) on March 19, 2011. A relief team is being staffed.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current

KK/S

protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. The Bureau of Consular Affairs reported that three U.S. chartered buses departed Sendai March 19. The remaining 10 buses were cancelled due to lack of demand. The consular team in Sendai finished door-to-door searches for U.S. citizens and are returning to Tokyo. No further U.S.-chartered flights are planned at this time.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

Commission Meeting scheduled for Monday, March 21. (Public/Media expected) Bill Borchardt presenting – supporting activities in Japan; justification for continued operation of U.S. facilities; path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 17, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants"

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

Earthquake/Tsunami Status Update March 19, 2011 1800 EDT

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

NHK media report on March 17, 0100 EDT stated that helicopter crews dumping water on Unit 3 reactor building reported dose rates at 375 R/hr at 300 ft. above the building.

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 19 – 21, 2011) indicates wind headed offshore until Sunday, with a shift counter clockwise to onshore. This onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

Fukushima Daiichi

STATUS as of 1800 EDT, March 19, 2011 - (0700 Japan, March 20, 2011)

Unit 1 – (NRC priority: 4)

Core Status: Damaged, extent undetermined
Core Cooling: RCS depressurized (Source: FEPC); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF)
Secondary Containment: lost (visual)
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF); Time margin 128 days; pool/area temp < 100 C (Source: NRC Team)

Unit 2 – (NRC priority: 3)

Core Status: damaged, extent undetermined
Core Cooling: RCS pressures unknown (Source: IAEA, March 19); sea water injected enough to cool core (Source: NISA)
Primary Containment: Possible Torus damage
Secondary Containment: Hole cut in side of fuel floor metal to reduce H_2 buildup. Steam coming from hole (visual).
Spent Fuel Pool: 587 bundles in pool (Source: GEH); Time margin 40 days; pool/area temp <100 C (Source: NRC Team)
Other: Access to the substation for reserve power supply from external transmission line was completed and cable connection is under preparation (Source: NISA); usefulness in question for pump motors & instrumentation due to time since equipment was last energized and current equipment environment (Source: NRC Team);

Unit 3 – (NRC priority: 1)
Core Status: Damaged, extent undetermined
Core Cooling: RCS pressure unknown (Source: FEPC); radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: status unknown
Secondary Containment: lost (visual); white smoke (Source: IAEA – Interpreted by NRC as steam)
Spent Fuel Pool: 514 bundles in pool (Source: GEH); fire trucks supplying cooling spray 40 tons at least twice daily. Time margin (for fuel to become uncovered from evaporation rate & volume) 0 days (Source: NRC Team)

Unit 4 – (NRC priority: 2)
Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 to 1331 bundles in pool (Source: GEH & NISA); pool may be dry; damage to fuel rods suspected (Source: JAIF); water was dumped on site with water cannons; time margin 6 days; pool/area temp < 100 C (Source: NRC Team)

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)
Core Status: Core in RPV (Source: INPO)
Spent Fuel Pool: 950 bundles (Source: GEH); (temperature 65 C) Unit 6 emergency diesel generator is available and supplying power to units 5 and 6; water injection to RVP & SFP continuing (Source: NISA)
Other: Ventilated the rooftop of reactors to release hydrogen and prevent explosions (Source: IAEA); pump for Residual Heat Removal started up and cooling of Spent Fuel Storage Pool has started using power supply from Emergency Diesel Generator for Unit 6 (Source: NISA)

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)
Core Status: Core in RPV (Source: INPO)
Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 62 C); 2 unit EDGs available.
Other: Ventilated the rooftops of reactors to release hydrogen and prevent explosions (Source: IAEA); second unit of EDG (A) has started up (Source: NISA)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) maintained at 55 C (Source: NISA) located on land side of Unit 4 (visual)
Electrical Power (NRC priority: 7): Restoration from Aux Transformer to Unit 2, 480 v Pumps (first) in progress.
Dry Cask Storage: Visual inspection didn't reveal any problems.

TEPCO continues to lay cables to restore electricity to reactors No. 1, 2, 5 and 6 March 19 and said it hoped to start supplying electricity to reactors No. 3 and 4 March 20. Once restored, TEPCO will test the pumps and other cooling systems, which might be damaged. Tests could pose the risk of fire. Two diesel generators at reactor No. 6 are operational. TEPCO announced the water circulation function was restored at reactor No. 5.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Protective Measures Team (PMT) Update

The PMT is working with DOE/NARAC to refine source term models in an effort to develop dose projections beyond 50 miles. The 50 mile distinction is made because NRC RASCAL modeling is only capable to estimate dose values out to 50 miles. Therefore, NRC has the responsibility to develop source terms and dose projections within Japan, up to 50 miles from the reactor site, while DOE has the lead for dose projections beyond 50 miles and for the United States and territories. PMT also working with DOE/NARAC on agreed upon source term for calculations of dose to U.S. territories.

Department of Energy Aerial Monitoring operations were conducted on March 17-18, 2011. Two missions using fixed wing (C-12 aircraft) conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials. Dose rates measured approximately 20-40 mR per hour. A field team measurement was 18 mR per hour. Integrated four day whole body dose would exceed the 1 rem PAG.

International Response

- IAEA sent a two person team to conduct coordination activities and to take measurements. NRC communicated with IAEA to discuss the status and concerns. The team's updates have been added to the IAEA Early Notification and Assistance Conventions Website (ENAC) website and NRC has this information.
- France has shared technical data with the NRC and publicly posted its assessment of projected doses in Tokyo on the IRSN website.
- Spain Parliament is still reviewing and deciding on support levels.
- Italy is interested in discussing what the USG is doing, and might be interested in helping in some way.
- China has offered to help.

- Russia has sent a team to Tokyo. The U.S. team has met with the Russians. We believe the Russians are departing.

Reference

Units
1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (µSv)
1 rem = 0.01 Sv = 10 mSv

Earthquake/Tsunami Status Update March 20, 2011 0600 EDT

USNRC Emergency Operations Center Status Update

March 20, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 10 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff. One NRC staff member returned to the US due to illness. A relief team is being staffed.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. The Bureau of Consular Affairs reported that three U.S.

KK/6

chartered buses departed Sendai March 19. The remaining 10 buses were cancelled due to lack of demand. The consular team in Sendai finished door-to-door searches for U.S. citizens and are returning to Tokyo. No further U.S.-chartered flights are planned at this time.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

NRC continues to work with other Federal agencies to deliver temporary cooling equipment to the Daiichi site. An initial shipment of equipment will depart for Japan on March 20, 2011.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

Commission Meeting scheduled for Monday, March 21 (significant public/media attention expected) Bill Borchardt presenting – topics include supporting activities in Japan, justification for continued operation of U.S. facilities, and path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 18, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants"

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

Earthquake/Tsunami Status Update March 20, 2011 0600 EDT

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

NHK media report on March 17, 0100 EDT stated that helicopter crews dumping water on Unit 3 reactor building reported dose rates at 375 R/hr at 300 ft. above the building.

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 20 – 22, 2011) indicates light wind oscillating on-shore during the day and offshore at night. Each onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

Fukushima Daiichi
STATUS as of 1930 EDT, March 19, 2011 - (0830 Japan, March 20, 2011)

Unit 1 – (NRC priority: 4)

Core Status: Damaged, extent undetermined
Core Cooling: RCS pressure 2.75 atm (Source: IAEA); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF)
Secondary Containment: lost (visual)
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF); Time margin 128 days; pool/area temp < 100 C (Source: NRC Team)
Other: Offsite power line connected to local substation, power restoration ongoing (Source: IAEA)

Unit 2 – (NRC priority: 3)

Core Status: damaged, extent undetermined
Core Cooling: RCS pressure unknown (Source: IAEA, March 19); sea water injected enough to cool core (Source: NISA)
Primary Containment: Possible Torus damage
Secondary Containment: Hole cut in side of fuel floor metal to reduce H_2 buildup. Steam coming from hole (visual).
Spent Fuel Pool: 587 bundles in pool (Source: GEH); Time margin 40 days; pool/area temp <100 C (Source: NRC Team)
Other: Offsite power line connected to local substation, power restoration ongoing (Source: NISA); usefulness in question for pump motors & instrumentation due to time

since equipment was last energized and current equipment environment (Source: NRC Team);

Unit 3 – (NRC priority: 1)
Core Status: Damaged, extent undetermined
Core Cooling: RCS pressure unknown (Source: FEPC); radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: status unknown
Secondary Containment: lost (visual); white smoke (Source: IAEA – Interpreted by NRC as steam)
Spent Fuel Pool: 514 bundles in pool (Source: GEH); fire trucks supplying cooling spray 40 tons at least twice daily. Time margin (for fuel to become uncovered from evaporation rate & volume) 0 days (Source: NRC Team)

Unit 4 – (NRC priority: 2)
Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 to 1331 bundles in pool (Source: GEH & NISA); pool may be dry; damage to fuel rods suspected (Source: JAIF); water was dumped on site with water cannons; time margin 6 days; pool/area temp < 100 C (Source: NRC Team)

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)
Core Status: Core in RPV (Source: INPO)
Spent Fuel Pool: 950 bundles (Source: GEH); (temperature 65 C) Unit 6 emergency diesel generator is available and supplying power to units 5 and 6; water injection to RVP & SFP continuing (Source: NISA)
Other: Ventilated the rooftop of reactors to release hydrogen and prevent explosions (Source: IAEA); pump for Residual Heat Removal started up and cooling of Spent Fuel Storage Pool has started using power supply from Emergency Diesel Generator for Unit 6 (Source: NISA)

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)
Core Status: Core in RPV (Source: INPO)
Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 62 C); 2 unit EDGs available.
Other: Ventilated the rooftops of reactors to release hydrogen and prevent explosions (Source: IAEA); second unit of EDG (A) has started up (Source: NISA)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) maintained at 55 C (Source: NISA) located on land side of Unit 4 (visual)
Electrical Power (NRC priority: 7): Restoration from Aux Transformer to Unit 2, 480 v Pumps (first) in progress.
Dry Cask Storage: Visual inspection didn't reveal any problems.

TEPCO continues to lay cables to restore electricity to reactors No. 1, 2, 5 and 6 March 19 and said it hoped to start supplying electricity to reactors No. 3 and 4 on March 20. Once restored, TEPCO plans to test the pumps and other cooling systems, which might be damaged. Tests

could pose the risk of fire. Two diesel generators at reactor No. 6 are operational. TEPCO announced the water circulation function was restored at reactor No. 5.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Protective Measures Team (PMT) Update

The PMT is working with DOE/NARAC to refine source term models in an effort to develop dose projections beyond 50 miles. The 50 mile distinction is made because NRC RASCAL modeling is only capable to estimate dose values out to 50 miles. Therefore, NRC has the responsibility to develop source terms and dose projections within Japan, up to 50 miles from the reactor site, while DOE has the lead for dose projections beyond 50 miles and for the United States and territories. PMT also working with DOE/NARAC on agreed upon source term for calculations of dose to U.S. territories. On March 20, NARAC received MELCOR source term information for reactors and spent fuel pools for use in further modeling of worst case scenarios.

Department of Energy Aerial Monitoring operations were conducted on March 17-18, 2011. Two missions using fixed wing (C-12 aircraft) conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials. RASCAL runs using the data supplied by the AMS fly over and MEXT monitoring point readings support the decision for the 50 mile evacuation recommendation for US citizens issued on March 16.

Information received from Naval Reactors discussed military aircraft survey activities and the identification of very low level indications of radionuclides approximately 2300 miles NE of the Fukushima reactors and south of the Aleutian Islands, AK. EPA Radnet monitoring stations appeared to record a short lived, very low level indication at stations in Anchorage and Juneau on March 17 and 18.

