STAFF'S PRIORITIZATION OF ACRS RECOMMENDATIONS FOR NRC ACTIONS TO BE TAKEN IN RESPONSE TO FUKUSHIMA LESSONS–LEARNED

The purpose of this enclosure is to provide the results of the U.S. Nuclear Regulatory Comission (NRC) staff's analysis of recommendations made by the Advisory Committee on Reactor Safeguards (ACRS) in letters dated October 13, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11284A136), and November 8, 2011 (ADAMS Accession No. ML11311A264). This enclosure also describes the staff's process for resolving the ACRS recommendations, as well as any other Fukushima–related issue that arises from the staff's ongoing lessons-learned deliberations, stakeholder interactions, and international outreach activities.

Process for Addressing Additional Issues

The staff developed a process to disposition all additional issues, including recommendations by the ACRS. All issues are reviewed by a panel of senior-level advisors from different NRC program offices. The panel determines whether each issue represents a valid safety concern, and whether there is a clear nexus to the Fukushima Dai–ichi accident. If neither criterion is met, or only one criterion is met, the panel chooses to either disposition the issue with no action, or direct it to one of the NRC's existing regulatory processes (e.g., generic issue process). If both criteria are met, the issue is forwarded for further consideration by the cognizant technical staff in the appropriate NRC line organization. Should the issue go forward, the cognizant technical staff is tasked with developing a proposal for Steering Committee (SC) disposition. The SC may elect to take no further action, disposition the issue using an existing NRC process, or prioritize the issue as a Tier 1, 2, or 3 item under the Japan Lessons–Learned Program.

This process will be used to disposition recommendations and issues sent to the NRC. The SC is routinely presented with a list of issues screened out by the panel of senior–level advisors for review, and it ultimately determines the final prioritization and disposition of each issue. Once this occurs, the staff documents the SC's findings, in detail, and plans to publish the results on the NRC's public Web site.

ACRS Recommendations

The staff has evaluated the recommendations of the ACRS in its October 13, 2011, and November 8, 2011, letters, using the staff's process for screening additional recommendations. The staff documented the SC's disposition of each ACRS recommendation, and has ensured that the cognizant technical staff working groups have used them to enhance the Tier 1, 2, and 3 actions that will be taken as a result of the events at the Fukushima Dai–ichi Nuclear Power Plant. A summary of the staff's disposition of the ACRS recommendations is provided in the table below. The staff addressed ACRS Recommendations 1(a)-1(g), 2(a)-2(f), and 3 from the letter dated October 13, 2011; as well as ACRS Conclusions 1-5 from letter dated November 8, 2011.

The staff also acknowledges the receipt of ACRS letter dated February 15, 2012. The staff will evaluate these additional ACRS comments/ recommendations and will enter them into its process for screening additional recommendations decribed above.

ACRS Recommendations Incorporated into Tier 1 Activities	
ACRS Recommendation	**Staff Response**
• ACRS Recommendation 1(b)—"Actions related to NTTF Recommendation 2.3 should be expanded to assure that the walkdowns address the integrated effects of severe storms as well as seismic and flooding events." • ACRS Conclusion 2—"Tier 1 recommendations should be expanded to include the additional immediate actions recommended in our October 13, 2011, report, regarding flooding hazard reevaluations, integrated walkdowns, station blackout, boiling water reactor (BWR) hardened vents, shared ventilation systems, hydrogen control and mitigation, spent fuel pools (SFPs) and integration of onsite emergency actions."	The NRC staff expanded NTTF Recommendation 2.3 to ensure that the walkdowns address the integrated effects of severe storms as well as seismic and flooding events, in light of the ACRS recommendations. This expansion of NTTF Recommendation 2.3 will have no net impact on the proposed staff resources stated in SECY-11-0137, "Prioritization of Recommended Actions To Be Taken in Response to Fukushima Lesson Learned," dated October 3, 2011.
• ACRS Recommendation 1(c)—"Actions related to NTTF Recommendation 4.1 should be expanded to include issuance of an advanced notice of proposed rulemaking and requiring licensee to provide an assessment of capabilities to cope with an extended station blackout (SBO)." • ACRS Recommendation 2(a)—"Performance-based criteria to mitigate and manage an extended SBO should be considered as an alternative to the specific coping times proposed in Recommendation 4.1."	The NRC staff expanded NTTF Recommendation 4.1 to include an advanced notice of proposed rulemaking (ANPR) and performance-based criteria for an extended SBO, in light of the ACRS recommendations and Commission direction in SRM-SECY-11-0124. This expansion of NTTF Recommendation 4.1 will have no net impact on the proposed staff resources stated in SECY-11-0137. Additionally, the Order associated with NTTF Recommendation 4.2 does include performance-based criteria for SBO coping times.

