

## **Update on Tier 3 Activities**

### Periodic Confirmation of Seismic and Flooding Hazards

Recommendation 2.2 of the Near-Term Task Force (NTTF) report suggests that the U.S. Nuclear Regulatory Commission (NRC) require licensees to periodically update external hazards based on any new and significant information since the most recent reevaluation. In SECY-11-0137, "Prioritization of Recommended Actions to Be Taken in Response to Fukushima Lessons Learned," dated October 3, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11272A111), the NRC staff prioritized Recommendation 2.2 as Tier 3 because it will be developed from Recommendation 2.1, "Seismic and Flooding Reevaluations," a Tier 1 item requiring licensees to reevaluate flooding and seismic hazards using present-day methodologies and guidance. This recommendation depends on the insights gained from the seismic and flooding reevaluations and, because those evaluations are not complete, no updates are currently available to report.

No work was done this period; however, when sufficient insights are gained from the seismic and flooding reevaluations, the NRC staff plans to start the rulemaking process. The staff expects to first develop a technical basis and then engage stakeholders for public participation.

### Enhancements to the Capability To Prevent or Mitigate Seismically Induced Fires and Floods

This activity is unique in that it has a Tier 1 aspect and a Tier 3 aspect. The status update for all parts of this activity is included in Enclosure 1 under the same heading as this section.

### Reliable Hardened Vents for Other Containment Designs; and

### Hydrogen Control and Mitigation Inside Containment or Other Buildings

Both of these lessons-learned activities originated from the NTTF report. NTTF Recommendation 5.2 stated a need was to reevaluate hardened vents for containment designs other than boiling-water reactor (BWR) Mark I and Mark II containments (which are being addressed under Tier 1). NTTF Recommendation 6 was to identify insights from Fukushima related to hydrogen control and mitigation inside containment or in other buildings, and to determine whether additional regulatory action is warranted. While these activities are separate, the NRC staff expects that insights from implementation of the order related to severe-accident-capable vents for Mark I and II containments (Order EA-13-109, ADAMS Accession No. ML13130A067) will inform further evaluation and action for both activities. Additionally, the staff of the Office of Nuclear Regulatory Research is participating as a working group member in a study related to hydrogen generation, transport, and risk management organized by the Organization for Economic Co-operation and Development (OECD). The outcome of this task group will be a status paper that reviews the approaches for hydrogen management under severe accident conditions within the OECD member countries. The paper would include safety requirements, mitigation systems and their implementation status, analysis codes and their validation status, and severe accident management strategies. This will allow identifying advantages and drawbacks of the various approaches.

The NRC staff issued the interim staff guidance (ISG) for Phase 1 (JLD-ISG-2013-02) of Order EA-13-109 on November 14, 2013 (ADAMS Accession No. ML13304B836). The licensees are required to submit an overall integrated plan (OIP) by June 30, 2014. Currently, the staff is holding meetings with the Nuclear Energy Institute industry group to develop an acceptable OIP template for implementation of Order EA-13-109, as well as to continue development of a technical and regulatory basis for the accident management and filtering strategies rulemaking. The staff will evaluate existing plans for other containment designs (e.g., Mark III, ice-condenser, and large dry containments) and hydrogen control as progress is made with the Mark I and Mark II issues. Once the staff has determined that sufficient insights have been gained from the Mark I and Mark II work and other related activities, it will commence evaluation of other containment designs and hydrogen control to determine whether regulatory action is warranted for either or both activities.

#### Activities Related to Emergency Preparedness

In SECY-12-0095 (ADAMS Accession No. ML12165A092), the following four Tier 3 items were included within one program plan:

- (1) Emergency preparedness (EP) enhancements for prolonged station blackout (SBO) and multi-unit events;
- (2) Emergency Response Data System capability;
- (3) Additional EP topics for prolonged SBO and multi-unit events;
- (4) EP topics for decisionmaking, radiation monitoring, and public education.

These four items collectively originated from NTF Recommendations 9.1, 9.2, 9.3, 10.1, 10.2, 10.3, 11.1, 11.2, 11.3, and 11.4. The program plan outlined in SECY-12-0095 described an approach to collectively address these items using an advance notice of proposed rulemaking (ANPR). An ANPR is a tool that allows the NRC staff to solicit early written stakeholder input on a new potential rulemaking effort. The staff still intends to take this approach for certain Tier 3 EP activities (9.2, 9.3, and 10.3 related to Emergency Response Data Systems (ERDS); 10.1; 11.2; 11.3; and 11.4) and expects to use the ANPR feedback to help determine if there is a need for rulemaking; and, if so, what its scope and content should be.