International Response

- IAEA sent a two person team to conduct coordination activities and to take measurements. NRC communicated with IAEA to discuss the status and concerns. The team's updates have been added to the IAEA Early Notification and Assistance Conventions Website (ENAC) website and NRC has this information.
- France has shared technical data with the NRC and publicly posted its assessment of projected doses in Tokyo on the IRSN website.
- Spain Parliament is still reviewing and deciding on support levels.
- Italy is interested in discussing what the USG is doing, and might be interested in helping in some way.
- China has offered to help.
- Russia has sent a team to Tokyo. The U.S. team has met with the Russians. We believe the Russians are departing.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (µSv)
1 rem = 0.01 Sv = 10 mSv

Dunham, Katrina

From:	Jackson, Donald
Sent:	Sunday, March 20, 2011 7:54 AM
To:	Dean, Bill; Lew, David; Wilson, Peter; Roberts, Darrell; Collins, Daniel; Lorson, Raymond; Baker, Pamela; Walker, Tracy; Clifford, James; Miller, Chris; Weerakkody, Sunil
Cc:	Screnci, Diane; Sheehan, Neil; Trapp, James; McNamara, Nancy; Tifft, Doug; Hansell, Samuel; Hinson, Felicia; McKinley, Raymond; Rogge, John; Jackson, Donald; Cook, William
Subject:	March 20, 2011- 0730- CA Briefing On Japan Reactor Accidents
Attachments:	NRC Status Update 3-20 11--0600.pdf

The following is a synopsis of the briefing with changes or noteworthy items underlined:

Status of Fukushima Daiichi Units:

Unit 1-
No Significant Change

Unit 2-
No Significant Change
TEPCO has offsite power to an aux transformer- Working to restore control room envelope and ventilation, and switchgear/pumps/etc

Unit 3-
No Significant Change
External seawater spray applied most of day
Some reports of elevated primary containment pressure- TEPCO may be pursuing venting

Unit 4-
No Significant Change
Beginning seawater spray soon…during day Sunday

Other Issues-
Unit 5 and Unit 6- Both have AC Power
Unit 5 and Unit 6 SFPs Being Positively Cooled

Some dose rate info- Access Gate down to 60mR/hr, Near Unit 3 and 4 down to 15 R/hr, In affected power blocks- 1 to 5 R/hr

Wind is swinging to the south per forecast

Bechtel spray system still in Perth, Australia there are some loading issues in plane. Single train to still be shipped to Japan today with 2 techs

TEPCO is looking to make a bigger hole in U-2 Sec Ctmt

More at 2000 Sunday

Detailed info in attachment!

VR

Don Jackson

Chief- Region I DRP PB5
(610) 337-5306

KK 7

MARCH 20, 2011 0600 EDT - FUKUSHIMA DAI-ICHI

- Units 1, 2, and 3 reactors appear to in a stable condition with seawater injection continuing.

- Containment integrity is believed to be intact on Units 1, 2, and 3.

- Water continues to be sprayed on the Unit 3 reactor building/spent fuel pool. TEPCO believes the Unit 3 pool can be completely refilled in about 7 more hours. Containment pressure has been reported as "increasing" ... TEPCO is monitoring and assesses that this is consistent with ongoing injection activities. NISA indicated that another release may be needed.

- The Japanese Self Defense Force plans to resume water injection to the Unit 4 spent fuel pool from the ground level today.

- Two diesel generators are running and supplying AC power to Units 5 and 6. A Unit 5 RHR pump, powered by one of the U-6 diesel generators was started and is providing cooling to the Unit 5 spent fuel.

- TEPCO is now installing high voltage cables from a nearby transmission line to Units 1&2. Priority is being given to restoring power to RHR and cooling water pumps. Power is expected to be restored to Unit 1&2 later today. The same kind of cables are planned to be extended to Units 3&4 (perhaps by Monday). DOE Secretary Chu requested update the status of power restoration in advance of his appearance on Sunday morning news programs. The Liaison Team provided an update to DOE.

- Dose rates around Units 3 and 4 are reducing [was 40 rem/hr, now 15 rem/hr]. Dose rates around Units 5 and 6 are 100 mRem/hr. Dose rates near the power block range from 1 to 5 Rem/hr. The site access gate was reading 60 mRem/hr (which is about 4000 feet from the plant). The winds continue to blow from the North West, so the plume is going out to the sea. A dose rate was recorded to be 12 mRem/Hr at a point 20 km inland from the plant. All other dose rates 20 to 40 km from the plant are marginally above background. It was reported that very low levels of radioactive materials were detected in spinach and milk. [Dose rate data provided by industry representatives.]

- Still awaiting results from NARAC on "bounding worst case" source term's potential effects on U.S. Pending these results, NRC's protective measures team has drafted a more realistic worst case source term that is still being evaluated. Forecast meteorological data for the next 48 hours indicate light wind oscillating on-shore during the day and off-shore at night.

- Participated in conference call with NRC Site Team, TEPCO reps, and INPO to discuss installation of the first train of emergency cooling equipment designed by Bechtel. TEPCO raised several issues regarding logistics for transporting this equipment to the site, equipment assembly, training etc. In addition, TEPCO also requested additional items including radiation monitoring equipment, protective gear, etc. We are working to address these issues on a high priority basis.

- No new overhead imagery has been received.

Allen, Linda

From: Hiltz, Thomas
Sent: Wednesday, April 13, 2011 11:36 AM
To: Allen, Linda
Subject: FW: Official Use Only: USNRC Earthquake-Tsunami Update 03.20.11--1800 EDT
Attachments: USNRC Earthquake-Tsunami Update.032011.1800EDT.pdf

---

From: Tschiltz, Michael
Sent: Monday, March 21, 2011 7:40 AM
To: Habighorst, Peter; Hiltz, Thomas; Smith, Brian; Silva, Patricia; Campbell, Larry; Johnson, Robert
Cc: Bailey, Marissa; Smith, James; Kinneman, John
Subject: Official Use Only: USNRC Earthquake-Tsunami Update 03.20.11--1800 EDT

Branch Chiefs.. please share with your staff.. **Please note that this information is "Official Use Only" and is only being shared within the federal family.**

Thanks.. Mike

From: LIA07 Hoc
Sent: Sun Mar 20 17:56:57 2011
Subject: USNRC Earthquake-Tsunami Update 03.20.11--1800 EDT

Attached, please find the **1800 EDT March 20, 2011** status update from the US Nuclear Regulatory Commission's Emergency Operations Center regarding the impacts of the earthquake/tsunami.

Please note that this information is "Official Use Only" and is only being shared within the federal family.

Please call the Headquarters Operations Officer at 301-816-5100 with questions.

- Caroline

Caroline Nguyen
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Caroline.Nguyen@nrc.gov
LIA07.HOC@nrc.gov (Operations Center)

KK/8

USNRC Emergency Operations Center Status Update

March 20, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 10 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff. One NRC staff member returned to the US due to illness. A relief team is being staffed.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. The Bureau of Consular Affairs reported that three U.S.

chartered buses departed Sendai March 19. The remaining 10 buses were cancelled due to lack of demand. The consular team in Sendai finished door-to-door searches for U.S. citizens and are returning to Tokyo. No further U.S.-chartered flights are planned at this time.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

NRC continues to work with other Federal agencies to deliver temporary cooling equipment to the Daiichi site. An initial shipment of equipment will depart for Japan on March 20, 2011.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

Commission Meeting scheduled for Monday, March 21 (significant public/media attention expected) Bill Borchardt presenting – topics include supporting activities in Japan, justification for continued operation of U.S. facilities, and path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 18, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants."

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

Earthquake/Tsunami Status Update March 20, 2011 1800 EDT

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

NHK media report on March 17, 0100 EDT stated that helicopter crews dumping water on Unit 3 reactor building reported dose rates at 375 R/hr at 300 ft. above the building.

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 20 – 22, 2011) indicates light wind oscillating on-shore during the day and offshore at night. Each onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

On March 20, 0600 EDT, NEI reports that dose rates around Units 3 and 4 are reducing (was 40 rem/hr, now 15 rem/hr). Dose rates around Units 5 and 6 are 100 mrem/hr. Dose rates near the power block range from 1 to 5 rem/hr. The site access gate, which is about 4000 feet from the plant, was reading 60 mrem/hr. A dose rate of 12 mrem/hr was recorded at a point 20 km (12.4 miles) inland from the plant. All other dose rates at 20 to 40 km (12.4 – 24.8 miles) from the plant are marginally above background. It was reported that very low levels of radioactive materials were detected in spinach and milk.

Fukushima Daiichi
STATUS as of 1800 EDT, March 20, 2011 - (0700 Japan, March 21, 2011)

Unit 1 – (NRC priority: 4)
Core Status: Damaged, extent undetermined
Core Cooling: RCS pressure 2.95 ATM (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF)
Secondary Containment: lost (visual)
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF); Time margin 128 days; pool/area temp < 100 C (Source: NRC Team)
Other: Offsite power line connected to local substation, power restoration ongoing (Source: IAEA)

Unit 2 – (NRC priority: 3)
Core Status: damaged, extent undetermined
Core Cooling: RCS pressure 1.8 ATM (Source: IAEA, March 20); sea water injected enough to cool core (Source: NISA)

Primary Containment: Possible Torus damage, drywall pressure 1.25 ATM (Source: IAEA, March 20)
Secondary Containment: Hole cut in side of fuel floor metal to reduce H_2 buildup. Steam coming from hole (visual).
Spent Fuel Pool: 587 bundles in pool (Source: GEH); Time margin 40 days; pool/area temp <100 C (Source: NRC Team)
Other: Offsite power line connected to local substation, power restoration ongoing (Source: NISA); usefulness in question for pump motors & instrumentation due to time since equipment was last energized and current equipment environment (Source: IAEA)

Unit 3 – (NRC priority: 1)
Core Status: Damaged, extent undetermined
Core Cooling: RCS pressure 2.5 ATM (Source: IAEA, March 20); radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: status 3.1 ATM (Source: IAEA, March 20)
Secondary Containment: lost (visual); white smoke (Source: IAEA – Interpreted by NRC as steam)
Spent Fuel Pool: 514 bundles in pool (Source: GEH); fire trucks supplying cooling spray 40 tons at least twice daily.

Unit 4 – (NRC priority: 2)
Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 to 1331 bundles in pool (Source: GEH & NISA); pool may be dry; damage to fuel rods suspected (Source: JAIF); periodic water spray (Source: IAEA, March 20)

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)
Core Status: Core in RPV (Source: INPO), 4.32 ATM level + 198 cm above top of active fuel (TAF) (Source: IAEA, March 20)
Spent Fuel Pool: 950 bundles (Source: GEH); (temperature 65 C) Unit 6 emergency diesel generator is available and supplying power to units 5 and 6; water injection to RVP & SFP continuing (Source: NISA)
Other: Ventilated the rooftop of reactors to release hydrogen and prevent explosions (Source: IAEA); pump for Residual Heat Removal started up and cooling of Spent Fuel Storage Pool has started using power supply from Emergency Diesel Generator for Unit 6 (Source: NISA)

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)
Core Status: Core in RPV (Source: INPO), 7.94 ATM (Source: IAEA, March 20)
Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 62 C); 2 unit EDGs available.
Other: Ventilated the rooftops of reactors to release hydrogen and prevent explosions (Source: IAEA); second unit of EDG (A) has started up (Source: NISA)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) maintained at 55 C (Source: NISA) located on land side of Unit 4 (visual)

Earthquake/Tsunami Status Update March 20, 2011 1800 EDT

Electrical Power (NRC priority: 7): Restoration from Aux Transformer to Unit 2, 480 v Pumps (first) in progress.
Dry Cask Storage: Visual inspection didn't reveal any problems.

TEPCO continues to lay cables to restore electricity to reactors No. 1, 2, 5 and 6 on March 19 and said it hoped to start supplying electricity to reactors No. 3 and 4 on March 20. Once restored, TEPCO plans to test the pumps and other cooling systems, which might be damaged. Tests could pose the risk of fire. Two diesel generators at reactor No. 6 are operational. TEPCO announced the water circulation function was restored at reactor No. 5.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Protective Measures Team (PMT) Update

The PMT is working with DOE/NARAC to refine source term models in an effort to develop dose projections beyond 50 miles. The 50 mile distinction is made because NRC RASCAL modeling is only capable to estimate dose values out to 50 miles. Therefore, NRC has the responsibility to develop source terms and dose projections within Japan, up to 50 miles from the reactor site, while DOE has the lead for dose projections beyond 50 miles and for the United States and territories. PMT also working with DOE/NARAC on agreed upon source term for calculations of dose to U.S. territories.

Department of Energy Aerial Monitoring operations were conducted on March 17-18, 2011. Two missions using fixed wing (C-12 aircraft) conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials.

The PMT is focusing analysis efforts on realistic scenarios. As data becomes available we will continue to modify scenarios. The PMT has no new data that would change the current protective action recommendations of evacuation to 50 miles. In addition to monitoring the evacuation protective action recommendations, the PMT is also cognizant of potential ingestion pathway protective action recommendations and measurements on food reported in the media. The PMT is unaware of any recommendations made by the Japanese, but we asked the site team to ask on-site representatives if ingestion pathway PARs will be employed, and for data if available.

PMT is continuing to check monitoring done by U.S. assets including EPA Radnet stations, and U.S. reactors on the west coast.

