



Japan Lessons Learned Tier 3 Regulatory Actions

**ACRS Meeting of the Fukushima
Subcommittee**

Rockville, Maryland

May 22-23, 2012



Initial NRC Actions In Response to Fukushima

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-TAIHEIYU-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 IR/B

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, scrambled 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

Issue Date: 03/23/11 1 2515/183

TI 2515/183

NRC INSPECTION MANUAL IR/B

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:

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

- 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:

- 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(m)(2).
- To notify addressees about the NRC staff's need for information associated with licensee mitigating strategies under 10 CFR 50.54(m)(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
- 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 of 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(m)(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 thermal fire protection inspection.

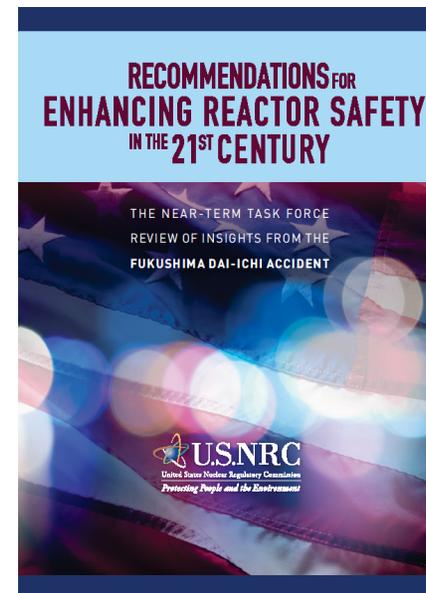
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BL 2011-01



NRC Lessons Learned Review

- Commission directed a methodical and systematic review of the safety of U.S. facilities in light of events in Japan
- Near-Term Task Force review completed July 2011 (www.nrc.gov)





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



Identifying Lessons Learned

- July 2011
 - Near-Term Task Force (NTTF) report issued
- September/October 2011
 - NTTF recommendations prioritized into Tiers 1, 2, and 3
- February 2012
 - Draft orders and requests for information provided to the Commission
- March 2012
 - The NRC staff issued the Tier 1 orders and request for information on March 12, 2012



Orders

- The NRC staff ordered licensees to:
 - Develop strategies and procure additional equipment to address beyond-design-basis external events and multiunit events
 - Include a reliable hardened vent in Mark I and Mark II containments
 - Enhance spent fuel pool level instrumentation for beyond design basis accidents



Requests for Information

- The NRC requested that licensees provide information on:
 - the adequacy of facility design bases with respect to seismic and flooding hazards
 - whether facility configurations, as confirmed by seismic and flooding walkdowns, are in compliance with current facility design bases
 - current communications system power supplies and their availability during a prolonged SBO event
 - the required staffing necessary to respond to a multiunit, prolonged SBO event



Rulemaking Activities

- Station Blackout (SBO) Rulemaking
 - Modify the SBO rule to require enhanced capability to mitigate a prolonged SBO
 - Advanced Notice of Proposed Rulemaking issued
 - The Commission directed that SBO rulemaking be completed within 24-30 months
- Emergency Procedures Integration Rulemaking
 - Create a new rule requiring the integration of the emergency procedures
 - Advanced Notice of Proposed Rulemaking issued
 - The rulemaking is expected to be completed in 2016



Other Recommendations for NRC Action

- Tier 2 Recommendations – Could not be initiated in the near term due to factors that include the need for further technical assessment and alignment, dependence on Tier 1 issues, or availability of critical skill set limitations.
- Tier 3 Recommendations – Require further staff study to support a regulatory action, have an associated shorter-term action that needs to be completed to inform the longer-term action, are dependent on critical skill sets, or are dependent on the resolution of NTTF Recommendation 1.