ACRS Recommendations Incorporated into Tier 1 Activities	
ACRS Recommendation	**Staff Response**
• ACRS Conclusion 1—"Rulemaking activities related to strengthening of SBO mitigation capability should be expedited."	The NRC staff accelerated NTTF Recommendation 4.1 as a result of the Commission's decision in Staff Requirements Memorandum (SRM)-SECY-11-0124, "Recommended Actions To Be Taken Without Delay from the Near-Term Task Force Report," dated October 18, 2011. The staff has designated the SBO rulemaking as a high-priority rulemaking with a completion goal of 24 to 30 months. This acceleration of NTTF Recommendation 4.1 will have no net impact on the proposed staff resources stated in SECY-11-0137.
• ACRS Recommendation 1(d)—"Actions related to NTTF Recommendation 5.1 should also be applied to BWR plants with Mark II containments."	The NRC staff expanded NTTF Recommendation 5.1 to include BWR Mark II containments, in light of the ACRS recommendations. This expansion of NTTF Recommendation 5.1 will have no net impact on the proposed staff resources stated in SECY-11-0137.
• ACRS Recommendation 1(f)—"Information should be requested from licensees regarding current plant-specific spent fuel pool (SFP) instrumentation, power supplies, and sources of makeup and cooling water." • ACRS Conclusion 5—"Staff Tier 1 Recommendation 7.1-2, 'Develop and issue order to licensees to provide reliable SFP instrumentation,' should be reconsidered. Schedules for SFP instrumentation improvements and other modifications to the SFP should be informed by quantification of the contribution made by SFPs to the overall plant risk."	The NRC staff enhanced NTTF Recommendation 7.1 and the associated SFP instrumentation Order in light of the ACRS recommendations. The staff used information gathered from all available resources regarding current plant-specific SFP instrumentation to inform the associated Order. This enhancement of NTTF Recommendation 7.1 will have no net impact on the proposed staff resources stated in SECY-11-0137.

ACRS Recommendations Incorporated into Tier 2 Activities	
ACRS Recommendation	**Staff Response**
• ACRS Recommendation 1(a)—"Actions related to NTTF Recommendation 2.1 should be expanded to include an expedited update of the applicable regulatory guidance, methods, and data for external flooding to ensure that outdated guidance and acceptance criteria are not used in the reevaluations."	The NRC staff will expand its actions related to NTTF Recommendation 2.1 to include "other external hazards" in light of Section 402 of the Consolidated Appropriations Act, 2012 (Public Law 112 74) and the ACRS recommendations. This is a new Tier 2 activity. However, in the Tier 1 actions associated with reevaluating seismic and flooding hazards, licensees will use the present-day regulatory guidance and methodologies that are currently being applied to ongoing reviews of ESP and COL applications.
• ACRS Recommendation 1(f)—"Information should be requested from licensee regarding current plant-specific SFP instrumentation, power supplies, and sources of makeup and cooling water." • ACRS Conclusion 5—"Staff Tier 1 Recommendation 7.1-2, "Develop and issue order to licensees to provide reliable SFP instrumentation," should be reconsidered. Schedules for SFP instrumentation improvements and other modifications to the SFP should be informed by quantification of the contribution made by SFPs to the overall plant risk."	The NRC staff will enhance NTTF Recommendations 7.2–7.5 in light of the ACRS recommendations. The staff will use information gathered from all available resources regarding current plant-specific SFP power supplies, and sources of makeup and cooling water, to inform future actions. These enhancements of NTTF Recommendations 7.2–7.5 will have no net impact on the proposed staff resources stated in SECY-11-0137.