International Response

- IAEA sent a team including the Director General and Head of Safety and Security Coordination Section, and two radiation monitoring technicians to conduct coordination activities and to take measurements. NRC communicated with IAEA to discuss the status and concerns. The team's updates have been added to the IAEA Early Notification and Assistance Conventions Website (ENAC) website and NRC has this information.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.
- France has publicly posted its assessment of projected doses in Tokyo on the IRSN website.

Reference

Units
1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (μSv)
1 rem = 0.01 Sv = 10 mSv

USNRC Emergency Operations Center Status Update

March 21, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 10 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff. One NRC staff member returned to the US due to illness. A relief team is being staffed.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. The Bureau of Consular Affairs reported that three U.S.

K149

chartered buses departed Sendai March 19. The remaining 10 buses were cancelled due to lack of demand. The consular team in Sendai finished door-to-door searches for U.S. citizens and are returning to Tokyo. No further U.S.-chartered flights are planned at this time.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

NRC participated in a phone call with the White House Situation Room, Ambassador Roos, Naval Reactors, and USFJ to discuss possible precautionary actions that could be taken by US military personnel in Japan in response to low dose levels detected in the plume from the Fukushima Daiichi site.

NRC continues to work with other Federal agencies to deliver temporary cooling equipment to the Daiichi site. An initial shipment of equipment is scheduled to arrive in Japan at 1600 EDT on March 21, 2011. A second shipment is scheduled to arrive in Japan at 0400 EDT on March 22, 2011.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

Commission Meeting scheduled for Monday, March 21 (significant public/media attention expected) Bill Borchardt presenting – topics include supporting activities in Japan, justification for continued operation of U.S. facilities, and path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 18, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants."

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Earthquake/Tsunami Status Update March 21, 2011 0600 EDT

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

NHK media report on March 17, 0100 EDT stated that helicopter crews dumping water on Unit 3 reactor building reported dose rates at 375 R/hr at 300 ft. above the building.

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 21 – 22, 2011) indicates light wind oscillating on-shore during the day and offshore at night. Each onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

On March 20, 0600 EDT, NEI reports that dose rates around Units 3 and 4 are reducing (was 40 rem/hr, now 15 rem/hr). Dose rates around Units 5 and 6 are 100 mrem/hr. Dose rates near the power block range from 1 to 5 rem/hr. The site access gate, which is about 4000 feet from the plant, was reading 60 mrem/hr. A dose rate of 12 mrem/hr was recorded at a point 20 km (12.4 miles) inland from the plant. All other dose rates at 20 to 40 km (12.4 – 24.8 miles) from the plant are marginally above background. It was reported that very low levels of radioactive materials were detected in spinach and milk.

Fukushima Daiichi
STATUS as of 0600 EDT, March 21, 2011 - (1900 Japan)

Unit 1 – (NRC priority: 4)

Core Status: Damaged, extent undetermined; RPV level ~1/2 fuel (Source: IAEA);
Core Cooling: RCS pressure 2.95 ATM (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF), drywell pressure 1.7 ATM
Secondary Containment: lost (visual)
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF); Time margin 128 days; pool/area temp < 100 C (Source: NRC Team)

Other: Offsite power line connected to local substation, power restoration ongoing (Source: IAEA)

Unit 2 – (NRC priority: 3)
Core Status: damaged, extent undetermined; RPV level ~1/2 of fuel
Core Cooling: RCS pressure 1.8 ATM (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: Possible Torus damage, drywall pressure 1.25 ATM (Source: IAEA, March 20)
Secondary Containment: Blowout panel opened in side of reactor building to reduce H2 buildup; steam coming from hole (visual).
Spent Fuel Pool: 587 bundles in pool (Source: GEH); Time margin 40 days; 40 tons of water sprayed into SFP; pool/area temp <100 C (Source: NRC Team)
Other: Offsite power restored to load-side power panel (Source: IAEA); condition of pump motors and instrumentation is unknown due to equipment environment (Source: NRC Team)

Unit 3 – (NRC priority: 1)
Core Status: Damaged, extent undetermined; RCS pressure 2.5 ATM (Source: IAEA); level ~2/3 of fuel; high radiation measured
Core Cooling: RCS pressure 2.5 ATM (Source: IAEA, March 20); radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: status unknown; drywell pressure 3.1 ATM (Source: IAEA, March 20)
Secondary Containment: lost (visual); white smoke (Source: IAEA – Interpreted by NRC as steam)
Spent Fuel Pool: 514 bundles in pool (Source: GEH); water sprayed from ground several times (Source: NISA); time margin (to fuel uncover from evaporate and volume) 0 days (Source: NRC Team) At 0250 EDT March 21, 2011, grey smoke was observed coming from the Southeast corner of the Unit 3 spent fuel pool. Workers were evacuated.

Unit 4 – (NRC priority: 2)
Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 to 1331 bundles in pool (Source: GEH & NISA); pool may be dry; damage to fuel rods suspected (Source: JAIF); periodic water spray (Source: IAEA, March 20); pool/area temp <100 C

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)
Core Status: Core in RPV (Source: INPO), 4.32 ATM, level + 164 cm above top of active fuel (TAF) (Source: IAEA, March 20)
Spent Fuel Pool: 950 bundles (Source: GEH); (temperature 65 C) Unit 6 emergency diesel generator is available and supplying power to units 5 and 6; RHR is cooling RPV and SFP (Source: NISA); Rx in cold shutdown (Source: IAEA)
Other: Ventilated the rooftop of reactors to release hydrogen and prevent explosions (Source: IAEA); pump for Residual Heat Removal started up and cooling of Spent Fuel

Storage Pool has started using power supply from Emergency Diesel Generator for Unit 6 (Source: NISA)

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)
Core Status: Core in RPV (Source: INPO), 7.9 ATM; level +175 cm > TAF (Source: IAEA, March 20)
Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 62 C); 2 unit EDGs available. Injection to SFP via make-up water system; RHR is cooling RVP & SFP (Source: NISA); reactor in cold shutdown (Source: IAEA)
Other: Ventilated the rooftops of reactors to release hydrogen and prevent explosions (Source: IAEA); second unit of EDG (A) has started up (Source: NISA)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) maintained at 57 C (Source: NISA) located on land side of Unit 4 (visual)
Electrical Power (NRC priority: 7): Offsite power connected to U-2 aux transformer/distribution panel; work continues on energizing equipment in U-2
Dry Cask Storage: Visual inspection didn't reveal any problems.

TEPCO continues to lay cables to restore electricity to reactors No. 1, 2, 5 and 6 on March 19 and said it hoped to start supplying electricity to reactors No. 3 and 4 on March 20. Once restored, TEPCO plans to test the pumps and other cooling systems, which might be damaged. Tests could pose the risk of fire. Two diesel generators at reactor No. 6 are operational. TEPCO announced the water circulation function was restored at reactor No. 5.

Electric power from a local substation has been connected to Units 1 and 2 – restoration of the power is ongoing. Connections to Units 3 and 4 are expected to start on March 20. Two diesel generators at Unit 6 are running. There is now enough power available to units 5 and 6 for the residual heat removal system pumps and the units are now in cold shutdown. Cooling has also been restored to the Unit 5 and 6 spent fuel pools. NISA said the temperature has fallen in both SFPs. Per TEPCO, the temperature of spent fuel pools in Unit 5 and 6 are approximately 60 degrees Celsius, and are not in a situation where there is immediate trouble. TEPCO is now focusing on restoring cooling to the other units.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Protective Measures Team (PMT) Update

The PMT is working with DOE/NARAC to refine source term models in an effort to develop dose projections beyond 50 miles. The 50 mile distinction is made because NRC RASCAL modeling is only capable of estimate dose values out to 50 miles. Therefore, NRC has the responsibility to develop source terms and dose projections within Japan, up to 50 miles from the reactor site, while DOE has the lead for dose projections beyond 50 miles and for the United States and territories. PMT also working with DOE/NARAC on agreed upon source term for calculations of dose to U.S. territories.

Department of Energy Aerial Monitoring operations were conducted on March 17-18, 2011. Two missions using fixed wing (C-12 aircraft) conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials. Air sampling was also conducted by the U.S. Navy on March 20 and 21, 2011. Samples were taken approximately 90 miles north of Tokyo, and at Yokosuka Naval Base, which is approximately 175 miles away from the Fukushima site. Air samples were taken in 15 minute intervals and resulted in detectable levels.

The Federation of Electric Power Companies of Japan reported a radiation level of 2,623 micro Sv/hour outside the main office building (approximately 1,640ft from Unit 2) at 0700 (JST) on March 20. Monitoring in the last 24 hours indicate that readings are progressively going down.

The PMT is focusing analysis efforts on realistic scenarios. As data becomes available we will continue to modify scenarios. The PMT has no new data that would change the current protective action recommendations of evacuation to 50 miles. In addition to monitoring the evacuation protective action recommendations, the PMT is also cognizant of potential ingestion pathway protective action recommendations and measurements on food reported in the media. The PMT is unaware of any recommendations made by the Japanese, but we asked the site team to ask on-site representatives if ingestion pathway PARs will be employed, and for data if available.

PMT is continuing to check monitoring done by U.S. assets including EPA Radnet stations, and U.S. reactors on the west coast.

International Response

- IAEA sent a team including the Director General and Head of Safety and Security Coordination Section, and two radiation monitoring technicians to conduct coordination activities and to take measurements. NRC communicated with IAEA to discuss the status and concerns. The team's updates have been added to the IAEA Early Notification and Assistance Conventions Website (ENAC) website and NRC has this information.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.

- France has publicly posted its assessment of projected doses in Tokyo on the IRSN website.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (µSv)
1 rem = 0.01 Sv = 10 mSv

USNRC Emergency Operations Center Status Update

March 21, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 12 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff. A relief team is being staffed.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. The Bureau of Consular Affairs reported that three U.S. chartered buses departed Sendai March 19. The remaining 10 buses were cancelled due to

KK/10

lack of demand. The consular team in Sendai finished door-to-door searches for U.S. citizens and are returning to Tokyo. No further U.S.-chartered flights are planned at this time.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

NRC participated in a phone call with the White House Situation Room, Ambassador Roos, Naval Reactors, and USFJ to discuss possible precautionary actions that could be taken by US military personnel in Japan in response to low dose levels detected in the plume from the Fukushima Daiichi site.

NRC continues to work with other Federal agencies to deliver temporary cooling equipment to the Daiichi site. An initial shipment of equipment arrived in Japan at about 1600 EDT on March 21, 2011. A second shipment is scheduled to arrive in Japan at 0400 EDT on March 22, 2011.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

Commission Meeting was held on Monday, March 21, 2011. Topics included supporting activities in Japan, justification for continued operation of U.S. facilities, and path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 18, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants."

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 21 – 22, 2011) indicates light wind oscillating on-shore during the day and offshore at night. Each onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

The most recent survey data does not indicate any substantial change of dose measurements at the site.

Fukushima Daiichi
STATUS as of 1800 EDT, March 21, 2011 - (0700, March 22 Japan)

Unit 1 – (NRC priority: 4)

Core Status: Damaged, extent undetermined; RPV level ~1/2 fuel (Source: IAEA);
Core Cooling: RCS pressure 2.97 ATM (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF), drywell pressure 1.6 ATM (Source: JAIF)
Secondary Containment: lost (visual)
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF); Time margin 128 days; pool/area temp < 100 C (Source: NRC Team)
Other: Offsite power line connected to local substation, power restoration ongoing (Source: IAEA)

Unit 2 – (NRC priority: 3)

Core Status: damaged, extent undetermined; RPV level ~1/2 of fuel
Core Cooling: RCS pressure 0.8 ATM (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: Possible Torus damage, drywall pressure 1.2 ATM (Source: IAEA, March 20)

Secondary Containment: Blowout panel opened in side of reactor building to reduce H2 buildup; steam coming from hole (visual).
Spent Fuel Pool: 587 bundles in pool (Source: GEH); Time margin 40 days; 40 tons of water sprayed into SFP; pool/area temp <100 C (Source: NRC Team)
Other: Offsite power restored to load-side power panel (Source: IAEA); condition of pump motors and instrumentation is unknown due to equipment environment (Source: NRC Team)

Unit 3 – (NRC priority: 1)
Core Status: Damaged, extent undetermined; RCS pressure 0.4 ATM (Source: IAEA); level ~2/3 of fuel; high radiation measured
Core Cooling: Radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: status unknown; drywell pressure 1.2 ATM (Source: IAEA, March 20)
Secondary Containment: lost (visual); white smoke (Source: IAEA – Interpreted by NRC as steam)
Spent Fuel Pool: 514 bundles in pool (Source: GEH); water sprayed from ground several times (Source: NISA); time margin (to fuel uncover from evaporate and volume) 0 days (Source: NRC Team) At 0250 EDT March 21, 2011, grey smoke was observed coming from the Southeast corner of the Unit 3 spent fuel pool. Workers were evacuated. News reports indicate that workers have returned.

