



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

November 16, 2015

Stephen G. Burns
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

**SUBJECT: PLANS FOR RESOLVING THE NRC NEAR-TERM TASK FORCE OPEN
FUKUSHIMA TIER 2 AND 3 RECOMMENDATIONS**

Dear Chairman Burns:

During the 629th meeting of the Advisory Committee on Reactor Safeguards (ACRS), November 4-7, 2015, we reviewed the NRC staff's publicly available draft White Paper prepared to support Commission Paper SECY-15-0137, "Proposed Plans for Resolving Open Fukushima Tier 2 and 3 Recommendations." Our Fukushima Subcommittee reviewed draft material for this paper on October 6, 2015. During these reviews, we had the benefit of discussions with the staff and representatives of the Nuclear Energy Institute. We also had the benefit of the documents referenced.

CONCLUSIONS

1. We agree with the staff's assignment of each of the open Tier 2 and 3 recommendations into three resolution groups.
2. We agree with the staff's conclusions for the Group 1 recommendations, that the NRC's existing regulatory framework and requirements are adequate and that no further regulatory action is warranted.
3. We will review the staff's evaluations and their closure proposals and plans associated with the Group 2 and Group 3 recommendations prior to their submittal to the Commission in 2016.

BACKGROUND

In SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," the staff provided its proposed prioritization of the NRC Near-Term Task Force (NTTF) recommendations to the Commission. The staff's prioritization approach grouped the recommendations in three tiers. Tier 1 consisted of

those NTTF recommendations which the staff determined would lead to the most safety benefit, which should be started without unnecessary delay, and for which sufficient resources and critical skill sets were available. Tier 2 consisted of those NTTF recommendations that could not be initiated in the near-term due to factors that included the need for further technical assessment and alignment, dependence on Tier 1 issues, or availability of critical skill sets. Tier 3 consisted of those NTTF recommendations that required further study to support a regulatory action, had an associated shorter-term action that needed to be completed to inform the longer-term action, were dependent on the availability of critical skill sets, or were dependent on the resolution of NTTF Recommendation 1. Accordingly, most of the Tier 3 items involved studies and assessments to investigate whether the value of taking regulatory action could be demonstrated.

While the major staff work to date has been the implementation of the Tier 1 recommendations, the staff has been working on the Tier 2 and Tier 3 recommendations. Some of the initial Tier 2 and 3 recommendations have been subsumed into Tier 1 activities for completion, and one was completed in May 2014. The staff proposals to address the remaining open Tier 2 and 3 recommendations are documented in nine enclosures to SECY-15-0137 and in the staff's publicly available draft White Paper that was used as the basis for our review.

DISCUSSION

The staff recognizes that any new regulatory requirement imposed as a result of the open Tier 2 and 3 recommendations must be appropriately justified, as required by Section 50.109 of Title 10 of the *Code of Federal Regulations*, "Backfitting." As discussed in the enclosures to SECY-15-0137, the staff's initial evaluation of the remaining recommendations has determined that the existing NRC regulatory framework and requirements are adequate and that no further regulatory action is warranted. However, the staff has not yet completed discussions with the ACRS and other stakeholders on the results from some of its assessments, and in some cases additional staff assessment is still underway. As such, the staff's resolution plans for the open recommendations are categorized into three types of actions for consideration by the Commission:

Group 1 - Recommendations that should be closed now because the staff has determined that the NRC's existing regulatory framework and requirements are adequate, and that no further regulatory action is warranted. Required assessment has been performed, and appropriate interaction with the ACRS and stakeholders has been completed. These include all recommendations in Enclosures 3, 6, 8, and 9, and all but one recommendation in Enclosure 7.

Group 2 - Recommendations that the staff's initial assessment has concluded should be closed based on the regulatory rationale noted above, but for which interaction with either the ACRS or external stakeholders is warranted prior to finalizing the assessment. These include recommendations in Enclosures 4 and 5. The staff proposes to submit closure recommendations to the Commission in March 2016.

Group 3 - Recommendations for which the current basis for closure could benefit from additional assessment and documentation by the staff, along with ACRS or external stakeholder interaction. These include recommendations in Enclosures 1 and 2, and one recommendation in Enclosure 7. The staff proposes to submit closure recommendations to the Commission in December 2016.

We agree with the staff's assignment of each open Tier 2 and 3 recommendation into one of these three resolution groups. The staff's closure plans and documentation for the Group 1 recommendations are satisfactory and we concur that these recommendations should be closed now. We will review the staff's evaluations and their closure proposals and plans associated with the Group 2 and Group 3 recommendations prior to their submittal to the Commission in 2016. In reviewing the full set of recommendations with regard to requirements for new reactors, the staff has found that appropriate policies are in place, such that no regulatory changes were identified to be necessary. We agree with this conclusion.

