U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NRC Response to Fukushima Dai-ichi Accident

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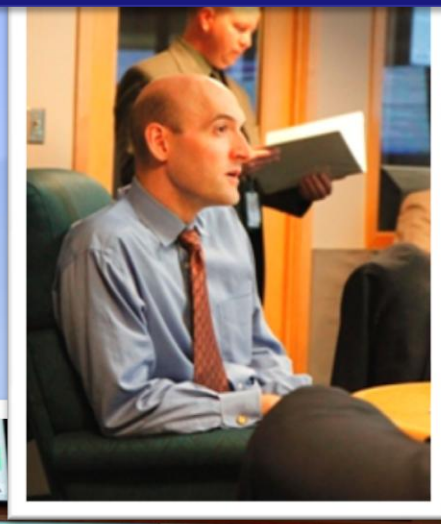
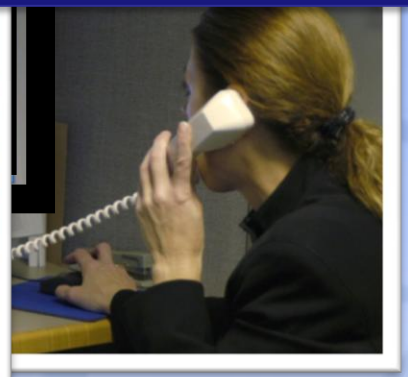
Japan Lessons-Learned Project Directorate

Washington, DC Section of ANS Meeting
November 16, 2011

NRC Response

Modified Executive, Reactor Safety, Protective Measures, Safeguards, Public Affairs, and Liaison Teams

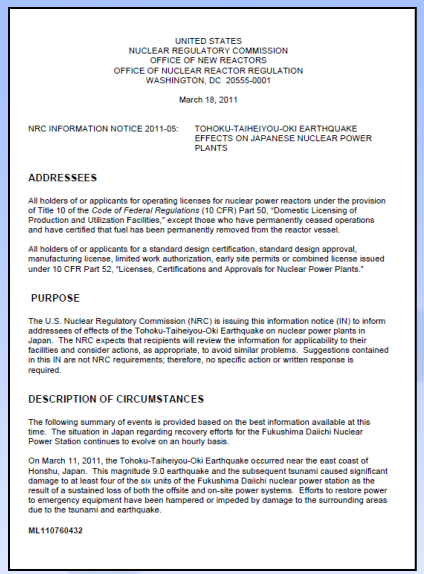




Site Team

- Stationed in U.S. Embassy in Tokyo
- Meet regularly with Japanese officials
- Support U.S. Ambassador
- Provide technical guidance as requested

Initial NRC Actions



UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

March 18, 2011

NRC INFORMATION NOTICE 2011-05: TOHOKU-TAIHEIYOU-OKI EARTHQUAKE EFFECTS ON JAPANESE NUCLEAR POWER PLANTS

ADDRESSEES

All holders of or applicants for operating licenses for nuclear power reactors under the provision of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

All holders of or applicants for a standard design certification, standard design approval, manufacturing license, limited work authorization, early site permits or combined license issued under 10 CFR Part 52, "Licenses, Certifications and Approvals for Nuclear Power Plants."

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of effects of the Tohoku-Taiheiyou-Oki Earthquake on nuclear power plants in Japan. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

The following summary of events is provided based on the best information available at this time. The situation in Japan regarding recovery efforts for the Fukushima Daiichi Nuclear Power Station continues to evolve on an hourly basis.

On March 11, 2011, the Tohoku-Taiheiyou-Oki Earthquake occurred near the east coast of Honshu, Japan. This magnitude 9.0 earthquake and the subsequent tsunami caused significant damage to at least four of the six units of the Fukushima Daiichi nuclear power station as the result of a sustained loss of both the offsite and on-site power systems. Efforts to restore power to emergency equipment have been hampered or impeded by damage to the surrounding areas due to the tsunami and earthquake.

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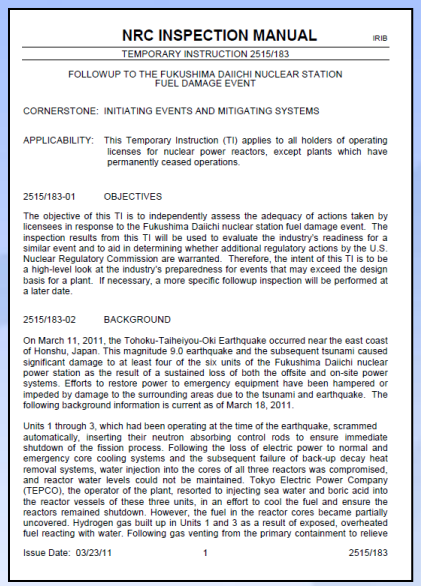
IN 2011-05



NRC INSPECTION MANUAL IRIB

TEMPORARY INSTRUCTION 2515/183

FOLLOWUP TO THE FUKUSHIMA DAIICHI NUCLEAR STATION FUEL DAMAGE EVENT

CORNERSTONE: INITIATING EVENTS AND MITIGATING SYSTEMS

APPLICABILITY: This Temporary Instruction (TI) applies to all holders of operating licenses for nuclear power reactors, except plants which have permanently ceased operations.