Unit 4 – (NRC priority: 2)
Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 to 1331 bundles in pool (Source: GEH & NISA); periodic water spray (Source: IAEA, March 20); pool/area temp <100 C
Other: work for laying electricity cable to power center completed at ~0200 EDT March 21, 2011 (Source: NISA)

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)
Core Status: Core in RPV (Source: INPO), 4.32 ATM, level + 164 cm above top of active fuel (TAF) (Source: IAEA, March 20)
Spent Fuel Pool: 950 bundles (Source: GEH); (temperature 65 C) Unit 6 emergency diesel generator is available and supplying power to units 5 and 6; RHR is cooling RPV and SFP (Source: NISA); Rx in cold shutdown (Source: IAEA)
Other: Ventilated the rooftop of reactors to release hydrogen and prevent explosions (Source: IAEA); pump for Residual Heat Removal started up and cooling of Spent Fuel Storage Pool has started using power supply from Emergency Diesel Generator for Unit 6 (Source: NISA), switched to external power supply 2236 EDT March 20 (Source: NISA)

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)
Core Status: Core in RPV (Source: INPO), 7.9 ATM; level +175 cm > TAF (Source: IAEA, March 20)

Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 62 C); 2 unit EDGs available. Injection to SFP via make-up water system; RHR is cooling RVP & SFP (Source: NISA); reactor in cold shutdown (Source: IAEA)
Other: Ventilated the rooftops of reactors to release hydrogen and prevent explosions (Source: IAEA); second unit of EDG (A) has started up (Source: NISA)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) maintained at 57 C (Source: NISA) located on land side of Unit 4 (visual). Water spray started 2137 EDT March 20 (Source: NISA)
Electrical Power (NRC priority: 7): Offsite power connected to U-2 aux transformer/distribution panel; work continues on energizing equipment in U-2
Dry Cask Storage: Visual inspection didn't reveal any problems. All casks are vertical casks manufactured by Hitachi Shipbuilding (Source: RST)

TEPCO continues to lay cables to restore electricity to reactors No. 1, 2, 5 and 6 on March 19 and said it hoped to start supplying electricity to reactors No. 3 and 4 on March 20. Once restored, TEPCO plans to test the pumps and other cooling systems, which might be damaged. Tests could pose the risk of fire. Two diesel generators at reactor No. 6 are operational. TEPCO announced the water circulation function was restored at reactor No. 5.

Electric power from a local substation has been connected to Units 1 and 2 – restoration of the power is ongoing. Connections to Unit 4 completed 0200 EDT March 21; connections to Unit 3 were ongoing. (Source: NISA) Two diesel generators at Unit 6 are running. There is now enough power available to units 5 and 6 for the residual heat removal system pumps and the units are now in cold shutdown. Cooling has also been restored to the Unit 5 and 6 spent fuel pools. NISA said the temperature has fallen in both SFPs. Per TEPCO, the temperature of spent fuel pools in Unit 5 and 6 are approximately 60 degrees Celsius, and are not in a situation where there is immediate trouble. TEPCO is now focusing on restoring cooling to the other units.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Protective Measures Team (PMT) Update

Department of Energy Aerial Monitoring operations were conducted on March 17-20, 2011. Missions conducted parallel and serpentine patterns near the Fukushima nuclear power plant.

A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials. Air sampling was also conducted by the U.S. Navy on March 20 and 21, 2011. Samples were taken approximately 90 miles north of Tokyo, and at Yokosuka Naval Base, which is approximately 175 miles away from the Fukushima site. Air samples were taken in 15 minute intervals and resulted in detectable levels.

The PMT has no new data that would change the current protective action recommendations of evacuation to 50 miles. In addition to monitoring the evacuation protective action recommendations, the PMT is also cognizant of potential ingestion pathway protective action recommendations and measurements on food made by the Japanese government. Levels reported in the media exceeded the values in the U.S. Food and Drug Administration (FDA) derived levels for action. Based on data in the media reports, the PMT agreed with Japanese action to interdict those foodstuffs. Data from an air monitor in Ishioka, Japan, 90 miles southwest of site – level detected is small fraction of EPA PAG, Iodine, and no protective actions are recommended.

PMT is continuing to check monitoring done by U.S. assets including EPA Radnet stations, and U.S. reactors on the west coast.

International Response

- IAEA sent a team including the Director General and Head of Safety and Security Coordination Section, and two radiation monitoring technicians to conduct coordination activities and to take measurements. NRC communicated with IAEA to discuss the status and concerns. The team's updates have been added to the IAEA Early Notification and Assistance Conventions Website (ENAC) website and NRC has this information.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.
- France has publicly posted its assessment of projected doses in Tokyo on the IRSN website.
- Taiwan staffed their Operations Center, beginning on Saturday, March 12th, and continues to do so.
- The German regulator, GRS, has sent one technical staff person to Tokyo. The assumption is that he would be located at the German embassy.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (µSv)
1 rem = 0.01 Sv = 10 mSv

USNRC Emergency Operations Center Status Update

March 22, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 12 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff. A relief team is being staffed.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. The Bureau of Consular Affairs reported that three U.S. chartered buses departed Sendai March 19. The remaining 10 buses were cancelled due to

KK/11

lack of demand. The consular team in Sendai finished door-to-door searches for U.S. citizens and are returning to Tokyo. No further U.S.-chartered flights are planned at this time.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

NRC participated in a phone call with the White House Situation Room, Ambassador Roos, Naval Reactors, and USFJ to discuss possible precautionary actions that could be taken by US military personnel in Japan in response to low dose levels detected in the plume from the Fukushima Daiichi site.

NRC continues to work with other Federal agencies to deliver temporary cooling equipment to the Daiichi site. An initial shipment of equipment was expected to arrive in Japan at 2020 EDT on March 21, 2011. A second shipment is scheduled to arrive in Japan at 0445 EDT on March 22, 2011.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

A Commission Meeting was held on Monday, March 21, 2011. Topics included supporting activities in Japan, justification for continued operation of U.S. facilities, and path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 18, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants."

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Earthquake/Tsunami Status Update March 22, 2011 0600 EDT

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 21 – 22, 2011) indicates light wind oscillating on-shore during the day and offshore at night. Each onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

The most recent survey data does not indicate any substantial change of dose measurements at the site.

Fukushima Daiichi
STATUS as of 0600 EDT, March 22, 2011 - (1900, March 22 Japan)

Unit 1 – (NRC priority: 4)

Core Status: Damaged, extent undetermined; RPV level ~1/2 fuel (Source: IAEA);
Core Cooling: RCS pressure 2.97 ATM (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF), drywell pressure 1.6 ATM (Source: JAIF)
Secondary Containment: lost (visual)
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF); Time margin 128 days; pool/area temp < 100 C (Source: NRC Team)
Other: Offsite power line connected to local substation, power restoration ongoing (Source: IAEA)

Unit 2 – (NRC priority: 3)

Core Status: damaged, extent undetermined; RPV level ~1/2 of fuel
Core Cooling: RCS pressure 0.8 ATM (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: Possible Torus damage, drywell pressure 1.2 ATM (Source: IAEA, March 20)

Secondary Containment: Blowout panel opened in side of reactor building to reduce H2 buildup; smoke coming from hole on 3/21 (visual).
Spent Fuel Pool: 587 bundles in pool (Source: GEH); Time margin 40 days (Source: NRC Team); 40 tons of water sprayed into SFP; pool/area temp <100 C (Source: IAEA)
Other: Offsite power restored to load-side power panel (Source: IAEA); condition of pump motors and instrumentation is unknown due to equipment environment (Source: NRC Team)

Unit 3 – (NRC priority: 1)
Core Status: Damaged, extent undetermined; RCS pressure 0.6 ATM (Source: IAEA); level ~2/3 of fuel; high radiation measured
Core Cooling: Radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: status unknown; drywell pressure 1.2 ATM (Source: IAEA, March 20)
Secondary Containment: lost (visual); white smoke (Source: IAEA – Interpreted by NRC as steam)
Spent Fuel Pool: 514 bundles in pool (Source: GEH); water sprayed from ground several times (Source: NISA); time margin (to fuel uncover from evaporate and volume) 0 days (Source: NRC Team) At 0250 EDT March 21, 2011, grey smoke was observed coming from the Southeast corner of the Unit 3 spent fuel pool. Workers were evacuated. Smoke lessened 2 hours later (Source: IAEA). News reports indicate that workers have returned.

Unit 4 – (NRC priority: 2)
Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 to 1331 bundles in pool (Source: GEH & NISA); periodic water spray (Source: IAEA, March 20); pool/area temp <100 C
Other: work for laying electricity cable to power center completed at ~0200 EDT March 21, 2011 (Source: NISA)

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)
Core Status: Core in RPV (Source: INPO), 4.32 ATM, level + 164 cm above top of active fuel (TAF) (Source: IAEA, March 20)
Spent Fuel Pool: 950 bundles (Source: GEH); (temperature 36 C (Source: JAIF)); RHR is cooling RPV and SFP (Source: NISA); Rx in cold shutdown (Source: IAEA)
Other: Ventilated the rooftop of reactors to release hydrogen and prevent explosions (Source: IAEA); Unit 5 is being powered from the electrical grid (Source: NISA).

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)
Core Status: Core in RPV (Source: INPO), 7.9 ATM; level +175 cm > TAF (Source: IAEA, March 20)
Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 36 C (Source: NISA)); 2 unit EDGs available. Injection to SFP via make-up water system; RHR is cooling RVP & SFP (Source: NISA); reactor in cold shutdown (Source: IAEA)
Other: Ventilated the rooftops of reactors to release hydrogen and prevent explosions (Source: IAEA); second unit of EDG (A) has started up (Source: NISA)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) maintained at 57 C (Source: NISA) located on land side of Unit 4 (visual). Water spray started 2137 EDT March 20 (Source: NISA)
Electrical Power (NRC priority: 7): Offsite power connected to U-2 aux transformer/distribution panel; work continues on energizing equipment in U-2
Dry Cask Storage: Visual inspection didn't reveal any problems. All casks are vertical casks manufactured by Hitachi Shipbuilding (Source: RST)

Electric power from a local substation has been connected to Units 1 and 2 – restoration of the power is ongoing. Connections to Unit 4 completed 0200 EDT March 21; connections to Unit 3 were ongoing. (Source: NISA) Two diesel generators at Unit 6 are running. There is now enough power available to units 5 and 6 for the residual heat removal system pumps and the units are now in cold shutdown. Cooling has also been restored to the Unit 5 and 6 spent fuel pools. NISA said the temperature has fallen in both SFPs. TEPCO is now focusing on restoring cooling to the other units.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Protective Measures Team (PMT) Update

Department of Energy Aerial Monitoring operations were conducted on March 17-21, 2011; no sorties have been flown in the last two days due to inclement weather. Missions conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials. Air sampling was also conducted by the U.S. Navy on March 20 and 21, 2011. Samples were taken approximately 90 miles north of Tokyo, and at Yokosuka Naval Base, which is approximately 175 miles away from the Fukushima site. Air samples were taken in 15 minute intervals and resulted in detectable levels.

The PMT continues to aggregate and assess available dose rate information. Multi-day trending of available onsite monitors shows slightly declining dose rates over the past several days. On-site surveys of the exterior of the reactor buildings show dose rates of 60 mR/hr to 15 R/hr with the highest doses around reactor building 3.

In addition to monitoring the evacuation protective action recommendations, the PMT is also cognizant of potential ingestion pathway protective action recommendations and measurements on food made by the Japanese government. Levels reported in the media exceeded the values in the U.S. Food and Drug Administration (FDA) derived levels for action. Based on data in the media reports, the PMT agreed with Japanese action to interdict those foodstuffs. Data from an air monitor in Ishioka, Japan, 90 miles southwest of site – level detected is small fraction of EPA PAG, Iodine, and no protective actions are recommended.

PMT is continuing to check monitoring done by U.S. assets including EPA Radnet stations, and U.S. reactors on the west coast. The PMT has no new data that would change the current protective action recommendations of evacuation to 50 miles. Additionally, the PMT has begun reviewing criteria for relaxing protective recommendations for future re-entry.