Tier 3 Recommendations

- Commission-approve Charter
- Longer-Term Task Groups
 - Team Leader (SES or Branch Chief)
 - Subject Matter Experts
 - Japan Lessons-Learned Directorate
- Lead is with the Line Organizations
- Recommendation for action to the Steering Committee through the lead office



Focus of Longer-Term Review

- Identification and resolution of key issues and information needed to support a recommendation on the need for regulatory action
- Program plans to guide issue identification and resolution
- Planning framework will extend to decision point on whether regulatory action is needed, but not beyond



Tier 3 Recommendations

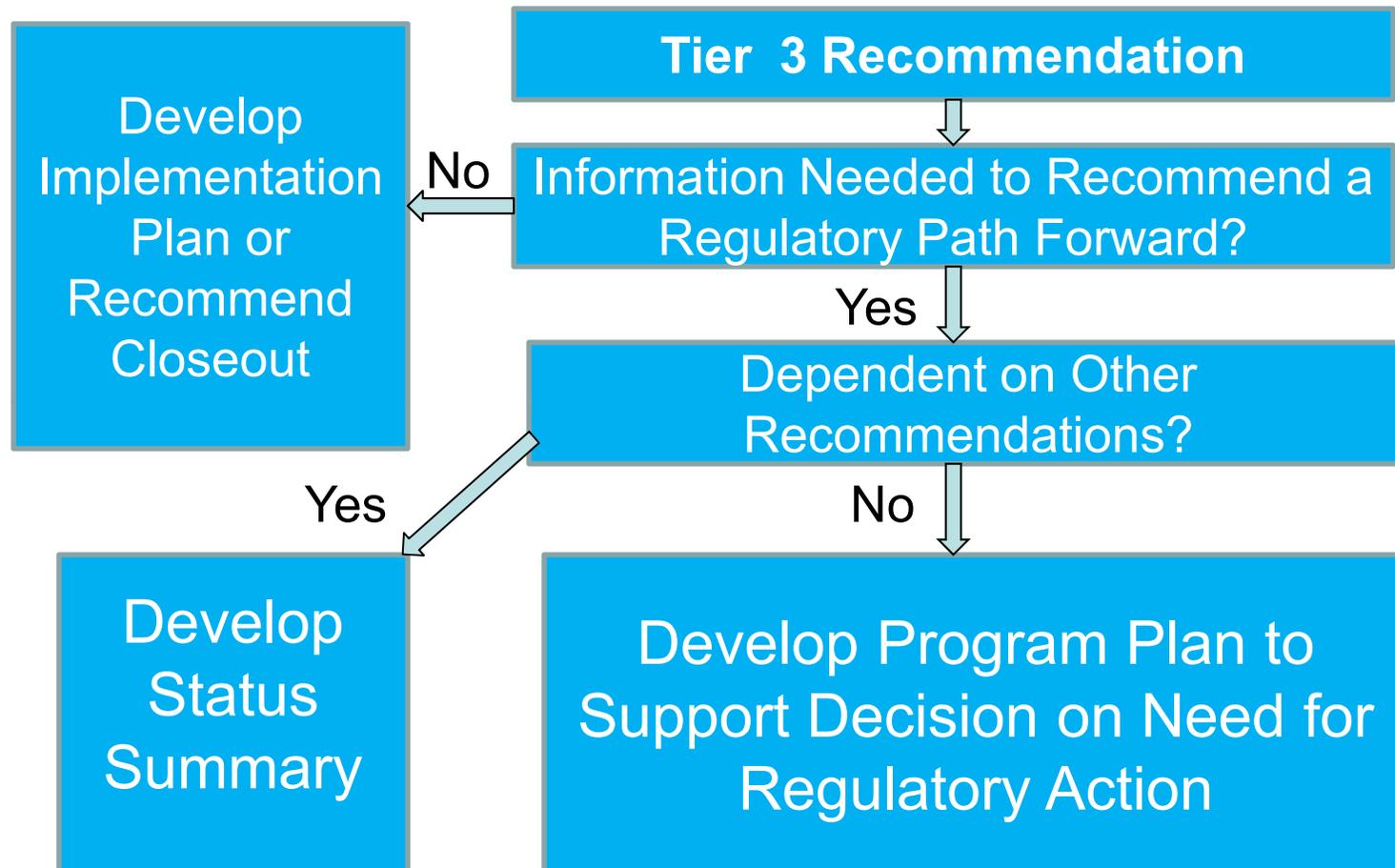
- 2.2 Periodic Confirmation of Seismic and Flooding Hazards
- 3 Potential Enhancement to the Capability to Prevent or Mitigate Seismically-Induced Fires and Floods
- 5.2 Reliable Hardened Vents for Other Containment Designs
- 6 Hydrogen Control and Mitigation Inside Containment or in Other Buildings
- 9.1/9.2 EP Enhancements for Prolonged SBO and Multiunit Events
- 9.3 ERDS Capability
- 10 Additional EP Topics for Prolonged SBO and Multiunit Events