No work was done this period; however, the staff expects to issue the ANPR in fiscal year 2016. Several of the Tier 3 EP activities (9.1, 9.2, 9.3 (with the exception of maintenance of ERDS capability throughout an accident), 9.4, 10.2, and 11.1) could be addressed through a proposed consolidated rulemaking effort, as is further discussed in Enclosure 6 to this SECY.

#### Reactor Oversight Process Modifications to Reflect Recommended Defense-in-Depth Framework

This lessons-learned activity originated from NTF Recommendation 12.1 to expand the scope of the annual Reactor Oversight Process (ROP) self-assessment and biennial ROP realignment to include more fully any defense-in-depth considerations that might result from resolution of

NTTF Recommendation 1. Therefore, implementation of this activity largely depends on the outcome of work on Recommendation 1, which is ongoing.

However, the NRC staff is identifying and incorporating improvements to the ROP based on insights from implementing other lessons-learned activities. For example, NRC inspectors have identified areas for improvement in the inspection program—a key component of the ROP—as a result of conducting inspections to review licensee walkdowns of flooding protection features. These insights are evaluated and incorporated as part of the existing ROP self-assessment and ROP realignment processes. The staff expects that insights from additional lessons-learned activities (i.e., conducting Temporary Instructions to verify Order compliance and responses to requests for information) can be incorporated in the same manner.

#### NRC Staff Training on Severe Accidents and Severe Accident Management Guidelines

This lessons-learned activity originated from NTTF Recommendation 12.2 to enhance NRC staff training on severe accidents, including resident inspector training on severe accident management guidelines (SAMGs). Because the Onsite Emergency Response Capabilities rulemaking (Tier 1) is expected to require better integration of emergency procedures, including SAMGs, this activity partially depends on the final outcome of that rulemaking activity.

However, the staff is working toward implementing several potential enhancements related to severe accident training:

1. Increasing the frequency of severe accident courses, including exporting the courses to the regional offices;
2. Updating courses with lessons learned from the Fukushima accident;
3. Modifying existing qualification programs to include requirements for severe accident courses;
4. Adding SAMG courses to qualification program training;
5. Developing new, additional courses that focus on severe accidents.

The NRC staff recognizes that additional changes could be developed as a result of the ongoing State of the Art Reactor Consequence Analysis study, the Level 3 probabilistic risk assessment (PRA) study, and any future Fukushima lessons-learned insights.

While part of this activity depends on the outcome of the Onsite Emergency Response Capabilities rulemaking, the NRC staff currently has information on severe accidents to update the training and believes that increasing its knowledge in this area is beneficial.

#### Basis of Emergency Planning Zone Size and Pre-Staging Potassium Iodide beyond 10 Miles

Both of these lessons-learned activities originated as “additional issues” in SECY-11-0137. The first activity involves the NRC staff evaluating the basis of the plume exposure pathway emergency planning zone (EPZ) size. In the staff’s early post-Fukushima reviews of the event,

it determined that there was no immediate information to suggest that the NRC's existing basis for EPZ size was inadequate. However, the staff decided to add this activity as an "additional issue" so that it could perform a confirmatory analysis once additional insights were gained from the ongoing Level 3 PRA study and a planned United Nations assessment of Fukushima. The staff expects it will be several years before these other activities are complete.

The second activity involves the NRC staff's evaluation of whether potassium iodide should be pre-staged beyond the current 10-mile zone. As was the case for the EPZ activity, the staff determined in its early post-Fukushima reviews that there was no immediate information to suggest that the NRC's existing requirements regarding potassium iodide distribution were inadequate. However, this activity was also added as an "additional issue" to allow a confirmatory analysis to be conducted based on information obtained from studies proposed by the Japanese Government. These studies are expected to take 5 to 7 years before useful data is obtained. Currently, the staff is engaged with the Nuclear Energy Agency, International Atomic Energy Agency (IAEA), and scientific forums to actively study the impact of releases from Fukushima on public health, the use of KI, and thyroid disease.

#### Expedited Transfer of Spent Fuel to Dry Cask Storage

On October 9, 2013, the staff provided SECY-13-0112, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML13256A334), to the Commission. The purpose of the study was to help the agency determine whether accelerated transfer of spent fuel from the spent fuel pool (SFP) to dry cask storage significantly reduces risks to public health and safety. The study provided consequence estimates of a hypothetical spent fuel pool accident initiated by a low-likelihood seismic event at a reference plant based on the Peach Bottom BWR Mark I spent fuel pool. The study compared high-density and low-density loading conditions and assessed the benefits of post-9/11 mitigation measures. One of the objectives of the current study was to inform the Japan lessons-learned Tier 3 activities.