International Response

- IAEA sent a team including the Director General and Head of Safety and Security Coordination Section, and two radiation monitoring technicians to conduct coordination activities and to take measurements. NRC communicated with IAEA to discuss the status and concerns. The team's updates have been added to the IAEA Early Notification and Assistance Conventions Website (ENAC) website and NRC has this information.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.
- France has publicly posted its assessment of projected doses in Tokyo on the French Radioprotection and Nuclear Safety Institute (IRSN) website.
- Taiwan staffed their Operations Center, beginning on Saturday, March 12th, and continues to do so.
- The German regulator, BMU, has sent one technical staff person to Tokyo. The assumption is that he would be located at the German embassy.
- The Institute of Nuclear Power Operations (INPO) is sending staff to Japan to prioritize requests and organize the US industry response.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (µSv)
1 rem = 0.01 Sv = 10 mSv

USNRC Emergency Operations Center Status Update

March 22, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report was changed to include NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

A total of 11 NRC experts supporting USAID response efforts from the NRC are in Japan and have engaged with the US Ambassador and his staff. A relief team is being staffed.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

At 0550 EDT, March 14, 2011, the NRC experts in Japan reported that the Japanese have requested US technical assistance with cooling the Fukushima Daiichi Units, as needed. The effort is being coordinated by the US Ambassador. At 0900 EDT, March 15, 2011, the Japanese government accepted DOE's Radiological Assistance Program (RAP) team assistance, which includes Aerial Measuring System (AMS) flyovers. UK and Canada have requested NRC to share this information and we are working with DOE to see if this can be shared.

On March 16, NRC provided the White House with information on protective measures for NRC staff in Japan and information to provide advice for other federal workers in Japan. The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate. The Bureau of Consular Affairs reported that three U.S. chartered buses departed Sendai March 19. The remaining 10 buses were cancelled due to

KK/12

lack of demand. The consular team in Sendai finished door-to-door searches for U.S. citizens and are returning to Tokyo. No further U.S.-chartered flights are planned at this time.

Japanese Ministry of Defense (MOD) has assumed the lead role in Japanese response activities. TEPCO is now in an advisory role to MOD.

NRC participated in a phone call with the White House Situation Room, Ambassador Roos, Naval Reactors, and United States Forces Japan (USFJ) to discuss possible precautionary actions that could be taken by US military personnel in Japan in response to low dose levels detected in the plume from the Fukushima Daiichi site.

NRC continues to work with other Federal agencies to deliver temporary cooling equipment to the Daiichi site. An initial shipment of equipment was expected to arrive in Japan at 2020 EDT on March 21, 2011. A second shipment is scheduled to arrive in Japan at 0445 EDT on March 22, 2011.

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

A Commission Meeting was held on Monday, March 21, 2011. Topics included supporting activities in Japan, justification for continued operation of U.S. facilities, and path forward for NRC staff.

Status of NRC Licensee and Agreement State Facilities

NRC issued Information Notice 2011-05 to the U.S. nuclear power reactor fleet on March 18.

The Institute of Nuclear Power Operations (INPO) issued a Level 1 Event Report (highest level) to its members on the afternoon of March 15, 2011. It identifies 4 actions, with due dates, and requires a written response. In general, the actions include walkdowns and verifications of aspects of facility capabilities to address B.5.b equipment and procedures, Severe Accident Management Guidelines (SAMGs), mitigation of station blackout (SBO) conditions, mitigation of internal and external flooding, and fire and flooding events that could be impacted by a concurrent seismic event.

The Nuclear Energy Institute (NEI) issued several fact sheets, the latest on March 18, 2011: "Perspective on Radiation Releases and Emergency Planning at U.S. Nuclear Power Plants."

Current Understanding of Japanese Facilities

(This information is compiled from TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, IAEA information releases, Federation of Electric Power Companies of Japan, Japan Atomic Industrial Forum, World Association of Nuclear Operators, the NRC in-country team and others.)

Earthquake/Tsunami Status Update March 22, 2011 1800 EDT

Fukushima Daiichi

Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km for residents who stayed behind. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. As of 1830 EDT on March 15, 2011, there have been no updates to protective actions.

On March 17, Japanese authorities have changed the classification of the event from a Level 4 to a Level 5 "Accident with Wider Consequences" on the International Nuclear and Radiological Event Scale (INES).

All available information indicates that the majority of releases from the Fukushima site have been carried out to sea by the prevailing winds. Forecast meteorological data for the next 48 hour period (March 21 – 22, 2011) indicates light wind oscillating on-shore during the day and offshore at night. Each onshore shift remains predicted to last approximately 12 hours before shifting back offshore.

DOE Aerial Measurement Teams have completed two flyovers of the Daiichi site. NRC has received the data and the analyses, which support a concentration of ground deposition in the NW quadrant (from the plant site) also reported by Ministry of Education, Culture, Sports, Science and Technology (MEXT) field monitoring teams following the March 15 on-shore wind shift.

The most recent survey data does not indicate any substantial change of dose measurements at the site.

A research vessel of the Japan Agency for Marine-Earth Science and Technology will measure the air dose rates over and collect seawater samples from the coastal waters near the nuclear facility. The seawater samples collected will be brought back and sent to the Japan Atomic Energy Agency for analysis (Source: IAEA).

Fukushima Daiichi
STATUS as of 1800 EDT, March 22, 2011 - (0700 Japan, March 23)

Unit 1 – (NRC priority: 4)

Core Status: Damaged, extent undetermined; RPV level ~1/2 fuel (Source: IAEA)
Core Cooling: RCS pressure 2.97 atm (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: functional (Source: JAIF), drywell pressure 1.6 atm (Source: JAIF)
Secondary Containment: lost during hydrogen explosion
Spent Fuel Pool: 292 bundles in pool (Source: GEH); water level unknown (Source: JAIF); Time margin 127 days; pool/area temp < 100 C (Source: NRC Team)
Other: Offsite power line connected to local substation, power restoration ongoing (Source: IAEA)

Unit 2 – (NRC priority: 3)

Core Status: damaged, extent undetermined; RCS pressure unknown; RPV level ~1/2 of TAF; fire truck providing seawater to recirc line; offsite power restored to load-side power panel (Source: NISA); condition of pump motors and instrumentation being evaluated (Source: IAEA)
Core Cooling: RCS pressure 0.8 atm (Source: IAEA, March 20); sea water injected to cool core (Source: NISA)
Primary Containment: Integrity unknown (possible torus damage), drywell pressure 1.2 atm (Source: IAEA, March 20)
Secondary Containment: Blowout panel opened in side of reactor building to reduce hydrogen buildup; smoke (steam?) coming from hole
Spent Fuel Pool: 587 bundles in pool (Source: GEH); Time margin 39 days (Source: NRC Team); pool/area temp significantly <100 C (Source: IAEA)

Unit 3 – (NRC priority: 1)

Core Status: Damaged, extent undetermined; RCS pressure 0.6 atm (Source: IAEA); level ~2/3 of fuel; fire truck providing seawater to recirc line
Core Cooling: Radiation released; sea water injected to cool core (Source: NISA)
Primary Containment: integrity unknown; drywell pressure 1.2 atm (Source: IAEA, March 20)
Secondary Containment: lost during hydrogen explosion; white smoke (Source: IAEA – Interpreted by NRC as steam)
Spent Fuel Pool: 514 bundles in pool (Source: GEH); water sprayed from ground several times (Source: NISA); time margin (to fuel uncover from evaporate and volume) 0 days (Source: NRC Team) At 0250 EDT March 21, 2011, grey smoke was observed coming from the Southeast corner of the Unit 3 SFP. Workers were evacuated. Smoke lessened 2 hours later (Source: IAEA). News reports indicate that workers have returned. Fuel likely uncovered.

Unit 4 – (NRC priority: 2)

Core Status: offloaded
Core Cooling: N/A
Primary Containment: N/A
Secondary Containment: lost (visual)
Spent Fuel Pool: 1201 to 1331 bundles in pool (Source: GEH & NISA); pool likely dry at one point causing significant fuel damage; water sprayed into pool to refill; pool/area temp <100 C; external electrical cable now connected to power center
Other: work for laying electricity cable to power center completed at ~0200 EDT March 21, 2011 (Source: NISA)

Unit 5 – Shutdown since January 3, 2011 (NRC priority: 5)

Core Status: Core in RPV (Source: INPO), 4.32 ATM, RPV intact; RPV level + 164 cm above TAF (Source: IAEA, March 20); offsite electrical power restored (Source: NISA); RHR providing cooling
Spent Fuel Pool: 950 bundles (Source: GEH); temperature 42 C (Source: JAIF); RHR providing cooling (Source: NISA); reactor in cold shutdown (Source: IAEA)
Other: Ventilated the rooftop of reactor building to release hydrogen and prevent explosions (Source: IAEA)

Unit 6 – Shutdown since August 14, 2010 (NRC priority: 6)

Core Status: Core in RPV (Source: INPO), 7.9 atm; level +175 cm > TAF (Source: IAEA, March 20); RHR providing cooling

Spent Fuel Pool: 876 bundles (Source: GEH); (temperature 36 C (Source: JAIF)); 2 unit EDGs available. Injection to SFP via make-up water system; RHR is cooling RPV & SFP (Source: NISA); reactor in cold shutdown (Source: IAEA)

Other: Ventilated the rooftop of reactor building to release hydrogen and prevent explosions (Source: IAEA); second unit of EDG (A) has started up (Source: NISA)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH) maintained at 57 C (Source: NISA) located on land side of Unit 4 (visual). Water spray started 2137 EDT March 20 (Source: NISA)

Electrical Power (NRC priority: 7): Offsite power connected to U-2 auxilliary transformer / distribution panel; work continues on energizing equipment in U-2

Dry Cask Storage: Visual inspection didn't reveal any problems. All casks are vertical casks manufactured by Hitachi Shipbuilding (Source: RST)

Electric power from a local substation has been connected to Units 1 and 2 – restoration of the power is ongoing. Connections to Unit 4 completed 0200 EDT March 21; connections to Unit 3 were ongoing. (Source: NISA) Two diesel generators at Unit 6 are running. There is now enough power available to units 5 and 6 for the RHR system pumps and the units are now in cold shutdown. Cooling has also been restored to the Unit 5 and 6 SFPs. NISA said the temperature has fallen in both Unit 5 and 6 SFPs. TEPCO is now focusing on restoring normal cooling to the other units.

Other Plants

Fukushima Daini

- No changes to report

Onagawa

- No changes to report

Rokkasho

- No changes to report

Acronyms

atm – Atmosphere (unit of pressure)
EDG – Emergency Diesel Generator
RCS – Reactor Coolant System
RHR – Residual Heat Removal
RPV – Reactor Pressure Vessel
SFP – Spent Fuel Pool
TAF – Top of Active Fuel

Protective Measures Team (PMT) Update

Department of Energy Aerial Monitoring operations were conducted on March 17-21, 2011; no sorties have been flown in the last two days due to inclement weather. Missions conducted parallel and serpentine patterns near the Fukushima nuclear power plant. A narrow band to the northwest, 13 to 20 miles from the site, has a high concentration of contaminated materials. Air sampling was also conducted by the U.S. Navy on March 20 and 21, 2011. Samples were taken approximately 90 miles north of Tokyo, and at Yokosuka Naval Base, which is approximately 175 miles away from the Fukushima site. Air samples were taken in 15 minute intervals and resulted in detectable levels.

The PMT continues to aggregate and assess available dose rate information. Multi-day trending of available onsite monitors shows slightly declining dose rates over the past several days. On-site surveys of the exterior of the reactor buildings show dose rates of 60 mR/hr to 15 R/hr with the highest doses around reactor building 3.

In addition to monitoring the evacuation protective action recommendations, the PMT is also cognizant of potential ingestion pathway protective action recommendations and measurements on food made by the Japanese government. Levels reported in the media exceeded the values in the U.S. Food and Drug Administration (FDA) derived levels for action. Based on data in the media reports, the PMT agreed with Japanese action to interdict those foodstuffs. Data from an air monitor in Ishioka, Japan, 90 miles southwest of site – level detected is small fraction of EPA PAG, Iodine, and no protective actions are recommended.

PMT is continuing to check monitoring done by U.S. assets including EPA Radnet stations, and U.S. reactors on the west coast. The PMT has no new data that would change the current protective action recommendations of evacuation to 50 miles. Additionally, the PMT has begun reviewing criteria for relaxing protective recommendations for future re-entry.

International Response

- The IAEA held a special session of the Board of Governors on March 21, 2011. Director General Amano provided a summary of his trip to Japan. The IAEA continues to have daily press and technical briefings.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.
- France has publicly posted its assessment of projected doses in Tokyo on the French Radioprotection and Nuclear Safety Institute (IRSN) website.
- Taiwan staffed their Operations Center, beginning on Saturday, March 12th, and continues to do so.
- The German regulator, BMU, has sent one technical staff person to Tokyo. The assumption is that he would be located at the German embassy.
- The Institute of Nuclear Power Operations (INPO) is sending staff to Japan to prioritize requests and organize the US industry response.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (μSv)
1 rem = 0.01 Sv = 10 mSv

USNRC Emergency Operations Center Status Update

March 26, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report includes NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

The team of NRC experts in Japan continues to support the US Ambassador and his staff.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

On March 14, 2011, the NRC experts in Japan reported that the Japanese had requested US technical assistance for cooling the Fukushima Daiichi Units, as needed. The effort to provide assistance is being coordinated by the US Ambassador.