Our review of each of the open recommendations follows. They are presented in the sequence in which the staff plans to close them. We emphasize that by stating that no further regulatory action is required does not mean that actions have not been taken or improvements will not be pursued in response to each of these recommendations. SECY-15-0137 demonstrates and documents the depth and breadth of the work the staff and industry have already completed to address them. In addition, many recommendations have been affected directly by work performed in response to the Tier 1 recommendations, and others were affected indirectly by the general Fukushima-related response activities and programs.

Group 1 - Recommendations to Be Closed Now

Capabilities to Prevent Seismically-Induced Fires and Floods (NTTF Recommendation 3)

NTTF Recommendation 3 concluded that the staff should evaluate potential enhancements to the capability to prevent or mitigate seismically-induced fires and floods. The staff's assessment has determined that regulatory requirements to enhance existing capability to prevent or mitigate such events are not warranted.

The staff's initial evaluation found that there are no current state-of-practice probabilistic risk assessment (PRA) methods for determining the risk from these hazards. In response, the staff directed a feasibility study be conducted by Brookhaven National Laboratory (BNL) to examine approaches that could be developed or applied for this task. While this feasibility study presents detailed documentation of extensive technical information and opinion, recommendations and incentives to improve PRA treatment of these issues were not presented. This suggested to the staff that further progress would likely require substantial resources and that further work should not be pursued. The staff proposes to finalize this report in December 2015.

The staff relied on post-Fukushima walkdowns as the means to identify seismically-induced fire and flooding threats and upon site corrective action programs to reduce the frequency or consequences of those that are found. The effectiveness of this approach depends on the capabilities and rigor of the walkdown teams, and the extent and robustness of the corrective actions. The staff concluded that the risk contribution from these seismically-induced events is relatively small compared to that from seismic events alone. This conclusion is based on qualitative examination of defenses against the most severe hazards - primarily the robustness of plant mitigation capabilities, the existence of layers of protection, and response mechanisms that already exist or will be in place as a result of related NNTF Tier 1 recommendation activities. The staff's conclusions may inadvertently overlook plant-specific scenarios for these compound hazards that result from seismic events which are not as severe as those being examined for potential damage to safety-related equipment, but nonetheless could ignite fires and damage detection or suppression systems.

While we agree with the staff that no new regulatory requirements should be developed to address these events, we are confounded that the PRA feasibility study did not identify a reasonable approach for their assessment. We plan to investigate these concerns further with the staff through our Reliability and PRA Subcommittee after we have the opportunity to review the final BNL feasibility study report.

Evaluation of Emergency Planning Zone Size and Pre-Staging of Potassium Iodide Beyond 10 Miles (NRC Staff-initiated)

The NNTF recommended reconsidering the basis for the emergency planning zone (EPZ) size and practices associated with the pre-staging of potassium iodide beyond 10 miles. This was determined to be a Tier 3 issue, because further assessment and information from the Fukushima accident would be needed before the evaluation could be completed.

The 10-mile EPZ establishes the area in which protective actions are appropriate. Nuclear power plant licensees, federal, state, and local governments, and offsite response organizations perform comprehensive planning for this zone and routinely test and evaluate these plans. On February 27, 2014, the Commission approved the staff's recommendation to deny a petition for rulemaking requesting the Commission amend its regulations to expand existing EPZs around nuclear power plants, create a new EPZ, and require the incorporation of concurrent natural disasters in the required periodic emergency plan drills. This reinforces the concept that the current EPZs provide for a comprehensive emergency planning framework that would allow expansion of the response efforts beyond the designated distances should events warrant any expansion.

The staff continues to review and evaluate programs conducted by international organizations and Japanese studies that are monitoring the health and environmental impacts of the radioactive releases from the Fukushima Dai-ichi reactors. The results of

ongoing studies being conducted by the World Health Organization, the United Nations Commission on the Effects of Atomic Radiation, and the Fukushima Health Management Survey have not challenged the EPZ planning basis or the potassium iodide distribution program. The staff plans to continue to monitor these studies and engage stakeholders in the appropriate forums. The staff evaluations of these topics are thorough and sufficiently complete to support their conclusions that further regulatory action is not warranted, and that these recommendations should be considered resolved and closed.