Tier 3 Recommendations (cont.)

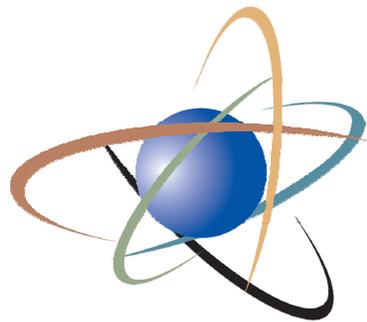
- 11 EP Topics for Decision-making, Radiation Monitoring, and Public Education
- 12.1 Reactor Oversight Process Modifications
- 12.2 Staffing Training on Severe Accidents and Resident Inspector Training on SAMGs
- Transfer of Spent Fuel to Dry Cask Storage
- Prestaging of Potassium Iodide Beyond 10 Miles
- Reactor and Containment Instrumentation Ability to Withstand Beyond Design Basis Conditions
- Basis of Emergency Planning Zone Size

Flow Chart for Tier 3 Recommendations





Questions?



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Recommendation 2.2 Periodic Reassessment of External Hazards

Jenise Thompson

May 23, 2012



Background

- NTTF report asks staff to “initiate rulemaking to require licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. If necessary, update the design basis for SSCs important to safety to protect against the updated hazards.”
- Recommendation 2.1 and 2.3 are currently underway for seismic and flooding hazards
- Recommendation 2.1 for other natural external hazards has not started work yet due to resource limitations.



Staff Approach

- **Define and begin the initial pre-rulemaking activities necessary to position the agency for a future rulemaking to implement NTTF Recommendation 2.2, as resources become available**
- **Scope of rulemaking to include external hazards**
 - **Seismic**
 - **Flooding**
 - **Other natural external hazards**
 - **Other man-related external hazards (under discussion)**



Pre-rulemaking Activities

- Collect information as it comes up for R2.1 and R2.3
- Engage with external stakeholders as appropriate
- What constitutes new and significant information?
- What will the staff do with the updated hazard information?
 - Use of risk-informed approach?
- How will staff determine if it is necessary to update the design basis for SSCs important to safety?
 - Threshold for regulatory actions
- Review of international practices and insights from Recommendation 2.1



Public Meeting – May 7, 2012

- Questions from public
 - Nexus to Fukushima for inclusion of other man-related external hazards
 - “old” information “newly” discovered
 - Handling of information submitted as contention to new reactor licensing
 - Similar actions in the past (GI program)
 - Schedule concerns



Questions?



NTTF Recommendation 3: Seismically Induced Fires and Floods

May 22, 2012

Kevin Coyne, RES/DRA



Background

- Seismic events have the potential to cause:
 - multiple failures of safety-related SSCs;
 - induce separate fires or flooding events in multiple locations at the site; and
 - degrade the capability of plant SSCs intended to mitigate the effects of fires and floods.