The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate.

One train of temporary cooling equipment has been transported to Yokota Air Force Base. Plans are being made for the U.S. Navy to provide two fresh water barges to the Daiichi site.

The NRC Reactor Safety Team has provided a set of recommendations pertaining to severe accident management strategies to the NRC team in Japan. The recommendations were coordinated with GEH, EPRI, INPO, Naval Reactors, and DOE.

KH 13

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

The Commission has established a senior level agency task force to conduct a methodical and systematic review of NRC processes and regulations with specific near-term and long-term objectives.

Status of NRC Licensee and Agreement State Facilities

No new information to report

Industry Consortium

No new information to report

Current Understanding of Japanese Facilities

(This information is compiled from the NRC in-country team, TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, International Atomic Energy Agency (IAEA) information releases, Federation of Electric Power Companies of Japan, World Association of Nuclear Operators, Department of Energy (DOE) and others.)

Fukushima Daiichi

The Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. Japanese government officials have recommended to residents living within 20 to 30 km of the site to voluntarily evacuate their homes – not because of changing conditions at the site – but because of increasingly difficult logistical issues.

Meteorological information obtained by PMT through NARAC and other sources indicate that a 360 degree wind shift has occurred over the duration of the accident (on March 11).

Current forecast meteorological data appears to indicate that winds are shifting offshore (from the NW to W) midday Saturday and continuing offshore through Tuesday.

STATUS as of 0430 EDT, March 26, 2011 - (1730 Japan, March 26)

Unit 1 – (NRC Priority: 1)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
The volume of sea water injected to cool the core has left enough salt to fill the lower plenum to the core plate (Source: GEH, US Industry).
Vessel temperatures 149C at bottom drain, 197C at FW nozzle (Source: NISA)
RPV at 65.7 psig (increasing trend), DW and torus pressure at 40 psig (decreasing trend) (Source: NISA).

Core Cooling: Fresh water injection initiated at 1537 hrs JDT 3/25, injecting through FW 120l/min or 31.7 g/m (Source: NISA).
Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Not damaged, 40 psig (TEPCO was considering venting on 3/24)

Secondary Containment: Severely damaged (hydrogen explosion)

Spent Fuel Pool: Fuel covered, no seawater injected - (Source: JAIF, NISA, TEPCO)
The fuel in this pool is all over 12 years old and very little heat input (<0.1 MW) (Source: DOE).

Rad Levels: DW 4780 R/hr, Torus 3490 R/hr (source instruments unknown), Outside plant: 16mR/hr at main gate (slight trend downward) (Source: MEXT)

Power: Electric power available, equipment testing in progress (Source: JAIF, NISA, TEPCO)
External AC power to the Main Control Room of Unit 1 became available at 11:30 JDT 3/24/2011. Lighting operating in Main Control Room.

Unit 2 – (NRC Priority: 2)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
Suspect the volume of sea water injected to cool the core has left enough salt to fill the lower plenum to the core plate (Source: GEH, US Industry). Bottom head temperature 104C, feed water nozzle temperature 107C (Source: JAIF, NISA, TEPCO).

Core Cooling: Fresh water with boric acid injection as of 10:10 A.M. on March 26 (TEPCO),
Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Damage suspected (Source: JAIF, NISA, TEPCO)

Secondary Containment: Damaged (Source: JAIF, NISA, TEPCO), hole in refuel floor siding (Source: visual)

Spent Fuel Pool: Fuel covered, seawater injected on March 20, fuel pool temperature 52C (Source: JAIF, NISA, TEPCO)

Rad Levels: DW 4560 R/hr; Torus 154 R/hr (source instruments unknown); Outside plant: 16mR/hr at main gate (slight trend downward) (Source: MEXT)

Power: External AC power has reached the unit, checking integrity of equipment before energizing.

Unit 3 – (NRC Priority: 3)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
Suspect the volume of sea water injected to cool the core has left enough salt to likely fill the lower plenum to the core plate (Source: GEH, US Industry). Bottom head temperature 111C, FW nozzle temperature: Unreliable (Source: JAIF, NISA 1800 JDT 3/25/11, TEPCO)

Core Cooling: Freshwater injection via fire line initiated 1802 JDT 3/25/11 (Source: NISA)
Seawater injection through RHR, Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Damage suspected (Source: NISA, TEPCO). "Not damaged" (Source: JAIF). Need to resolve
Secondary Containment: Damaged (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Low water level (Source: JAIF, NISA, TEPCO), spraying and pumping sea water into the SFP via the Cooling and Purification Line (Source: NISA)
Rad Levels: DW 5100 R/hr, torus 150 R/hr (INPO source instruments unknown); Outside plant: 16mR/hr at main gate (slight trend downward) (Source: MEXT); 100 R/hr debris outside Rx building (covered).
Power: External AC power has reached the unit, checking integrity of equipment before energizing. Lighting operating in Main Control Room.

Unit 4 – (NRC Priority: 4)
Core Status: Offloaded 105 days at time at accident (Source: JAIF, NISA, TEPCO)
Core Cooling: Not necessary (Source: JAIF, NISA, TEPCO)
Primary Containment: Not applicable (Source: JAIF, NISA, TEPCO)
Secondary Containment: Severely damaged, hydrogen explosion. (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Low water level, spraying with sea water, hydrogen from the fuel pool exploded, fuel pool is cool heating up very slowly (Source: JAIF, NISA, TEPCO)
Temperature is unknown (Source: NISA).
Video was to be taken of SFP pool on 3/24 (Source: unverified)
Power: External AC power has reached the unit, checking electrical integrity of equipment before energizing. (Source: JAIF, NISA, TEPCO)

Unit 5 – (NRC Priority: 5)
Core Status: In vessel (Source: JAIF, NISA, TEPCO)
Core Cooling: Functional (Source: JAIF, NISA, TEPCO)
Primary Containment: Functional (Source: JAIF, NISA, TEPCO)
Secondary Containment: Vent hole drilled in rooftop to avoid hydrogen build up (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Fuel pool cooling functional, RHR pump repaired, temperature 37.9 C (Source: JAIF, NISA, TEPCO)
Power: External AC power supplying the unit, diesel generators available. (Source: JAIF, NISA, TEPCO)

Unit 6 – (NRC Priority: 6)
Core Status: In vessel (Source: JAIF, NISA, TEPCO)
Core Cooling: Functional (Source: JAIF, NISA, TEPCO)
Primary Containment: Functional (Source: JAIF, NISA, TEPCO)
Secondary Containment: Vent hole drilled in rooftop to avoid hydrogen build up (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Fuel pool cooling functional, temperature 22 C (Source: JAIF, NISA, TEPCO)
Power: External AC power supplying the unit, diesel generators available. (Source: JAIF, NISA, TEPCO)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH); water level maintained at 53ºC (Source: NISA); water spray started at 2137 EDT March 20 (Source: NISA); normal cooling started 1805 JDT 3/24/2011 (Source: NISA)
Electrical Power (NRC priority: 7): Offsite power connected to Unit 2 auxiliary transformer / distribution panel; work continues on energizing equipment in Unit 2

Dry Cask Storage: Visual inspection revealed no problems. All casks are vertical casks manufactured by Hitachi Shipbuilding (Source: RST)

On March 25, 2011, NRC assigned revised priorities to Units 1 through 4. This was based on analysis by the Reactor Safety Team. Unit 1 is priority 1 based on the fact that primary containment integrity can still be preserved if the responders take the correct actions to inject to the RPV and Primary containment. Unit 2 is priority 2 because of the apparent damage to primary containment and the other barriers to release. This damage requires continued attention to cool the core and provide water to the primary containment to minimize potential for release. Unit 3 is priority 3, because primary containment may be okay but continued attention is required to pursue core cooling and injection. Unit 4 is priority 4 because progress has been made in addressing the spent fuel pool heat removal requirements and the SFP area has indicated temperatures of less than 100 °C.

Other Plants

No new information to report

Acronyms

atm – Atmosphere (unit of pressure)
DW – Drywell
EDG – Emergency Diesel Generator
FW – Feed Water
CS – Reactor Coolant System
RHR – Residual Heat Removal
RPV – Reactor Pressure Vessel
SFP – Spent Fuel Pool
TAF – Top of Active Fuel

Protective Measures Team (PMT) Update

The PMT continues to aggregate and assess available dose rate information from DOE Aerial Monitoring operations, the U.S. Navy, and TEPCO. Multi-day trending of available onsite monitors shows slightly declining dose rates over the past several days. Based upon information received on March 25 and 26, dose rates at the main gate were 16mR/hr (Source: MEXT). This shows a slight trend downward.

Potential ingestion pathway radiation measurements made by the Japanese government on food from regions near the Daiichi site exceed the values established by the U.S. Food and Drug Administration (FDA). Tokyo government officials advised residents to stop giving tap water to infants based on radioactive levels.

The PMT is continuing efforts to develop reentry plans for short-term reentry and retrieval of personal effects. A long term reentry plan was developed on March 22, 2011 and was reviewed on March 24, 2011 with no changes recommended. The PMT is also working with the Environmental Protection Agency (EPA) with environmental data from US Nuclear Power plants. A draft short term re-entry guide for members of the public was sent to the NRC team in Japan for comment by March 27, 2011.

The PMT has begun efforts to compile a comprehensive list of hypothetical source terms since the onset of the crisis in Japan that have been supplied to NARAC. The source terms are summarized in a matrix by date and reactor unit/ spent fuel pool, and percent fuel melt. Furthermore, the PMT is trending exposure rate data around the site based on Ministry of Education, Culture, Sports, Science and Technology (MEXT) data which is periodically sent to the PMT.

Per IAEA 1700 UTC March 24, Radiation exposure on 3 TEPCO related workers was confirmed. They were working in the basement Unit 3 turbine building where contaminated water was on the floor. The radiation exposures of the 3 workers were 180 mSv, 179 mSv, and 173 mSv. Additional information received on March 25, 2011 indicated possible beta doses of 18 rem. (A dose of 18 Rem would not cause "beta burns", as previously reported.) Two of the workers had severely contaminated their feet (radiation doses above water was 40 R/hr) and were transferred to the Fukushima Prefecture Medical University.

PMT has completed work with NARAC on the source term for Plausible Realistic Case model based on plant conditions as of March 24, 2011. Run was completed at 1400 EDT on March 25, 2011, and results have been verified by the PMT. The Plausible Realistic Case assumed partial melting of Unit 1 (70% core melt; 10%/day release), Unit 2 (33% core melt; a 5-inch sq. hole in containment), and Unit 3 (33% core melt; 100%/day release. The case did not assume any release from the spent fuel pools. Actual meteorological data and forecasts were used. Releases were assumed to occur over 12 days, and dose results were calculated for 14 days for locations in Japan. According to the RASCAL run using this source term, TEDE was greater than 5 Rem out to around 2 miles and greater than 1 Rem (TEDE PAG) out to around 8 miles from the plant. Adult thyroid dose was greater than 10 Rem out to around 5.25 miles from the plant. Child thyroid dose was greater than 5 Rem out to around 11 miles from the plant. The NARAC run is expected to be completed and provided to the PMT for review on March 26.

International Response

- The IAEA held a special session of the Board of Governors on March 21, 2011. Director General Amano provided a summary of his trip to Japan. The IAEA continues to have daily press and technical briefings.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.
- France has publicly posted its assessment of projected doses in Tokyo on the French Radioprotection and Nuclear Safety Institute (IRSN) website.
- Taiwan staffed their Operations Center, beginning on Saturday, March 12th, and continues to do so. They may also be participating in the daily UK/Canada/France call.
- An Institute of Nuclear Power Operations (INPO) staff member has arrived in Tokyo and is coordinating with US government staff at the Embassy.
- NRC is coordinating with the State Department to provide the US Ambassador the plume analysis to share with the Japanese government.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (μSv)
1 rem = 0.01 Sv = 10 mSv

USNRC Emergency Operations Center Status Update

March 26, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report includes NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

The team of NRC experts in Japan continues to support the US Ambassador and his staff.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

On March 14, 2011, the NRC experts in Japan reported that the Japanese had requested US technical assistance for cooling the Fukushima Daiichi Units, as needed. The effort to provide assistance is being coordinated by the US Ambassador.

The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate.