2515/183-01 OBJECTIVES

The objective of this TI is to independently assess the adequacy of actions taken by licensees in response to the Fukushima Daiichi nuclear station fuel damage event. The inspection results from this TI will be used to evaluate the industry's readiness for a similar event and to aid in determining whether additional regulatory actions by the U.S. Nuclear Regulatory Commission are warranted. Therefore, the intent of this TI is to be a high-level look at the industry's preparedness for events that may exceed the design basis for a plant. If necessary, a more specific followup inspection will be performed at a later date.

2515/183-02 BACKGROUND

On March 11, 2011, the Tohoku-Taiheiyou-Oki Earthquake occurred near the east coast of Honshu, Japan. This magnitude 9.0 earthquake and the subsequent tsunami caused significant damage to at least four of the six units of the Fukushima Daiichi nuclear power station as the result of a sustained loss of both the offsite and on-site power systems. Efforts to restore power to emergency equipment have been hampered or impeded by damage to the surrounding areas due to the tsunami and earthquake. The following background information is current as of March 18, 2011.

Units 1 through 3, which had been operating at the time of the earthquake, scrammed automatically, inserting their neutron absorbing control rods to ensure immediate shutdown of the fission process. Following the loss of electric power to normal and emergency core cooling systems and the subsequent failure of back-up decay heat removal systems, water injection into the cores of all three reactors was compromised, and reactor water levels could not be maintained. Tokyo Electric Power Company (TEPCO), the operator of the plant, resorted to injecting sea water and boric acid into the reactor vessels of these three units, in an effort to cool the fuel and ensure the reactors remained shutdown. However, the fuel in the reactor cores became partially uncovered. Hydrogen gas built up in Units 1 and 3 as a result of exposed, overheated fuel reacting with water. Following gas venting from the primary containment to relieve

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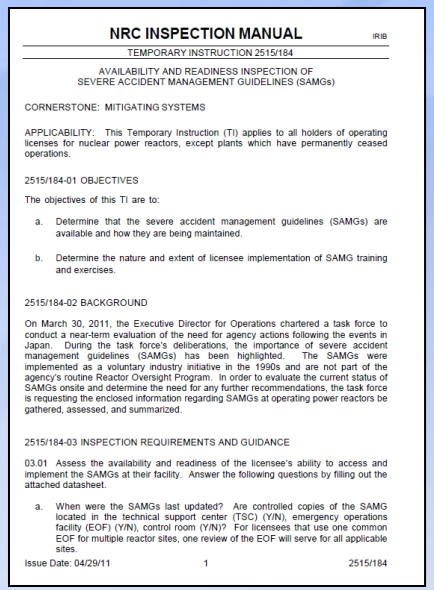
TI 2515/183



NRC INSPECTION MANUAL IRIB

TEMPORARY INSTRUCTION 2515/184

AVAILABILITY AND READINESS INSPECTION OF SEVERE ACCIDENT MANAGEMENT GUIDELINES (SAMGs)

CORNERSTONE: MITIGATING SYSTEMS

APPLICABILITY: This Temporary Instruction (TI) applies to all holders of operating licenses for nuclear power reactors, except plants which have permanently ceased operations.

2515/184-01 OBJECTIVES

The objectives of this TI are to:

a. Determine that the severe accident management guidelines (SAMGs) are available and how they are being maintained.

b. Determine the nature and extent of licensee implementation of SAMG training and exercises.

2515/184-02 BACKGROUND

On March 30, 2011, the Executive Director for Operations chartered a task force to conduct a near-term evaluation of the need for agency actions following the events in Japan. During the task force's deliberations, the importance of severe accident management guidelines (SAMGs) has been highlighted. The SAMGs were implemented as a voluntary industry initiative in the 1990s and are not part of the agency's routine Reactor Oversight Program. In order to evaluate the current status of SAMGs onsite and determine the need for any further recommendations, the task force is requesting the enclosed information regarding SAMGs at operating power reactors be gathered, assessed, and summarized.

2515/184-03 INSPECTION REQUIREMENTS AND GUIDANCE

03.01 Assess the availability and readiness of the licensee's ability to access and implement the SAMGs at their facility. Answer the following questions by filling out the attached datasheet.

a. When were the SAMGs last updated? Are controlled copies of the SAMG located in the technical support center (TSC) (Y/N), emergency operations facility (EOF) (Y/N), control room (Y/N)? For licensees that use one common EOF for multiple reactor sites, one review of the EOF will serve for all applicable sites.

