



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

March 14, 2012

The Honorable Gregory B. Jaczko  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT: ACRS REVIEW OF PROPOSED ORDERS IN RESPONSE TO FUKUSHIMA  
LESSONS LEARNED (SECY-12-0025)**

Dear Chairman Jaczko:

During the 592<sup>nd</sup> meeting of the Advisory Committee on Reactor Safeguards (ACRS), March 8-10, 2012, we reviewed the staff's three proposed Orders regarding (1) development of strategies to mitigate beyond design basis natural phenomena, (2) installation of reliable hardened containment vents for boiling water reactors (BWRs) with Mark I and Mark II containments, and (3) installation of enhanced spent fuel pool instrumentation. The Orders are delineated in SECY-12-0025 [1], and correspond to Near-Term Task Force (NTTF) Recommendations 4.2, 5.1, and 7.1, respectively [2]. We were briefed by the staff on this subject during our 591<sup>st</sup> meeting, February 9-11, 2012, before the Orders were published. During our 591<sup>st</sup> meeting, we were also briefed by representatives of the Nuclear Energy Institute (NEI) on industry's proposed "FLEX" approach to expediting implementation of Fukushima Daiichi lessons learned [3]. During these reviews, we had the benefit of discussions with representatives of the NRC staff, NEI, and members of the public. We also had the benefit of the documents referenced.

### **CONCLUSIONS AND RECOMMENDATIONS**

1. The technical basis for the required venting capacity equivalent to 1% of licensed/rated thermal power prescribed in the Order related to hardened containment venting system (HCVS) for BWRs with Mark I and Mark II containments is not apparent and should be clarified.
2. The Order pertaining to containment venting specifies that the HCVS should be designed consistent with the design basis of the plant. We expect that the HCVS will be treated in a similar manner as other plant systems if the seismic, flooding and other natural external hazards reevaluations to be performed under NTTF Recommendation 2.1 were to show the current design basis of the plant to be non-bounding.
3. The language in the Order pertaining to enhanced spent fuel pool instrumentation does not make it clear that plant operating procedures must be modified to integrate use of the instrumentation for response to abnormal spent fuel pool level conditions.

4. The industry's proposed "FLEX" approach appears to be responsive to the Order pertaining to mitigation strategies for beyond-design-basis external events. It also provides actions to address potential vulnerabilities to seismic, flooding and other external hazards. However, implementation of FLEX does not eliminate the need for the reevaluations of these hazards to be performed in response to NTTF Recommendation 2.1 or the potential for additional follow up regulatory actions.
5. It should be recognized that future activities related to NTTF Recommendation 8 on the integration of onsite emergency response capabilities will impact the procedures, guidance, and training requirements associated with these Orders.

## **BACKGROUND**

On October 3, 2011, the NRC staff issued a notation vote paper (SECY-11-0137 [4]) for Commission consideration of the staff's proposed prioritization of the Fukushima Near-Term Task Force (NTTF) recommendations. The paper identified (1) regulatory actions to be taken by the staff in response to the Fukushima lessons learned; (2) implementation challenges; (3) the technical and regulatory bases for the prioritization; (4) additional recommendations, if any; and (5) a schedule and milestones with recommendations for appropriate stakeholder engagement and involvement of the ACRS. The staff's prioritization of the NTTF recommendations grouped the recommendations into three Tiers. The report (SECY-11-0137) focused on developing the schedules, milestones, and resources associated with near-term (Tier 1 and Tier 2) activities. Assessment of longer-term NTTF recommendations was deferred pending completion of evaluation of the resource impacts of the near-term recommendations.

The following Tier 1 recommendations were identified in SECY-11-0137:

- 2.1 Seismic and flood hazard reevaluations
- 2.3 Seismic and flood walkdowns
- 4.1 Station blackout (SBO) regulatory actions
- 4.2 Equipment covered under 10 CFR 50.54(hh)(2)
- 5.1 Reliable hardened vents for Mark I and Mark II containments
- 7.1 Spent Fuel Pool (SFP) instrumentation
- 8 Strengthening and integration of emergency operating procedures, severe accident management guidelines, and extensive damage mitigation guidelines
- 9.3 Emergency preparedness regulatory actions (staffing and communications)

The staff recommended issuing Orders for NTTF Recommendations 4.2, 5.1, and 7.1; issuing 50.54(f) letters for Recommendations 2.1, 2.3, and 9.3; and initiating rulemaking procedures for Recommendations 4.1 and 8. On December 15, 2011, the Commission issued a Staff Requirements Memorandum (SRM) to SECY-11-0137 [5] supporting the staff's proposed actions to implement, without delay, the NTTF recommendations. Consistent with Commission direction, on February 17, 2012, staff issued SECY-12-0025 [1] describing the proposed Orders related to NTTF Recommendations 4.2, 5.1, and 7.1, and the requests for information pertaining to NTTF Recommendations 2.1, 2.3, and 9.3. SECY-12-0025 also describes the process developed by the staff to screen and disposition stakeholder recommendations and additional issues related to Fukushima beyond those included in the NTTF report.

The purpose of this letter is to document our review of the proposed Orders described in SECY-12-0025 to address NTTF Recommendations 4.2, 5.1, and 7.1. Our reviews of the staff's requests for information pertaining to NTTF Recommendations 2.1, 2.3, and 9.3; the staff's process for screening and dispositioning of additional issues; and the application of that process to ACRS recommendations included in our letters of October 13, 2011 and November 8, 2011, as well as the six additional issues identified in SECY-11-0137, are documented elsewhere [8, 9].