ACRS Recommendations Incorporated into Tier 3 Activities[1]	
ACRS Recommendation	**Staff Response**
• ACRS Recommendation 2(e)—"Selected reactor and containment instrumentation should be enhanced to withstand beyond-design-basis accident conditions." • Conclusion 4—"Tier 2 recommendations should be expanded to include the additional actions recommended in our October 13, 2011, report regarding enhancement of selected reactor and containment instrumentation, and the need to proactively engage in efforts to capture and analyze data from the Fukushima event."	The NRC staff will develop a new action on "reactor and containment instrumentation withstanding beyond-design-basis conditions" and add it to the Tier 3 actions that the NRC will take in response to the Fukushima lessons–learned.
• ACRS Recommendation 1(e)—"Discussions with stakeholders should be initiated regarding near-term actions for additional hydrogen control and mitigation measures in reactor buildings for plants with Mark I and Mark II containments."	The NRC staff will include discussions with stakeholders in its Tier 3 actions associated with NTTF Recommendation 6.
• ACRS Recommendation 2(b)—"Recommendation 6 should be expanded to include a requirement for BWR plants with Mark I and Mark II containments to implement combustible gas control measures in reactor buildings as a near-term defense-in-depth measure."	The NRC staff will enhance the Tier 3 actions associated with NTTF Recommendation 6 to include the implementation of combustible gas control measures in reactor buildings.

[1] The resource estimates associated with the incorporation of the above ACRS Recommendation into Tier 3 activities will be described in detail in the staff's 9-month SECY due to the Commission in July 2012.

ACRS Recommendations Incorporated into Tier 3 Activities	
ACRS Recommendation	**Staff Response**
• ACRS Recommendation 2(c)—"Recommendation 6 should be expanded to include an assessment of the vulnerabilities introduced by shared ventilation systems or shared stacks in multi-unit."	The NRC staff will enhance the Tier 3 actions associated with NTTF Recommendation 6 to include vulnerabilities introduced by shared ventilation systems or shared stacks in multiunit sites.
• ACRS Recommendation 1(g)—"Actions related to NTTF Recommendation 8 should be expanded to included fire response procedures." • ACRS Recommendation 2(d)—"Integration of onsite emergency response capabilities envisioned by Recommendation 8 should be expanded to include fire response procedures."	The NRC staff evaluated how to appropriately integrate the fire response procedure into a licensee's onsite emergency response capabilities and determined that the fire response procedures would be best considered with the agency's Tier 3 actions associated with NTTF Recommendation 3.
• ACRS Conclusion 3—"NTTF Recommendation 10.2 regarding evaluation of the command and control structure and qualifications of decision makers should be initiated in parallel with Tier 1 activities related to integration of onsite emergency actions."	The NRC staff evaluated how to appropriately initiate the "evaluation of the command and control structure and qualifications of decision makers" and determined that they would be best considered with the agency's Tier 3 actions associated with NTTF Recommendation 10.

ACRS Recommendations Addressed by Other NRC Processes or Programs	
ACRS Recommendation	**Staff Response**
• ACRS Recommendation 2(f)—"The NRC should proactively engage in efforts to define and participate in programs to capture and analyze data from the Fukushima event to enhance understanding of severe accident phenomena, including BWR melt progressions, seawater addition effects, hydrogen transport and combustion, and safety systems operability."	The NRC staff in the Office of Nuclear Regulatory Research (RES) is currently working on capturing and analyzing Fukushima data to enhance the agency's understanding of severe accident phenomena.
• ACRS Recommendation 3—"Licensing actions requiring the granting of containment accident pressure (CAP) credit should be suspended until the implications of post-Fukushima containment pressure control measures are understood."	The NRC staff determined that CAP credit will continue to be reviewed on a case-by-case basis.

New Tier 2 Activity–NTTF Recommendation 2.1
Other Natural External Hazards Reevaluations

The NTTF recommends the NRC require licensees to reevaluate and upgrade as necessary the design basis of structures, systems, and components (SSCs) important to safety for protection against updated seismic and flooding hazards . The ACRS recommended expanding this recommendation to include other natural external hazards other than seismic and flooding. The Consolidated Appropriations Act, Public Law 112-074, mandates the NRC to require licensees to reevaluate the external hazards at their sites and to require updates to their design basis, if necessary.