Background

- The NTTF recommended, as part of the longer term review, evaluation of potential enhancements to the capability to prevent or mitigate seismically induced fires and floods
 - Scope includes internal seismically induced fires (e.g., breakers, transformers) and floods (e.g., tanks, piping systems)
 - External seismically induced fires and floods are considered to be outside the scope of this issue
- **Prioritized as Tier 3 in SECY 11-0137**
 - Commission agreed with Tier 3 Prioritization, but
 - Directed the staff to initiate development of PRA method to evaluate potential enhancements as part of Tier 1 activities



Background (con't)

- PRA Method Challenges:
 - hazard definition & characterization
 - seismic fragilities for SSCs, including fire protection components
 - modeling concurrent and subsequent initiating events
 - treatment of systems interactions
 - human reliability analysis methodologies suitable for seismically induced hazards
 - multiunit risk considerations



Current Status

- Staff developed an initial plan for PRA method development in SECY 12-0025.
- PRA pre-planning activities include:
 1. Define objectives of method
 2. Identify relevant stakeholders
 3. Information gathering
 4. Coordination with other ongoing initiatives
 5. Resource and schedule estimate



Current Status (con't)

- Key Considerations
 - Limited number of staff with required knowledge, skills, and abilities
 - No current consensus state-of-practice methods exist for seismically induced fires and floods for NPPs
 - ASME/ANS Joint Committee on Nuclear Risk Management recently formed a working group to address multiple concurrent events
 - Other Tier 1 activities will provide substantial information relevant to this issue



Staff Assessment

- Results from several Tier 1 recommendations will better inform the this issue:
 - 2.1 Seismic and flooding hazard evaluation
 - 2.3 Seismic and flooding vulnerability walkdowns
 - 4.2 Mitigation Strategies
 - 5.1 Containment venting
 - 7.1 Spent fuel pool
- More efficient to wait until sufficient information becomes available from these efforts.



Staff Assessment (con't)

- Some work can be done now:
 - Standards development organization engagement
 - Assess results from NTTF Recommendations 2.1, 4.2, 5.1, 7.1 and other activities
 - Continue PRA method development activities



Staff Recommendation

- Continue development of PRA methodology
 - Engagement with PRA standards development organizations
 - Feasibility study to assess approaches for evaluating multiple concurrent events
- Assess results from Tier 1 activities and other related work
- Future re-evaluation of Recommendation 3



Public Comments (May 3)

- Agreement on prioritization of issue as Tier 3
- Qualitative risk assessment approaches should also be considered
- Ensure that the PRA method (and its application) includes documentation of key assumptions.



Questions?



Hydrogen Control and Mitigation (NTTF Recommendation 6)

Brett Titus
Office of Nuclear Reactor Regulation



Background

- The NTTF recommended, as part of the longer term review, identification of insights about hydrogen control and mitigation
 - Scope includes generation, transport, distribution, and combustion of hydrogen
 - Primary areas of interest consist of containment and adjacent buildings (although other locations are not excluded)
- Prioritized as Tier 3 in SECY 11-0137
- Commission agreed with Tier 3 Prioritization



Staff Assessment- Recommendation 6

- Interdependencies with other NTTF Tier 3 recommendations.
 - Implementation of Rec. 4 (SBO)
 - Rec. 5 (Hardened Vents) greatly reduce the likelihood of hydrogen explosions
 - Filtered Vents- concurrent analysis
 - Outcome could impact the path forward for Rec 6
 - These efforts will be collaborative



Staff Assessment- Recommendation 6

- Potential risk of hydrogen production and combustion is well known
 - Three Mile Island (1979)
 - Numerous Generic Issues and Generic Safety Issues
 - Many studies performed worldwide