On November 12, 2013, the staff provided COMSECY-13-0030, "Staff Evaluation and Recommendation for Japan Lessons-Learned Tier 3 Issue on Expedited Transfer of Spent Fuel" (ADAMS Accession No. ML13329A918), to the Commission. In COMSECY-13-0030, the NRC staff completed a regulatory analysis to determine whether additional study of this issue was warranted, after considering a broad history of NRC oversight of spent fuel storage, SFP operating experience (domestic and international), past studies of SFP safety, and the October 2013 SFP study (SECY-13-0112). In addition, the staff considered international practices related to the transfer of spent fuel from wet to dry storage, as well as stakeholder comments received during two public meetings. The staff concluded that the expedited transfer of spent fuel to dry cask storage would provide only a minor or limited safety benefit (i.e., less than safety goal screening criteria), and that its expected implementation costs would not be justified. The staff recommended to the Commission that additional studies and further regulatory analyses of this issue not be pursued, and that this Tier 3 Japan lessons-learned activity be closed.

On January 6, 2014, the Commission held a meeting entitled, "Spent Fuel Pool Safety and Consideration of Expedited Transfer of Spent Fuel to Dry Cask Storage." The Commissioners were briefed by industry representatives (Dominion Nuclear and the Electric Power Research

Institute (EPRI)), non-governmental organizations (Union of Concerned Scientists and Institute for Resource and Security Studies), and NRC staff. The industry representatives and non-governmental organizations provided their respective views on this issue, and the staff provided an overview of documents previously provided to the Commission. As directed by SRM-M140106A, the staff is interacting with EPRI and international counterparts to gather information on international spent fuel management practices.

At this time, the NRC staff is awaiting further direction from the Commission on whether to pursue any additional activities related to expedited transfer of spent fuel to dry cask storage.

#### Enhanced Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions

During its review of the NTTF recommendations in SECY-11-0124 and SECY-11-0137, the Advisory Committee on Reactor Safeguards noted that Section 4.2 of the NTTF report discusses how the Fukushima operators faced significant challenges in understanding the condition of the reactors, containments, and SFPs because the existing design-basis instrumentation was either lacking electrical power or providing erroneous readings. As a result, an additional recommendation was developed to address the regulatory basis for requiring reactor and containment instrumentation to be enhanced to withstand beyond-design-basis accident conditions. This activity was prioritized as Tier 3 because it requires further staff study and depends on the outcome of other lessons-learned activities. The program plan for this recommendation was detailed in SECY-12-0095.

The program plan for Enhanced Reactor and Containment Instrumentation outlined several steps needed to achieve a basis for a regulatory decision. The first step was to ensure that licensees are appropriately considering instrumentation needs during implementation of actions for NTTF Recommendations 2.3, 4.1, and 8 and Orders EA-12-049, EA-12-051, and EA-13-109. The next, and current, step is to obtain and review information from previous and ongoing research efforts for severe accident management analysis, and to monitor the results of U.S. Department of Energy (DOE) and international research activities and guidance being developed by domestic and international organizations. The NRC staff has performed, or is performing, the following tasks to develop new information and insights: (1) It reviewed the DOE modeling of the Fukushima event, (2) met with DOE and EPRI regarding research activities, (3) is participating in the development of the IAEA Nuclear Energy series document expected to be issued in 2014, (4) met with the American Nuclear Society Standards Board, and (5) is interfacing with the Institute of Electrical and Electronics Engineers (IEEE) Standards Committee for IEEE-497, "Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations." The International Electrotechnical Commission standards organization has designated working group 9 under Subcommittee 45B to explore the publication of a possible joint logo standard on accident monitoring with the IEEE-497 standard.

The next steps for this recommendation will be to meet with appropriate Tier 1 teams to review instrumentation-needs formulations and review pertinent licensee submittals for instrumentation-needs identification. The NRC staff will continue work with the standards-development organizations to identify criteria for severe accident instrumentation, support IAEA in issuing its document on accident-monitoring instrumentation, and research collaboration with EPRI and DOE. Once the staff has accumulated sufficient

knowledge and data, if a safety-significant instrumentation performance gap is identified, regulatory action will be taken through the appropriate mechanism (rulemaking, generic communication, etc.).

The NRC staff plans on making a regulatory determination by December 2015.