Regulations and Guidance

1. General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," of Appendix A, "General Design Criteria for Nuclear Power Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," requires, in part, that SSCs important to safety be designed to withstand the effects of natural phenomena such as tornadoes and hurricanes without loss of capability to perform their safety functions. The design bases for these SSCs shall reflect appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

2. GDC 4, "Environmental and Dynamic Effects Design Bases," requires, in part, that SSCs that are important to safety be adequately protected against the effects of missiles resulting from events and conditions outside the plant.

3. GDC 44, "Cooling Water," states, in part, that a system to transfer heat from SSCs important to safety to an ultimate heat sink (UHS) shall be provided. The system safety function shall be to transfer the combined heat load of these SSCs under normal operating and accident conditions.

4. The regulations in Subpart B, "Evaluation Factors for Stationary Power Reactor Site Applications On or After January 10, 1997, " to 10 CFR Part 100, "Reactor Site Criteria," state, in part, that meteorological characteristics of the site that are necessary for safety analysis or that may have an impact upon plant design (such as maximum probable wind speed and precipitation) must be identified and characterized (10 CFR 100.20(c)(2)). The regulations further state, in part, that the physical characteristics of the site, including meteorology, must be evaluated and site parameters established such that potential threats from such physical characteristics will pose no undue risk to the type of facility proposed to be located at the site (10 CFR 100.21(d)).

5. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition" contains the following sections of interest:

    a. Section 2.3.1, "Regional Climatology"
    b. Section 2.4.2, "Floods"
    c. Section 2.4.11, "Low Water Considerations"

d. Section 3.3.1, “Wind Loadings”
e. Section 3.3.2, “Tornado Loadings”
f. Section 3.5.1.4, “Missiles Generated by Tornadoes and Extreme Winds”
g. Section 5.4.7, “Residual Heat Removal (RHR) System”
h. Section 6.2.1, “Containment Functional Design”
i. Section 6.2.2, “Containment Heat Removal Systems”
j. Section 6.4, “Control Room Habitability System”
k. Section 9.1.3, “Spent Fuel Pool Cooling and Cleanup System”
l. Section 9.2.2, “Reactor Auxiliary Cooling Water Systems”

6. Interim Staff Guidance DC/COL-ISG-7, “Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures,” was issued final on October 9, 2009.

7. Regulatory Guide (RG) 1.27, “Ultimate Heat Sink for Nuclear Power Plants,” Revision 2, was issued January 1976.

8. RG 1.76, “Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants,” Revision 1, was issued March 2007.

9. RG 1.221, “Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants,” was issued October 2011.

Staff Assessment and Basis for Prioritization

As a follow-on activity to the completion of the Tier 1 actions on seismic and flooding hazards associated with NTTF Recommendation 2.1, the staff concludes that the recommendation should be enhanced to include other natural hazards (e.g., meteorological phenomena) that could affect the safety of power reactors in the U.S. This expansion was suggested to the staff by the ACRS and was subsequently mandated to the NRC in Section 402 of the Consolidated Appropriations Act of 2012.

ACRS letter dated October 13, 2011 (ADAMS Accession No. ML11284A136), recommended that the staff should expand actions related to NTTF Recommendation 2.3 to include:

> The integrated effects of severe storms as well as seismic and flooding events.

The Consolidated Appropriations Act, Public Law 112-074, was signed into law on December 23, 2011. Section 402 clarified the scope of the staff’s reevaluation of licensees’ design bases to include other external events, as described below:

> The Nuclear Regulatory Commission shall require reactor licensees to re-evaluate the seismic, tsunami, flooding, and other external hazards at their sites against current applicable Commission requirements and guidance for such licensees as expeditiously as possible, and thereafter when appropriate, as determined by the Commission, and require each licensee to respond to the Commission that the design basis for each reactor meets the requirements of its license, current applicable Commission requirements and guidance for such license. Based upon the evaluations conducted pursuant to this section and other information it deems relevant, the Commission shall require licensees to update the design basis for each reactor, if necessary.