## DISCUSSION

The functional requirements and quality standards of the HCVS for BWR facilities with Mark I and Mark II containments are clearly elucidated in Attachment 2 of the Order pertaining to NTTF Recommendation 5.1. Among the HCVS functional requirements specified in Attachment 2, Section 1.2.1 requires that *"The HCVS shall have the capacity to vent the steam/energy equivalent of 1 percent of licensed/rated thermal power (unless a lower value is justified by analyses), and be able to maintain containment pressure below the primary containment design pressure."* The Order does not provide the technical basis for the 1% capacity specified in the functional requirements.

We note that 1% of licensed thermal power corresponds to decay heat a few hours after a reactor trip. Hence, should venting be required earlier in the event, the 1% venting capacity may not be sufficient to stop the rise in containment pressure. In that case, a higher venting capacity may be required to maintain containment pressure below the primary containment design pressure. Therefore, we recommend that the technical basis for the required venting capacity equivalent to 1% of licensed/rated thermal power prescribed in the Order related to HCVS for BWRs with Mark I and Mark II containments be clarified.

Among the HCVS quality standards specified in the Order, Section 2.1 specifies that *"The HCVS vent path up to and including the second containment isolation barrier shall be designed consistent with the design basis of the plant."* The time line for compliance with this Order (December 31, 2016 or sooner) runs concurrently with Phase 1 of the seismic and flooding hazards reevaluations outlined in the 50.54(f) letter associated with NTTF Recommendation 2.1. Additionally, the Phase 1 reevaluations do not revise the current design basis of the plant. We expect that the HCVS will be treated in a similar manner as other plant systems if the seismic, flooding and other natural external hazards reevaluations to be performed under NTTF Recommendation 2.1 were to show the current design basis of the plant to be non-bounding.

While plants may already have procedures to respond to abnormal SFP level indications, such procedures need to be re-examined, and if necessary modified, consistent with level setpoints to be established based on the new instrumentation. The requirements specified in the Order pertaining to reliable SFP level instrumentation appropriately include the establishment and maintenance of procedures for the testing, calibration, and use of the primary and backup spent fuel pool instrument channels. However, the language in the Order does not make it clear that plant operating procedures must also be modified to integrate use of the instrumentation for response to abnormal SFP level conditions.

The Order related to mitigation strategies of beyond-design-basis events refers to industry's proposal for a Diverse and Flexible Mitigation Capability (FLEX), as documented in NEI's letter dated December 16, 2011 [3]. FLEX is a proposed strategy to fulfill the key safety functions of core cooling, containment integrity, and spent fuel cooling following a beyond-design-basis external event. The FLEX approach is still evolving, and we have not had an opportunity to review details of its integrated mitigation concept or implementation. The approach appears to be responsive to the Order. However, implementation of FLEX does not eliminate the need for the reevaluations of external hazards to be performed in response to NTTF Recommendation 2.1 or the potential for additional follow up regulatory actions.

The timeline for implementation of these Orders will likely be concurrent with the Tier 1 rulemaking activities aimed at addressing NTTF Recommendation 8 related to integration of onsite emergency response capabilities. Hence, it should be recognized that the procedures, guidance, and training to be developed in response to these Orders will in all likelihood be impacted by the rulemaking.

We look forward to working with the staff on these important matters.

Sincerely,

*/RA/*

J. Sam Armijo  
Chairman

## REFERENCES

1. Notation Vote SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," February 17, 2012 (ML12039A103)
2. "Recommendations for Enhancing Reactor Safety in the 21<sup>st</sup> Century, The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," July 12, 2011 (ML111861807)
3. Letter from the Nuclear Energy Institute (Adrian P. Heymer) to US NRC (David L. Skeen), "An Integrated, Safety-Focused Approach to Expediting Implementation of Fukushima Daiichi Lessons Learned," December 16, 2011 (ML11353A008)
4. Notation Vote SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," October 3, 2011 (ML11272A111)
5. Staff Requirements Memorandum to SECY-11-137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," December 15, 2011 (ML113490055)

6. ACRS Letter to the NRC Chairman, "Initial ACRS Review of: (1) the NRC Near-Term Task Force Report on Fukushima and (2) Staff's Recommended Actions to be Taken Without Delay," October 13, 2011 (ML11284A136)
7. ACRS Letter to the NRC Chairman, "ACRS Review of Staff's Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned (SECY-11-0137)," November 8, 2011, (ML11311A264)
8. ACRS Letter to the EDO, "Draft 10 CFR 50.54(f) Letter on Implementation of the Near-Term Task Force Recommendations from the Fukushima Daiichi Event," February 15, 2012 (ML12046A145)
9. ACRS Letter to the EDO, "Response to February 27, 2012 Letter Regarding Final Disposition of Fukushima-Related ACRS Recommendations in Letters Dated October 13, 2011 and November 8, 2011," March 13, 2012 (ML12072A197)

6. ACRS Letter to the NRC Chairman, "Initial ACRS Review of: (1) the NRC Near-Term Task Force Report on Fukushima and (2) Staff's Recommended Actions to be Taken Without Delay," October 13, 2011 (ML11284A136)
7. ACRS Letter to the NRC Chairman, "ACRS Review of Staff's Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned (SECY-11-0137)," November 8, 2011, (ML11311A264)
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Letter to The Honorable Gregory B. Jaczko, Chairman, from J. Sam Armijo, ACRS Chairman, dated March 14, 2012

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