Emergency Preparedness Activities That Have Not Been Addressed Elsewhere (NTTF Recommendations 9, 10, and 11)

This section addresses several Tier 3 recommendations related to emergency preparedness. The general categories include emergency preparedness enhancements and additional topics for prolonged station blackout and multi-unit events, emergency response data system capability improvements, emergency preparedness topics for decision making, and public education. In Enclosure 7 of SECY-15-0137, the staff has detailed the programmatic approaches that have been developed to address these recommendations and to integrate the appropriate elements into routine staff programs and activities. The staff has identified several items that pertain to the Mitigation of Beyond-Design-Basis Events rulemaking activities and their implementation. These have been transferred to that program for resolution. For several of the recommendations, the staff's plan for closure means that improvements are being integrated into existing emergency preparedness programs, and future enhancements will continue to follow this route. This will include further evaluation of lessons learned from the Fukushima emergency planning experience.

Enhancements to the Reactor Oversight Process (NTTF Recommendation 12.1)

NTTF Recommendation 12.1 suggested that the NRC redefine the scope of the annual Reactor Oversight Process (ROP) self-assessment and the biennial ROP realignment process to more fully include defense-in-depth considerations. The recommendation was prioritized as Tier 3 because of a dependency upon Recommendation 1 and the related connectivity to defense-in-depth initiatives. Following the Commission's decision to redirect the staff's focus on Recommendation 1, the staff modified the objective to enhance the ROP to incorporate Fukushima Dai-ichi response programs.

The staff is working to identify and evaluate improvements to the ROP based on insights from Fukushima-related lessons learned, reviews, and inspection activities, as part of the Baseline Inspection Procedure Enhancement Project. For example, the staff is examining post-Fukushima licensee walkdowns of flood protection features. In addition, the staff completed proposed changes to "Adverse Weather Protection" inspection procedures to incorporate associated lessons learned. The staff also issued temporary instructions to inspect the implementation of mitigation strategies, spent fuel pool instrumentation, emergency preparedness communication, staffing, and multi-unit dose assessment plans to verify licensee compliance with Commission Orders. The next step will be to assure ROP elements for monitoring full implementation of the onsite FLEX program. The staff demonstrated their program focus on integrating the important site-specific implementation elements of the NTTF recommendations into the ROP.

NRC Staff Training on Severe Accidents and Severe Accident Management Guidelines
(NTTF Recommendation 12.2)

NTTF Recommendation 12.2 asks that the NRC enhance staff training on severe accidents, including NRC resident inspector training on Severe Accident Management Guidelines (SAMGs). Progress has been made in enhancing training on severe accidents and SAMGs, and the staff plans to use well-established processes to make future enhancements. The program is being integrated with the existing staff training programs and will incorporate future Fukushima-related findings, severe accident research developments, and continuous improvement as a result of student and instructor feedback. Since the overall program incorporates training for severe accidents, the staff should assure a proper balance in training development and training time between these programs and those in other fundamentals of nuclear safety such as reactor oversight, corrective action, quality assurance, and nuclear safety culture. This balance should also be maintained for the broader scope of Fukushima-related activities, to assure that staff focus on all activities reflects a risk-informed approach.

Group 2 - Recommendations to Be Closed in March 2016

Reliable Hardened Vents for Other Containments and Hydrogen Control and Mitigation
(NTTF Recommendations 5.2 and 6)

NTTF Recommendation 5.2 asked that the NRC assess the need to require the installation of reliable, hardened venting systems for containments with designs other than boiling water reactor (BWR) Mark I and Mark II containments. NTTF Recommendation 6 urged that the staff assess the need to further strengthen requirements associated with hydrogen control and mitigation inside and outside reactor containment buildings.

The staff has performed a preliminary analysis and determined that further regulatory action beyond that completed for Mark I and Mark II containments is not warranted. The staff findings and conclusions with respect to these issues for other reactor containments (BWR Mark III, pressurized water reactor (PWR) ice condenser, and PWR large dry) build upon the conclusions they have drawn through extensive studies and evaluations of the Mark I and Mark II containment designs. The staff has drawn also from the substantial research and analysis programs in the 1980s and 1990s, which resulted in important systems and procedural modifications for these other reactor containments.

The staff has concluded that issues of hydrogen mitigation in the reactor buildings of Mark I and Mark II containment BWRs do not merit further consideration because reliable vents will prevent over-pressurization of the containments and massive leakage of hydrogen into the reactor buildings. The conclusion neglects the potential for other pathways of hydrogen release to the reactor building under severe reactor accident conditions. It was, for example, speculated in the immediate aftermath of combustion events during the Fukushima accidents that hydrogen could be leaked to the reactor

buildings through failed bellows on the containments or through thermally or radiolytically degraded seals. Either pathway might be sufficient to release enough hydrogen to pose a combustion hazard while keeping containment pressures below levels mandating vent activation. It may, then, be more prudent for the staff to perform a comprehensive examination of potential hydrogen release pathways before they forego consideration of hydrogen mitigation in the reactor buildings.