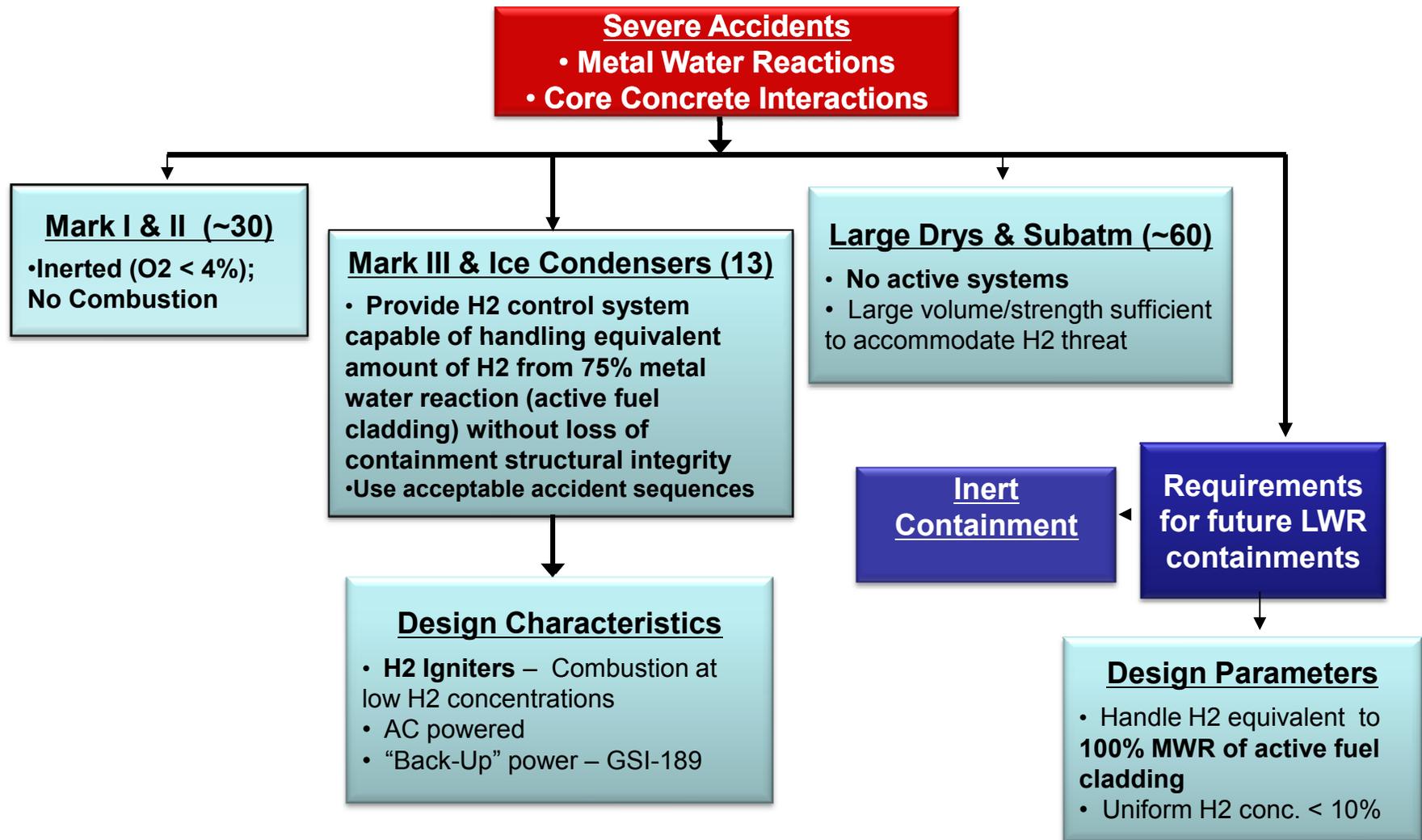


Staff Assessment- Recommendation 6

- 10 CFR 50.44, “Combustible Gas Control for Nuclear Power Reactors” revised in 2003
 - Eliminated requirements for H₂ recombiners and relaxed monitoring rules commensurate with risk significance
 - Retained requirements for mixed atmosphere, inert MK I&II containments, maintained 75% clad-water H₂ reaction criteria (100% for New Reactors) in MK III and Ice Condensers

10 CFR 50.44

Combustible Gas Control for LWRs





Staff Assessment - Recommendation 6

- Key Questions to be Investigated
 1. Is there new information regarding H₂ in general?
 2. Was the failure of the buildings consistent with our understanding?
 3. Are there important gaps in our understanding of the threat from H₂ gas?
 4. Is there new information which conflicts with the current technical basis?
 5. Has new technical information been revealed to necessitate regulatory action?