One train of temporary cooling equipment has been transported to Yokota Air Force Base. Plans are being made for the U.S. Navy to provide two fresh water barges to the Daiichi site.

The NRC Reactor Safety Team has provided a set of recommendations pertaining to severe accident management strategies to the NRC team in Japan. The recommendations were coordinated with GEH, EPRI, INPO, Naval Reactors, and DOE.

KH/14

Earthquake/Tsunami Status Update March 26, 2011 1800 EDT

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

The Commission has established a senior level agency task force to conduct a methodical and systematic review of NRC processes and regulations with specific near-term and long-term objectives.

Status of NRC Licensee and Agreement State Facilities

No new information to report

Industry Consortium

No new information to report

Current Understanding of Japanese Facilities

(This information is compiled from the NRC in-country team, TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, International Atomic Energy Agency (IAEA) information releases, Federation of Electric Power Companies of Japan, World Association of Nuclear Operators, Department of Energy (DOE) and others.)

Fukushima Daiichi

The Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. Japanese government officials have recommended to residents living within 20 to 30 km of the site to voluntarily evacuate their homes – not because of changing conditions at the site – but because of increasingly difficult logistical issues.

Meteorological information obtained by PMT through NARAC and other sources indicate that a 360 degree wind shift has occurred over the duration of the accident (on March 11).

Current forecast meteorological data appears to indicate that winds are shifting offshore (from the NW to W) midday Saturday, March 26, 2011 and continuing offshore through Tuesday, March 29, 2011.

STATUS as of 1800 EDT, March 26, 2011 - (0700 Japan, March 27)

Unit 1 – (NRC Priority: 1)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
The volume of sea water injected to cool the core has left enough salt to fill the lower plenum to the core plate (Source: GEH, US Industry).
Vessel temperatures 146°C at bottom drain, 197°C at FW nozzle (Source: NISA)
RPV at 65.7 psig (increasing trend), DW and torus pressure at 40 psig (decreasing trend) (Source: NISA).

Core Cooling: Fresh water injection initiated at 1537 JDT on March 25, injecting through FW 120 L/min or 31.7 g/m (Source: NISA).
Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Not damaged, 40 psia (TEPCO was considering venting on March 24)

Secondary Containment: Severely damaged (hydrogen explosion)

Spent Fuel Pool: Fuel covered, no seawater injected (Source: JAIF, NISA, TEPCO)
All fuels in this pool are over 12 years old and have very little heat input (<0.1 MW) (Source: DOE).

Rad Levels: DW 4780 R/hr, Torus 3490 R/hr (source instruments unknown), Outside plant: 16 mR/hr at main gate (slight trend downward) (Source: MEXT)

Power: Electric power available, equipment testing in progress (Source: JAIF, NISA, TEPCO)
External AC power to the Main Control Room of Unit 1 became available at 1130 JDT on March 24, 2011. Lighting operating in Main Control Room.

Unit 2 – (NRC Priority: 2)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
Suspect the volume of sea water injected to cool the core has left enough salt to fill the lower plenum to the core plate (Source: GEH, US Industry). Bottom head temperature 100°C, feed water nozzle temperature 107°C (Source: JAIF, NISA, TEPCO).

Core Cooling: Fresh water with boric acid injection as of 10:10 A.M. on March 26 (TEPCO), Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Damage suspected (Source: JAIF, NISA, TEPCO)

Secondary Containment: Damaged (Source: JAIF, NISA, TEPCO), hole in refuel floor siding (Source: visual)

Spent Fuel Pool: Fuel covered, seawater injected on March 20, fuel pool temperature 52°C (Source: JAIF, NISA, TEPCO)

Rad Levels: DW 4560 R/hr; Torus 154 R/hr (source instruments unknown); Outside plant: 16 mR/hr at main gate (slight trend downward) (Source: MEXT)

Power: External AC power has reached the unit; checking integrity of equipment before energizing.

Unit 3 – (NRC Priority: 3)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
Suspect the volume of sea water injected to cool the core has left enough salt to likely fill the lower plenum to the core plate (Source: GEH, US Industry). Bottom head temperature 111°C, FW nozzle temperature: Unreliable (Source: JAIF, NISA 1800 JDT March 25, TEPCO)

Core Cooling: Freshwater injection via fire line initiated 1802 JDT March 25 (Source: NISA)
Seawater injection through RHR, Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Damage suspected (Source: NISA, TEPCO). "Not damaged" (Source: JAIF). Need to resolve.
Secondary Containment: Damaged (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Low water level (Source: JAIF, NISA, TEPCO), spraying and pumping sea water into the SFP via the Cooling and Purification Line (Source: NISA)
Rad Levels: DW 5100 R/hr, torus 150 R/hr (INPO source instruments unknown); Outside plant: 16 mR/hr at main gate (slight trend downward) (Source: MEXT); 100 R/hr debris outside Rx building (covered).
Power: External AC power has reached the unit; checking integrity of equipment before energizing. Lighting operating in Main Control Room.

Unit 4 – (NRC Priority: 4)
Core Status: Offloaded 105 days at time of accident (Source: JAIF, NISA, TEPCO)
Core Cooling: Not necessary (Source: JAIF, NISA, TEPCO)
Primary Containment: Not applicable (Source: JAIF, NISA, TEPCO)
Secondary Containment: Severely damaged, hydrogen explosion. (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Low water level, spraying with sea water, hydrogen from the fuel pool exploded, fuel pool is cool heating up very slowly (Source: JAIF, NISA, TEPCO)
Temperature is unknown (Source: NISA).
Video was to be taken of SFP pool on March 24 (Source: unverified)
Power: External AC power has reached the unit; checking electrical integrity of equipment before energizing. (Source: JAIF, NISA, TEPCO)

Unit 5 – (NRC Priority: 5)
Core Status: In vessel (Source: JAIF, NISA, TEPCO)
Core Cooling: Functional (Source: JAIF, NISA, TEPCO)
Primary Containment: Functional (Source: JAIF, NISA, TEPCO)
Secondary Containment: Vent hole drilled in rooftop to avoid hydrogen build up (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Fuel pool cooling functional, RHR pump repaired, temperature 37.9ºC (Source: JAIF, NISA, TEPCO)
Power: External AC power supplying the unit, diesel generators available. (Source: JAIF, NISA, TEPCO)

Unit 6 – (NRC Priority: 6)
Core Status: In vessel (Source: JAIF, NISA, TEPCO)
Core Cooling: Functional (Source: JAIF, NISA, TEPCO)
Primary Containment: Functional (Source: JAIF, NISA, TEPCO)
Secondary Containment: Vent hole drilled in rooftop to avoid hydrogen build up (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Fuel pool cooling functional, temperature 22ºC (Source: JAIF, NISA, TEPCO)
Power: External AC power supplying the unit, diesel generators available. (Source: JAIF, NISA, TEPCO)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH); water level maintained at 53ºC (Source: NISA); water spray started at 2137 EDT March 20 (Source: NISA); normal cooling started 1805 JDT March 24 (Source: NISA)
Electrical Power (NRC priority: 7): Offsite power connected to Unit 2 auxiliary transformer / distribution panel; work continues on energizing equipment in Unit 2.

Dry Cask Storage: Visual inspection revealed no problems. All casks are vertical casks manufactured by Hitachi Shipbuilding (Source: RST)

Other Plants

No new information to report

Acronyms

atm – Atmosphere (unit of pressure)
DW – Drywell
EDG – Emergency Diesel Generator
FW – Feed Water
CS – Reactor Coolant System
RHR – Residual Heat Removal
RPV – Reactor Pressure Vessel
SFP – Spent Fuel Pool
TAF – Top of Active Fuel

Protective Measures Team (PMT) Update

The PMT continues to aggregate and assess available dose rate information from DOE Aerial Monitoring operations, the U.S. Navy, and TEPCO. Multi-day trending of available onsite monitors shows slightly declining dose rates over the past several days. Based upon information received on March 25 and 26, dose rates at the main gate were 16 mR/hr (Source: MEXT). This shows a slight trend downward.

Potential ingestion pathway radiation measurements made by the Japanese government on food from regions near the Daiichi site exceed the values established by the U.S. Food and Drug Administration (FDA). Tokyo government officials are now advising that residents can give tap water to infants. This information is based on a press release. The PMT is verifying this information.

The PMT had completed a draft of the reentry plans for short-term reentry and retrieval of personal effects and it has been sent to OSTP, DOE and the NRC team for comment by March 27, 2011. A long term reentry plan was developed on March 22, 2011, and was reviewed on March 24, 2011, with no changes recommended. The PMT is also working with the Environmental Protection Agency (EPA) with environmental data from US Nuclear Power plants.

The PMT has begun efforts to compile a comprehensive list of hypothetical source terms since the onset of the crisis in Japan that have been supplied to NARAC. The source terms are summarized in a matrix by date and reactor unit/spent fuel pool, and percent fuel melt. Furthermore, the PMT is trending exposure rate data around the site based on Ministry of Education, Culture, Sports, Science and Technology (MEXT) data which is periodically sent to the PMT.

Earthquake/Tsunami Status Update March 26, 2011 1800 EDT

Per IAEA 1700 UTC March 24, Radiation exposure on 3 TEPCO related workers was confirmed. They were working in the basement Unit 3 turbine building where contaminated water was on the floor. The radiation exposures of the 3 workers were 180 mSv, 179 mSv, and 173 mSv. Additional information received on March 25, 2011, indicated possible beta doses of 18 rem. (A dose of 18 rem would not cause "beta burns", as previously reported.) Two of the workers had severely contaminated their feet (radiation doses above water was 40 R/hr) and were transferred to the Fukushima Prefecture Medical University.

PMT has completed work with NARAC on the source term for Plausible Realistic Case model based on plant conditions as of March 24, 2011. Run was completed at 1400 EDT on March 25, 2011, and results have been verified by the PMT. The Plausible Realistic Case assumed partial melting of Unit 1 (70% core melt; 10%/day release), Unit 2 (33% core melt; a 5-inch sq. hole in containment), and Unit 3 (33% core melt; 100%/day release). The case did not assume any release from the spent fuel pools. Actual meteorological data and forecasts were used. Releases were assumed to occur over 12 days, and dose results were calculated for 14 days for locations in Japan. According to the RASCAL run using this source term, TEDE was greater than 5 rem out to around 2 miles and greater than 1 rem (TEDE PAG) out to around 8 miles from the plant. Adult thyroid dose was greater than 10 rem out to around 5.25 miles from the plant. Child thyroid dose was greater than 5 rem out to around 11 miles from the plant. The NARAC run is expected to be completed and provided to the PMT for review on March 26.

PMT completed the matrix of dose calculations that support the March 16 press release and subsequent calculations sent to NARAC.

PMT completed a requested breakdown of release assumptions by each unit, and the assumed core inventories for Dr. Holdren, OSTP.

International Response

- The IAEA held a special session of the Board of Governors on March 21, 2011. Director General Amano provided a summary of his trip to Japan. The IAEA continues to have daily press and technical briefings.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.
- France has publicly posted its assessment of projected doses in Tokyo on the French Radioprotection and Nuclear Safety Institute (IRSN) website.
- Taiwan staffed their Operations Center, beginning on March 12, and continues to do so. They are providing information on assumptions for the source term and expect NRC reciprocity.
- An Institute of Nuclear Power Operations (INPO) staff member has arrived in Tokyo and is coordinating with US government staff at the Embassy.
- NRC is coordinating with the State Department to provide the US Ambassador the plume analysis to share with the Japanese government.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (μSv)
1 rem = 0.01 Sv = 10 mSv

USNRC Emergency Operations Center Status Update

March 27, 2011
Earthquake / Tsunami Status Update
Compiled by Executive Briefing Team

This report includes NRC's current understanding of the ongoing situation in Japan. Historical and background information can be found in past reports.

NRC's Top Priorities

1) Continued assessment of radiological conditions, dose projections, and protective action recommendations.

2) Providing technical assistance to the U.S. Ambassador in Japan and the Japanese Government.

3) Coordination with other U.S. Departments and Agencies, the Institute of Nuclear Power Operations(INPO), Bechtel, General Electric Hitachi (GEH), Tokyo Electric Power Company (TEPCO), and the Japanese military.

Status

At 0946 EST, March 11, 2011, the NRC entered Monitoring Mode and the agency continues to monitor the unfolding events in Japan. The Headquarters Operations Center is staffed 24/7.

The team of NRC experts in Japan continues to support the US Ambassador and his staff.

NRC has issued numerous press releases related to the earthquake and tsunami. These press releases can be found online at: http://www.nrc.gov/reading-rm/doc-collections/news/2011/

On March 14, 2011, the NRC experts in Japan reported that the Japanese had requested US technical assistance for cooling the Fukushima Daiichi Units, as needed. The effort to provide assistance is being coordinated by the US Ambassador.