We look forward to interacting with the staff as they provide additional evaluation and supporting documentation for their conclusions in early 2016. In that work, the staff should further document the findings derived from their review of international activities and how they have affected their conclusions. We also expect that the staff will maintain their research programs and monitor international research and regulatory programs on Fukushima, and will continue to assess implications for NRC regulation and oversight.

Reactor and Containment Instrumentation Enhancements against Beyond-Design-Basis Events (ACRS-Initiated)

During our review of the original NTTF recommendations, we emphasized that Section 4.2 of the report discusses how the Fukushima operators faced significant challenges in understanding the condition of the reactors, containments, and spent fuel pools. In part, the challenges arose because the existing instrumentation was either without electrical power or was providing erroneous readings. As a result, an additional recommendation was developed by the staff to examine the regulatory basis for requiring that reactor and containment instrumentation be enhanced to withstand beyond-design-basis accident conditions.

To respond, the staff has performed an evaluation of severe accident instrumentation requirements. The staff does not expect to recommend any regulatory actions beyond those already taken. The staff concluded in SECY-15-0065, "Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events," that in view of quantified risk insights, regulatory requirements for SAMG instrumentation cannot be supported and that additional studies are unlikely to change this position.

The staff does propose to continue some research activities to assess the capability of instruments to withstand severe accident environments. This may support implementation of the upgraded SAMG programs. The staff plans to continue updating regulatory guidance for enhanced reactor and containment instruments for beyond-design-basis accident scenarios, which could be incorporated voluntarily by licensees in the future.

The staff plans to document the basis for closing this recommendation and interact with the ACRS and external stakeholders prior to reporting to the Commission by March 2016. Part of the basis for the staff's conclusion is that calculational aids could be used to supplement or replace data from instruments when required. We intend to explore

with the staff and industry severe accident instrumentation availability, capability, and reliability, as well as the detailed SAMG diagnostic approaches. The staff should include a detailed demonstration of how the SAMGs and calculational aids are capable of leading the operators to take the correct actions, even if minimal instrumentation is available or their indications are suspect. Validation work used to determine what instrumentation is necessary before, during, and subsequent to a severe accident will also be examined.

Group 3 - Recommendations to Be Closed in December 2016

Evaluation of Other Natural Hazards (ACRS-Initiated)

Based on comments received from internal and external stakeholders, and in response to comments from the ACRS, the staff is reevaluating natural external hazards other than seismic and flooding hazards. The staff has identified a subset of applicable natural hazards that should be considered for evaluation. To date, the staff has concluded that the most prevalent natural hazards beyond seismic and flooding are extreme winds, extreme temperatures, drought or other low-water conditions, and winter precipitation that results in snow and ice loading on structures. The next steps are to determine risk-informed screening criteria to be applied to exclude specific hazards for some or all licensees. The staff has not yet determined how the technical evaluations will be performed. We expect additional interaction with the staff regarding these approaches in 2016.

Periodic Reconfirmation of Natural Hazards (NTTF Recommendation 2.2)

NTTF Recommendation 2.2 proposed that the NRC initiate a rulemaking to require licensees to confirm seismic and flooding hazards every 10 years and address any new and significant information. It is the staff's view that the NRC's current regulatory framework is sufficient to effectively consider the implications of new external hazard information on plant safety. However, the staff also concluded that enhancing their current processes would improve their efficiency in identifying and assessing new information related to external hazards. The staff proposes a program intended to leverage resources by partnering with other federal agencies and industry to systematically and periodically evaluate new data, models, and methods, and assess their impact on currently-licensed facilities. The success of this endeavor will depend on the process approach. The staff has a history of successful partnerships with other federal agencies. We plan to review the staff's progress during 2016.

Emergency Preparedness Activities – Radiation Monitoring During an Accident (NTTF Recommendation 11.3)

NTTF Recommendation 11.3 recommended that the staff study the efficacy of real-time radiation monitoring onsite and within the EPZs, including consideration of alternating current power independence and availability of pertinent information on the internet. The staff intends to perform further assessment and engage with stakeholders in 2016.

In closing, the staff continues to maintain sharp focus to complete the remaining Fukushima NTTF Recommendations or to transition them to ongoing Agency programs. We look forward to continuing our interactions with the staff to address these topics.

Dr. Joy Rempe did not participate in the Committee's deliberations regarding this matter.

Sincerely,

/RA/

John W. Stetkar
Chairman

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