Plan for Addressing Recommendation 6

1. Examine additional H₂ control measures in adjacent buildings
 - Conduct stakeholder meetings for all existing containment types
 - Evaluate additional mitigation measures to improve robustness of reactor and auxiliary buildings
 - Quantify the impact on safety and risk



Plan for Addressing Recommendation 6

2. Evaluate the sources and timing of H₂ generation

- Review accident sequence info from Gov't of Japan, TEPCO, INPO, and international orgs
- Compare the actual accident timing and amounts of generated H₂ to analytical predictions
- Assess implications of results on the existing state of knowledge



Plan for Addressing Recommendation 6

3. Assess the potential migration/release pathways

- Review available forensic info from Gov't of Japan, TEPCO, INPO, and international org
- Use information (supplemented by reasonable assumptions) to conduct best estimate modeling to evaluate containment release pathways
- Assess implications of results on the existing state of knowledge



Plan for Addressing Recommendation 6

4. Review the Technical Basis for 10 CFR 50.44

- Considering the results of Tasks 1-3, confirm the validity of the existing basis or identify gaps and characterize their safety/risk significance
- Conduct stakeholder meetings for all existing containment types
- Determine if any regulatory action is needed



Challenges

- Very little reliable empirical data on H₂ has been reported since the accident
- Verifiable information on chain of events may not be available for 10+ years
- H₂ generation and control following a severe accident is a highly specialized technical discipline



Public comments

- Public meeting on May 14, 2012



Questions?



EP NTTF Recommendations Tier 2 & 3 Implementation

Kevin Williams
Office of Nuclear Security and Incident Response



NTTF EP Recommendations

Tier 2 Action

- NTTF Recommendation 9.3 - Emergency preparedness regulatory actions (the remaining portions of Recommendation 9.3, with the exception of Emergency Response Data System (ERDS) capability addressed in Tier 3)

Tier 3 Actions

- NTTF Recommendations 9.1/9.2 - Emergency preparedness (EP) enhancements for prolonged SBO and multiunit events (dependent on availability of critical skill sets)
- NTTF Recommendation 9.3 – ERDS capability (related to long-term evaluation Recommendation 10)
- NTTF Recommendation 10 - Additional EP topics for prolonged SBO and multiunit events (long-term evaluation)
- NTTF Recommendation 11 - EP topics for decision-making, radiation monitoring, and public education (long-term evaluation)



NRC Staff Commitments

- SECY-11-137 stated that the staff will initiate the Tier 2 actions associated with EP regulatory actions when sufficient technical information and applicable resources become available.
- SECY-11-0137 stated that the staff will provide assessments of the Tier 3 recommendations once it had completed its evaluation of the resource impacts associated with the Tier 1 and 2 recommendations.
- The staff will address the Tier 3 EP-related recommendations, schedules, and resources in the upcoming July SECY paper to the Commission.
- The staff will take regulatory action, as appropriate, after evaluating the licensee responses to the 50.54(f) letters (staffing and communication).
- The staff will continue to engage with stakeholders on the Tier 2 and Tier 3 EP-related recommendations.



Advanced Notice of Proposed Rulemaking

- The staff considers existing EP framework and regulations provide reasonable assurance of adequate protection of public health and safety in the event of a radiological emergency.
- The staff is considering an Advance Notice of Public Rulemaking (ANPR) to be utilized to determine if a technical-basis for rulemaking can be developed for EP-related NTTF Recommendations (9.1, 9.2, 9.3, 9.4, 10, and 11).
- Some of the recommendations may screen out to long-term studies.
- The staff would initiate the ANPR when sufficient resources become available which would include stakeholder engagement.
- The staff will address the ANPR and a completed evaluation of the resource impacts and scheduled in the upcoming July SECY paper to the Commission.



