

Update on Tier 3 Activities

Periodic Confirmation of Seismic and Flooding Hazards

Near-Term Task Force (NTTF) Recommendation 2.2 recommended 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 NTTF Recommendation 2.2 as Tier 3 because it will be developed from NTTF 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.

The NRC staff held no public meetings or produced any project-significant documents during the last 6 months. However, when sufficient insights are gained from the seismic and flooding reevaluations, the staff plans to start the rulemaking process to address this recommendation. 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 identified a need to reevaluate hardened vents for containment designs other than boiling water reactor 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 Mark 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 Organisation for Economic Co-operation and Development. The report has been completed and is under staff review. Initial insights indicate that use of passive autocatalytic recombiners in foreign plants is a dominant feature. Hydrogen-control strategies outside the primary containment have not been fully developed and more work is needed. The report also noted that use of an external filter should be considered in conjunction with other severe-accident

management measures. Once the reviews are complete, the staff will make recommendations as how these insights can support addressing NTTF Recommendations 5.2 and 6.

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). As required by the order, all licensees submitted an overall integrated plan by June 30, 2014. Currently, the staff is reviewing these plans and will start issuing interim staff evaluations by December 2014. 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 of hydrogen control to determine whether regulatory action is warranted for the 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 (ERDS) capability;
- (3) Additional EP topics for prolonged SBO and multi-unit events; and
- (4) EP topics for decisionmaking, radiation monitoring, and public education.

These four items collectively originated from NTTF 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 ERDS; 10.1; 11.2; 11.3; and 11.4) and expects to use the ANPR feedback to help determine whether there is a need for rulemaking and, if so, what its scope and content should be.

No work was done during this period; however, the NRC 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) are being addressed through a consolidated rulemaking approved in SRM-SECY-14-0046.

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

This lessons learned activity originated from NTTF 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. In SRM-13-0132, "U.S. Nuclear Regulatory Commission Staff Recommendation for the Disposition of Recommendation 1 of the Near-Term Task Force Report" (ADAMS Accession No. ML14139A104), the Commission provided the following guidance regarding NTTF Recommendation 1:

The objectives of Improvement Activities 1 [design-basis extension category] and 2 [defense-in-depth] should be reevaluated, as appropriate, in the context of the Commission direction on a long-term Risk Management Regulatory Framework (RMRF), more specifically, the proposed policy statement. Work on the RMRF and other interrelated activities should be treated outside the scope of the NRC's post-Fukushima actions. With these decisions, the Near-Term Task Force Report Recommendation 1 is closed.

Therefore, implementation of NTTF Recommendation 12.1 now depends on the RMRF, which is ongoing.

However, the NRC staff is identifying and evaluating improvements to the ROP based on insights from implementing a range of other internal lessons learned reviews and external audit 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. Feedback forms suggesting changes to flood-related (external) inspection procedures have been created and are being evaluated for potential procedure changes. As part of the existing ROP self-assessment and ROP realignment processes, insights gained from lessons learned activities (e.g., conducting Temporary Instructions to verify order compliance and responses to requests for information) will use the same process.

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 NRC 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; and
- (5) Developing new and additional courses that focus on severe accidents.

The NRC staff recognizes that additional changes could be developed as a result of the State-of-the-Art-Reactor Consequence Analysis (SOARCA) study, the ongoing 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 Mitigation of Beyond Design Basis Events rulemaking, the NRC staff currently has information on severe accidents and believes that increasing its knowledge in this area is beneficial.

The NRC staff has started holding a series of agencywide seminars on the state-of-the-art understanding of severe accidents. Presenters include at least two experts—an in-house expert and an external expert—to provide diverse perspectives to enable staff to more fully understand each severe accident phenomenon. The first seminar, held on March 6, 2014, used the SOARCA study and the Fukushima accident to walk through accident progression chronologically on a design-specific and scenario-specific basis. The second seminar, held on June 10, 2014, covered fission product release, transport, and deposition within the reactor coolant system, containment, and the surrounding buildings. More than 70 staff members from across the agency attended each seminar. The third seminar, held on October 7, 2014, covered severe accident induced steam generator tube rupture. More than 70 staff members from across the agency attended each seminar. The fourth seminar, planned for December 3, 2014, will cover steam explosions. Future seminars will be held quarterly, each covering one severe-accident phenomenon (e.g., hydrogen combustion or molten core/concrete interactions). Video recordings of the seminars are being added to iLearn for knowledge management purposes.