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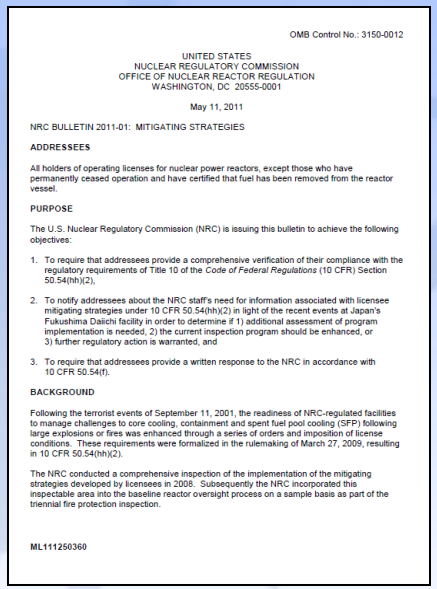
TI 2515/184



OMB Control No.: 3150-0012

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

May 11, 2011

NRC BULLETIN 2011-01: MITIGATING STRATEGIES

ADDRESSEES

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operation and have certified that fuel has been removed from the reactor vessel.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this bulletin to achieve the following objectives:

1. To require that addressees provide a comprehensive verification of their compliance with the regulatory requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(hh)(2),

2. To notify addressees about the NRC staff's need for information associated with licensee mitigating strategies under 10 CFR 50.54(hh)(2) in light of the recent events at Japan's Fukushima Daiichi facility in order to determine if 1) additional assessment of program implementation is needed, 2) the current inspection program should be enhanced, or 3) further regulatory action is warranted, and

3. To require that addressees provide a written response to the NRC in accordance with 10 CFR 50.54(f).

BACKGROUND

Following the terrorist events of September 11, 2001, the readiness of NRC-regulated facilities to manage challenges to core cooling, containment and spent fuel pool cooling (SFP) following large explosions or fires was enhanced through a series of orders and imposition of license conditions. These requirements were formalized in the rulemaking of March 27, 2009, resulting in 10 CFR 50.54(hh)(2).

The NRC conducted a comprehensive inspection of the implementation of the mitigating strategies developed by licensees in 2008. Subsequently the NRC incorporated this inspectable area into the baseline reactor oversight process on a sample basis as part of the triennial fire protection inspection.

ML111250360

BL 2011-01

NRC Lessons Learned Review

- Commission directed a methodical and systematic review of the safety of U.S. facilities in light of events in Japan
- Review includes:
  - Near-term review
  - Longer-term review
- Near-Term Task Force review complete

Current U.S. Plant Safety

- Similar sequence of events in the U.S. is unlikely
- Existing mitigation measures could reduce the likelihood of core damage and radiological releases
- No imminent risk from continued operation and licensing activities

Task Force Recommendations

- Reevaluate and upgrade the design-basis seismic and flooding protection
- Strengthen SBO mitigation capability for design-basis and beyond-design-basis external events
- Require reliable hardened vent designs in BWRs with Mark I and II containments

Task Force Recommendations

- Enhance spent fuel pool makeup capability and instrumentation
- Strengthen and integrate onsite emergency response capabilities
- Require that facility emergency plans address prolonged SBO and multi-unit events

Task Force Recommendations

- Longer-Term Review Topics
  - Evaluate potential enhancements to prevent or mitigate fires/floods
  - Hydrogen control/mitigation inside containment and other buildings
  - Pursue EP topics related to multi-unit events and prolonged SBO
  - Pursue EP topics related to decision-making, radiation monitoring, education
- Actions to enhance NRC programs

Additional Issues

- Filtration of Containment Vents
- Seismic Monitoring Instruments
- Basis for EP
- KI beyond 10 miles
- Dry Cask Storage
- Loss of Ultimate Heat Sink

Commission Papers and Direction

- **SRM SECY-11-0117 (10/19/11)**
  - Charter for Longer-Term Review
  - Establishes Directorate
- **SECY-11-0124 (9/9/11) – "21 day paper"**
  - Recommended Actions to be Taken Without Delay
  - SRM dated 10/18/11 authorizes staff to proceed
- **SECY-11-0137 (10/3/11) – "45 day paper"**
  - Prioritization of Recommended Actions
  - Under Commission review

Status and Next Steps

- Commission directed the staff to provide:
  - Longer-Term Charter (complete)
  - Short-Term Actions (complete)
  - Prioritization/Plan (complete)
  - Framework Recommendation (18 months)
- The Commission will provide direction

Conclusion

- Continuing confidence in safety of U.S. fleet
- NRC proposals awaiting Commission approval
- Continuing Licensing Activities
  - License renewal
  - New reactor licensing