Emergency Planning Zones

- The staff considers that the existing Emergency Planning Zone (EPZ) size provides reasonable assurance of adequate protection of public health and safety in the event of a radiological emergency.
- EPZ size re-evaluation is a longer-term action that is already being assessed by existing activities.
- The staff will utilize insights from the current Level 3 Probabilistic Risk Assessment (PRA) study results to inform the process for evaluation of potential impact that a multi-unit event may have on the EPZ.
- Any changes to EPZs would be discussed with stakeholders in public meetings.



Potassium Iodide (KI)

- The staff considers that the existing KI framework and regulations provide reasonable assurance of adequate protection of public health and safety in the event of a radiological emergency.
- The staff has concluded that based on available data to date, it is unlikely that the FDA thyroid dose PAGs were exceeded beyond 10 miles as a result of the accident at Fukushima.
- The staff will continue to monitor and evaluate the results of the findings by the Japanese government from studies conducted in and around the Fukushima.



Public comments

- Public meeting on May 4, 2012



Questions?



Recommendation 12.1 Status

May 23, 2012

Tim Kobetz,

Chief, Reactor Inspection Branch
Office of Nuclear Reactor Regulation



Recommendation 12.1

Strengthen the Reactor Oversight Process (ROP) to more fully include defense-in-depth considerations

- Expand the scope of the annual ROP self assessment
- Expand the scope of the biennial ROP realignment



Dependent on Recommendation 1

This recommendation is dependent on Recommendation 1 which recommended establishing a logical, systematic, and coherent regulatory framework that balances defense-in-depth and risk considerations.



Plan

- The staff will continue to implement the ROP in accordance with current policy
- Staff will begin to consider potential changes to the ROP self assessment and realignment programs when an action plan for Recommendation 1 has been established.
- The staff does not envision any unique challenges.



Communications

- Periodic stakeholder interactions will take place as necessary during the NRC's routine monthly meetings with NEI and the industry on ROP topics.
- Update the Commission on the status of Recommendation 12.1 in 2013 annual ROP Self-assessment SECY paper (issued in spring 2014).



Public Meeting on May 7th

- No questions or comments were received



Questions?



Staff Training on Severe Accidents and Severe Accident Management Guidelines

May 23, 2012

Joseph G. Giitter

Travis L. Tate



Purpose and Background

- Purpose
 - discuss the plan for Near-Term Task Force (NTTF) Recommendation 12.2 by describing the current level of NRC staff training on severe accidents and outline future training enhancements
- Background
 - SECY-11-0093 , NTTF Report – July 12, 2011
 - Staff Requirements Memorandum (SRM) for SECY-11-0093 – August 19, 2011
 - SECY-11-0137 – October 3, 2011
 - SRM for SECY-11-0137 – December 15, 2011



NTTF Recommendations

- Recommendation 12.2 (dependent on Recommendation 8)
 - “Enhance NRC staff training on severe accidents, including training resident inspectors on Severe Accident Management Guidelines (SAMGs)”
- Recommendation 8.4
 - “Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors”



Severe Accident Training

- Accident Progression Analysis
 - post-core damage conditions
- Accident Consequence Analysis
 - transport from core damage
- Perspectives on Reactor Safety
 - overview (design for safety, defense-in-depth, ECCS rulemaking, severe accident and safety goal policy)
 - accident sequences
 - accident progression (vessel/containment)
 - radiological releases and consequences



Relevant NRC Training

- Emergency Operating Procedures (EOPs)
 - GE Emergency Procedure and Severe Accident Guidelines
 - Westinghouse Emergency Procedure Guidelines
 - B&W / CE Emergency Procedure Guidelines
- Westinghouse SAMGs (video)



Qualification Training

- Senior Reactor Analyst
- Reactor Technical Reviewer
- Reactor Risk Analyst
- Nuclear Safety Professional Development Program



Enhancements

- Near-term actions
 - Frequency of severe accident courses
 - Update courses based on Fukushima lessons-learned
 - Qualification Program severe accident courses
 - Stakeholder feedback
 - Public Meeting – May 7, 2012



Enhancements (cont.)