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

These activities were not in the original NTF report; however in SECY-11-0137, the NRC staff recommended that evaluating the basis of the Emergency Planning Zone (EPZ) size warranted further consideration.

The NRC staff remains confident that the EP programs in support of nuclear power plants provide an adequate level of protection of the public health and safety and that appropriate protective actions can and will be taken in the event of a radiological event. This includes evacuations as well as the use of potassium iodide (KI). Available information and studies from the Fukushima accident have not weakened the staff's position. Current size of EPZs provides reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at an existing nuclear power plant. Nonetheless, the staff plans to use insights from the NRC's Level 3 PRA project, as well as information obtained from the international organizations, to inform the resolution of this recommendation. The United Nations Scientific Committee on the Effects of Atomic Radiation is preparing a scientific report to assess the radiation doses and associated effects on health and the environment. Also, the Fukushima Prefecture launched the Fukushima Health Management Survey to investigate long-term low-dose radiation exposure caused by the accident. The World Health Organization is also conducting studies of the protective actions taken during the accident. 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. The staff will monitor the results of these efforts for applicability to the NRC's EP regulatory framework and guidance, including EPZ size and KI use.

Expedited Transfer of Spent Fuel to Dry Cask Storage

In SRM-COMSECY-13-0030, "Staff Requirements - Staff Evaluation and Recommendation for Japan Lessons Learned Tier 3 Issue on Expedited Transfer of Spent Fuel to Dry Cask Storage," dated May 23, 2014, the Commission agreed with the NRC staff's recommendation that this issue be closed. The Commission also directed the staff to complete the following related activities:

- (1) Develop an Information Notice to inform licensees of the potential added safety benefit of adopting a "1 × 8" spent fuel pool (SFP) loading configuration;
- (2) Modify the regulatory analysis to explain why the "1 × 8" configuration was not found to provide a substantial increase in safety;
- (3) Evaluate whether to modify through amendment or errata the existing process for seismic-hazard reevaluation (Phase 1 of 10 CFR 50.54(f)) to eliminate the SFP evaluation step;
- (4) Provide an information paper detailing staff's views and considerations regarding the treatment of limited-term operational vulnerabilities associated with the discharge of spent fuel from cores into pools; and
- (5) Provide a technical overview of the operational and safety attributes of spent fuel rack designs used in other countries.

Items (2) and (5) have been completed. The rest of these activities are in progress.

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 (ACRS) 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, "Enhanced Reactor and Containment Instrumentation," 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 appropriately consider instrumentation needs during implementation of actions for NNTF Recommendations 2.3, 4.1, and 8 and Orders EA-12-049, EA-12-051, and EA-13-109. Next, the current step is to obtain and review information from previous and ongoing research efforts for severe accident management analysis; to monitor the results of the U.S. Department of Energy (DOE) and international research activities; and to influence guidance being developed by domestic and international organizations. The NRC staff has performed, or is performing, the following tasks consistently with the plan. The staff has: (1) reviewed the DOE modeling of the Fukushima event, (2) met with DOE and the Electric Power Research Institute (EPRI) regarding research activities, (3) participated in the EPRI Working Group for Severe Accident Instrumentation, (4) participated in the development of the IAEA Nuclear Energy series of documents on accident instrumentation, (5) met with the American Nuclear Society Standards Board, and (6) interfaced 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." In addition, 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. At the July 2014 Nuclear Power Engineering Committee (NPEC) Meeting, the working group submitted the latest draft standard for consideration by the NPEC balloting committee.

The next task for this recommendation will be to analyze appropriate Tier 1 activities to review instrumentation needs formulations. In addition, the NRC staff will continue to work with the standards-development organizations to identify criteria for severe accident instrumentation, support IAEA in issuing its document on accident-monitoring instrumentation, and continue research collaboration with EPRI and DOE. The staff has also been requested to brief the ACRS in September 2014 regarding its findings to date.

Once the NRC staff has accumulated sufficient knowledge and data, regulatory action will be taken through the appropriate mechanism, such as rulemaking or generic communication for any safety-significant instrumentation performance gaps. The staff will also consider the endorsement of any appropriate industry standards addressing severe-accident instrumentation in its guidance documents (e.g., Regulatory Guide 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants").

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