The current protective action recommendation for U.S. citizens residing within 50 miles (80 km) of the Fukushima Daiichi site is to evacuate.

One train of temporary cooling equipment has been transported to Yokota Air Force Base. Two fresh water barges from the U.S. Navy are en route to the Daiichi site.

The NRC Reactor Safety Team has provided a set of recommendations pertaining to severe accident management strategies to the NRC team in Japan. The recommendations were coordinated with GEH, EPRI, INPO, Naval Reactors, and DOE.

KK/15

The U.S. Department of Energy and the U.S. Environmental Protection Agency are the Federal communicators for questions regarding possible domestic impacts from the events in Japan and on domestic monitoring.

The Commission has established a senior level agency task force to conduct a methodical and systematic review of NRC processes and regulations with specific near-term and long-term objectives.

Status of NRC Licensee and Agreement State Facilities

No new information to report

Industry Consortium

No new information to report

Current Understanding of Japanese Facilities

(This information is compiled from the NRC in-country team, TEPCO press releases, NISA press releases, Japan Atomic Industrial Forum (JAIF) compiled data and assessments, International Atomic Energy Agency (IAEA) information releases, Federation of Electric Power Companies of Japan, World Association of Nuclear Operators, Department of Energy (DOE) and others.)

Fukushima Daiichi

The Japanese national government instructed evacuation for local residents within a 20km radius of the site boundary and sheltering in place out to 30 km. IAEA confirms a no-fly zone out to 30 km around the Fukushima Daiichi plant. Japanese government officials have recommended to residents living within 20 to 30 km of the site to voluntarily evacuate their homes – not because of changing conditions at the site – but because of increasingly difficult logistical issues.

Meteorological information obtained by PMT through NARAC and other sources indicate that a 360 degree wind shift has occurred over the duration of the accident (on March 11).

Current forecast meteorological data appears to indicate that winds are primarily from the west (headed offshore) and should generally continue offshore through Thursday, March 31, 2011.

Earthquake/Tsunami Status Update March 27, 2011 0430 EDT

STATUS as of 0430 EDT, March 27, 2011 - (1730 Japan, March 27)

Unit 1 – (NRC Priority: 1)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
The volume of sea water injected to cool the core has left enough salt to fill the lower plenum to the core plate (Source: GEH, US Industry).
Vessel temperatures 149°C at bottom drain, 197°C at FW nozzle (Source: NISA)
RPV at 65.7 psia (increasing trend), DW and torus pressure at 40 psia (decreasing trend) (Source: NISA).

Core Cooling: Fresh water injection initiated at 1537 JST on March 25, injecting through FW 120 L/min or 31.7 g/m (Source: NISA).
Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Not damaged, 40 psia (TEPCO was considering venting on March 24)

Secondary Containment: Severely damaged (hydrogen explosion)

Spent Fuel Pool: Fuel covered, no seawater injected (Source: JAIF, NISA, TEPCO)
All fuels in this pool are over 12 years old and have very little heat input (<0.1 MW) (Source: DOE).

Rad Levels: DW 4780 R/hr, Torus 3490 R/hr (source instruments unknown), Outside plant: 16 mR/hr at main gate (slight trend downward) (Source: MEXT)

Power: Electric power available, equipment testing in progress (Source: JAIF, NISA, TEPCO)
External AC power to the Main Control Room of Unit 1 became available at 1130 JST on March 24, 2011. Lighting operating in Main Control Room.

Unit 2 – (NRC Priority: 2)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
Bottom head temperature 104°C, feed water nozzle temperature 107°C (Source: JAIF, NISA, TEPCO).

Core Cooling: Fresh water with boric acid injection as of 1010 JST on March 26 (TEPCO), Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Damage suspected (Source: JAIF, NISA, TEPCO)

Secondary Containment: Damaged (Source: JAIF, NISA, TEPCO), hole in refuel floor siding (Source: visual)

Spent Fuel Pool: Fuel covered, seawater injected on March 20, fuel pool temperature 52°C (Source: JAIF, NISA, TEPCO)

Rad Levels: DW 4560 R/hr; Torus 154 R/hr (source instruments unknown); Outside plant: 16 mR/hr at main gate (slight trend downward) (Source: MEXT)

Power: External AC power has reached the unit; checking integrity of equipment before energizing.

Unit 3 – (NRC Priority: 3)

Core Status: Damaged, fuel partially or fully exposed (Source: JAIF, NISA, TEPCO).
Bottom head temperature 111°C, FW nozzle temperature: Unreliable (Source: JAIF, NISA 1800 JST March 25, TEPCO)

Core Cooling: Freshwater injection via fire line initiated 1802 JST March 25 (Source: NISA)
Seawater injection through RHR, Recirculation pump seals have likely failed. (Source: GEH)

Primary Containment: Damage suspected (Source: NISA, TEPCO). "Not damaged" (Source: JAIF). Need to resolve.

Secondary Containment: Damaged (Source: JAIF, NISA, TEPCO)

Spent Fuel Pool: Low water level (Source: JAIF, NISA, TEPCO), spraying and pumping sea water into the SFP via the Cooling and Purification Line (Source: NISA)
Rad Levels: DW 5100 R/hr, torus 150 R/hr (INPO source instruments unknown); Outside plant: 16 mR/hr at main gate (slight trend downward) (Source: MEXT); 100 R/hr debris outside Rx building (covered).
Power: External AC power has reached the unit; checking integrity of equipment before energizing. Lighting operating in Main Control Room.

Unit 4 – (NRC Priority: 4)
Core Status: Offloaded 105 days at time of accident (Source: JAIF, NISA, TEPCO)
Core Cooling: Not necessary (Source: JAIF, NISA, TEPCO)
Primary Containment: Not applicable (Source: JAIF, NISA, TEPCO)
Secondary Containment: Severely damaged, hydrogen explosion. (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Low water level, spraying with sea water, hydrogen from the fuel pool exploded, fuel pool is cool heating up very slowly (Source: JAIF, NISA, TEPCO)
Temperature is unknown (Source: NISA).
Video was to be taken of SFP pool on March 24 (Source: unverified)
Power: External AC power has reached the unit; checking electrical integrity of equipment before energizing. (Source: JAIF, NISA, TEPCO)

Unit 5 – (NRC Priority: 5)
Core Status: In vessel (Source: JAIF, NISA, TEPCO)
Core Cooling: Functional (Source: JAIF, NISA, TEPCO)
Primary Containment: Functional (Source: JAIF, NISA, TEPCO)
Secondary Containment: Vent hole drilled in rooftop to avoid hydrogen build up (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Fuel pool cooling functional, RHR pump repaired, temperature 37.9°C (Source: JAIF, NISA, TEPCO)
Power: External AC power supplying the unit, diesel generators available. (Source: JAIF, NISA, TEPCO)

Unit 6 – (NRC Priority: 6)
Core Status: In vessel (Source: JAIF, NISA, TEPCO)
Core Cooling: Functional (Source: JAIF, NISA, TEPCO)
Primary Containment: Functional (Source: JAIF, NISA, TEPCO)
Secondary Containment: Vent hole drilled in rooftop to avoid hydrogen build up (Source: JAIF, NISA, TEPCO)
Spent Fuel Pool: Fuel pool cooling functional, temperature 22°C (Source: JAIF, NISA, TEPCO)
Power: External AC power supplying the unit, diesel generators available. (Source: JAIF, NISA, TEPCO)

Common Spent Fuel Pool (NRC priority: 7): 6,000 bundles (Source: GEH); water level maintained at 53°C (Source: NISA); water spray started at 2137 EDT March 20 (Source: NISA); normal cooling started 1805 JST March 24 (Source: NISA)
Electrical Power (NRC priority: 7): Offsite power connected to Unit 2 auxiliary transformer / distribution panel; work continues on energizing equipment in Unit 2.
Dry Cask Storage: Visual inspection revealed no problems. All casks are vertical casks manufactured by Hitachi Shipbuilding (Source: RST)

Other Plants

No new information to report

Acronyms

atm – Atmosphere (unit of pressure)
DW – Drywell
EDG – Emergency Diesel Generator
FW – Feed Water
CS – Reactor Coolant System
RHR – Residual Heat Removal
RPV – Reactor Pressure Vessel
SFP – Spent Fuel Pool
TAF – Top of Active Fuel

Protective Measures Team (PMT) Update

The PMT continues to aggregate and assess available dose rate information from DOE Aerial Monitoring operations, the U.S. Navy, and TEPCO. Multi-day trending of available onsite monitors shows slightly declining dose rates over the past several days. Based upon information received on March 25 and 26, dose rates at the main gate were 16 mR/hr (Source: MEXT). This shows a slight trend downward.

Potential ingestion pathway radiation measurements made by the Japanese government on food from regions near the Daiichi site exceed the values established by the U.S. Food and Drug Administration (FDA). According to the Ministry of Economy, Trade, and Industry (METI) on March 26, the governors of Fukushima, Ibaraki, Tochigi, and Gunma Prefectures have been directed to issue suspension of shipment and restriction of intake for various vegetables and milk. In addition, restriction of drinking tap water (for all residents in some cases, and only for babies in others) have been issued in specific locations within Fukushima, Ibaraki, and Chiba Prefectures. (Source: METI).

The PMT has completed a draft of the recommendations for short term reentry of personnel for retrieval of personal effects and it has been sent to OSTP, DOE and the NRC team for comment by March 27, 2011.

The PMT has begun efforts to compile a comprehensive list of hypothetical source terms since the onset of the crisis in Japan that have been supplied to NARAC. The source terms are summarized in a matrix by date and reactor unit/spent fuel pool, and percent fuel melt. Furthermore, the PMT is trending exposure rate data around the site based on Ministry of Education, Culture, Sports, Science and Technology (MEXT) data which is periodically sent to the PMT.

Per IAEA 1700 UTC March 24, Radiation exposure on 3 TEPCO related workers was confirmed. They were working in the basement Unit 3 turbine building where contaminated water was on the floor. The radiation exposures of the 3 workers were 180 mSv, 179 mSv, and 173 mSv. Additional information received on March 26 by METI and two workers were

evaluated for possible beta burns to the legs. The evaluation concluded that the workers received a possible beta dose between 200 – 600 Rem, and concluded that treatment was unnecessary but progress will be monitored.

PMT has completed work with NARAC on the source term for Plausible Realistic Case model based on plant conditions as of March 24, 2011. Run was completed at 1400 EDT on March 25, 2011, and results have been verified by the PMT. The Plausible Realistic Case assumed partial melting of Unit 1 (70% core melt; 10%/day release), Unit 2 (33% core melt; a 5-inch sq. hole in containment), and Unit 3 (33% core melt; 100%/day release). The case did not assume any release from the spent fuel pools. Actual meteorological data and forecasts were used. Releases were assumed to occur over 12 days, and dose results were calculated for 14 days for locations in Japan. According to the RASCAL run using this source term, TEDE was greater than 5 rem out to around 2 miles and greater than 1 rem (TEDE PAG) out to around 8 miles from the plant. Adult thyroid dose was greater than 10 rem out to around 5.25 miles from the plant. Child thyroid dose was greater than 5 rem out to around 11 miles from the plant. The NARAC run is expected to be completed and provided to the PMT for review on March 26. PMT completed a requested breakdown of release assumptions by each unit, and the assumed core inventories for Dr. Holdren, OSTP. The source term used from RASCAL was questioned by the White House, and the PMT is re-evaluating how well RASCAL models the given scenario.

International Response

- The IAEA held a special session of the Board of Governors on March 21, 2011. Director General Amano provided a summary of his trip to Japan. The IAEA continues to have daily press and technical briefings.
- NRC has coordinated daily with the United Kingdom's Health and Safety Executive, Canadian Nuclear Safety Commission, and French Nuclear Safety Authority.
- France has publicly posted its assessment of projected doses in Tokyo on the French Radioprotection and Nuclear Safety Institute (IRSN) website.
- Taiwan staffed their Operations Center, beginning on March 12, and continues to do so. They are providing information on assumptions for the source term and expect NRC reciprocity.
- An Institute of Nuclear Power Operations (INPO) staff member has arrived in Tokyo and is coordinating with US government staff at the Embassy.
- NRC is coordinating with the State Department to provide the US Ambassador the plume analysis to share with the Japanese government.

Reference

Units

1 rem (rem) = 1,000 millirem (mrem)
1 Sievert (Sv) = 1,000 milliSieverts (mSv) = 1,000,000 microsieverts (μSv)
1 rem = 0.01 Sv = 10 mSv