- Longer-term actions
 - Dependent on Recommendation 8
 - State-of-the-Art Reactor Consequence Analysis (SOARCA)
 - Level 3 Probabilistic Risk Analysis
 - Fukushima lessons-learned
 - Qualification Program SAMG courses
 - Potential new course development
 - Stakeholder feedback



Public comments

- Public meeting on May 7, 2012



Questions?



Reactor and Containment Instrumentation (ACRS Recommendation 2(e))

Bill Kemper
Office of Nuclear Reactor Regulation



Background

ACRS 2(e) – “Selected reactor and containment instrumentation should be enhanced to withstand beyond-design-basis accident conditions”

- Current Reactors –Implement Post-TMI instrument recommendations to address design basis accidents
- New Reactors—Implement Post-TMI instruments plus describe severe accident capabilities



Dependencies

- Seismic and Flooding Evaluations
- SBO Rulemaking
- Mitigating Strategies Order
- Spent Fuel Pool Instrumentation Order
- EOPs/SAMGs/EDMGs Integration Rulemaking



Staff Recommendations

- Ensure that the need for enhanced reactor, containment, and SFP instrumentation is being adequately considered during Tier 1 NTTF actions
- Review/participate in domestic & international efforts to study/develop severe accident info needs and identify instrumentation gaps
- Gather and review information results from higher Tier actions
- Determine needs for a regulatory framework for enhanced reactor and containment instrumentation



Stakeholder Feedback

- Public Meeting held on May 7
- NEI Feedback
- Public question



Public comments

- Public meeting on May 7, 2012



Questions?



Additional Recommendation 5 Expedited Transfer of Spent Fuel to Dry Casks

Steve Jones

Office of Nuclear Reactor Regulation



Background

- In SECY 11-0137, the staff included an additional recommendation for expedited transfer of spent fuel to dry cask storage.
- Stakeholders have repeatedly requested such action as part of petitions for regulatory action based on the perceived potential to reduce the probability and consequences of overheated stored fuel.
- This issue has a nexus to the Fukushima Daiichi event because the potential for overheating of stored fuel, although unrealized, was a significant concern.



Staff Approach

- Complete validation of spent fuel safety with respect to the Commission Safety Goals, considering past evaluations and results of spent fuel pool scoping study.
- Analyze information using NRC Regulatory Analysis Guidelines to inform a recommendation.
- Identify any inconsistencies or gaps that may need additional research.
- Gather stakeholder input on staff analysis of information.
- Recommend course of action to the Commission.



Spent Fuel Pool Scoping Study

- Limited-scope consequence assessment
 - Specific to a single site configuration
 - Seismic initiator based on results of past studies
- Considers:
 - Configuration through 5 stages of operating cycle
 - High and low density fuel storage (racks unchanged)
 - Event progression with and without mitigation
- Supports:
 - Validation of seismic modeling
 - Validation of event progression modeling
 - Validation of consequence modeling



Identified Gaps

- Issues that increase value of transfer
 - Criticality (e.g., degraded neutron absorbers)
 - Multi-unit issues
- Issues that decrease value of transfer
 - Cask drop hazard (i.e., increased cask movement with hot fuel in pool)
 - Operational risks (e.g., radiation dose)
 - Industry limitations (e.g., cask production)
 - Repackaging for transportation and disposal



Related Issues

- Order EA 12-049: Mitigation Strategies
 - Enhances 10 CFR 50.54(hh) mitigation capabilities
 - SFP spray capabilities subject to further discussion
- Order EA 12-051: Spent Fuel Pool Instrumentation
- NTTF Recommendations 7.2-5 (Tier 2)
 - Safety-related makeup availability
 - Seismically-qualified spray capability



Stakeholder Feedback

- Category 3 Public Meeting held on May 14
- NEI Used Fuel Management Conference on May 8
- No specific feedback on program plan
- Stakeholder comments included:
 - Requests for immediate NRC action to require transfer of spent fuel to dry casks
 - Proposed areas of consideration/research to address the issue, which is already in the plan
 - Concern that the NRC is over-regulating spent fuel storage



Questions?