Other Natural External Hazards. The NRC will undertake regulatory actions to ensure that SSCs important to safety will withstand other natural external hazards. These other external hazards can be considered to include meteorological phenomena such as wind and missile loads from tornadoes and hurricanes, maximum rainfall rates and snow and ice load for roof design, drought and other low-water conditions that may reduce or limit the available safety-related cooling water supply, extreme maximum and minimum ambient temperatures for normal plant heat sink and containment heat removal systems (post-accident), and meteorological conditions related to the maximum evaporation and drift loss and minimum water cooling for the UHS design. Flooding reevaluations and walkdowns in response to Tier 1 NTTF Recommendations 2.1 and 2.3 will address reevaluation of flood hazards for each flood causing mechanism, based on present-day methodologies and regulatory guidance. This will include analyses of each flood causing mechanism that may impact the site including local intense precipitation and site drainage, flooding in streams and rivers, dam breaches and failures, storm surge and seiche, tsunami, channel migration or diversion, and combined effects.

The staff's assessment of the expansion of NTTF Recommendation 2.1 indicates that plants may differ in the way they protect against natural phenomena. The staff concluded that sufficient regulatory guidance currently exists to permit licensee reevaluations. However, the staff noted that results of inspections of SSCs at Fukushima Dai-ichi and Dai-ni Nuclear Power Stations may help inform the implementation of this recommendation. To the extent practical, the new information on the events at Fukushima Dai-ichi and Dai-ni should be incorporated into the reevaluations.

The staff concludes that this recommendation would improve safety. However, the staff also noted that the implementation of this recommendation would require significant resources for both licensees and the NRC, as well as specialized expertise to review licensee reevaluations and to document results of staff evaluations. Since sufficient resource flexibility, including availability of critical skill sets, does not exist at this time, the staff prioritized this action as a Tier 2 recommendation. Albeit very low, seismic and flooding hazards are expected to be the dominant risks to the operating fleet of plants from external hazards and therefore have been given priority as Tier 1 activities.

Staff Actions

Once sufficient expertise and resources are available, the NRC staff plans to undertake regulatory activities to do the following:

1. Continue stakeholder interactions to discuss the technical basis and acceptance criteria for conducting a reevaluation of site-specific external natural hazards. These interactions will also help to define guidelines for the application of current regulatory guidance and methodologies being used for early site permit and combined license reviews to the reevaluation of hazards at operating reactors.

2. Develop and issue a request for information to licensees pursuant to 10 CFR 50.54(f) to (1) reevaluate site-specific external natural hazards using the methodology discussed in Item 1 above, and (2) identify actions that have been taken, or are planned, to address plant-specific issues associated with the updated natural external hazards (including potential changes to the licensing or design basis of a plant).

3. Evaluate licensee responses and take appropriate regulatory action to resolve issues associated with updated site-specific natural external hazards.

Unique Implementation Challenges

The staff recognizes that the NRC and industry have limited, specialized expertise (e.g., physical scientists, hydrologists) to complete the actions associated with this recommendation.

Schedules and Milestones

Reevaluation of Other Natural External Hazards:

I. Issue a 10 CFR 50.54(f) letter 6 months following initiation of action.

   a. Initiate stakeholder interaction and technical development (e.g., methods, technical basis, acceptance criteria).

   b. Develop a 10 CFR 50.54(f) letter.

   c. Issue a 10 CFR 50.54(f) letter.

II. Evaluate licensee responses to the 10 CFR 50.54(f) letter, based on a timeline to be developed during stakeholder interactions, taking into account available resources.

   a. Write a safety evaluation or NUREG to document staff conclusions.

III. Issue orders to licensees (if needed), 3 months following a decision to issue orders.

   a. Develop the regulatory basis and draft orders.

   b. Issue orders.

IV. Initiate inspection activities, on a schedule to be determined

   a. Develop temporary instructions.

   b. Conduct inspections and document results.

V. Issue letters to close out the 10 CFR 50.54(f) letter and orders, 1 month after last inspection.

Resources for Other Natural External Hazards Reevaluations

Activity	Resource Category	Specific Expertise Needed	Estimated FTE	Locations of Most Applicable Expertise within NRC
I. Develop 10 CFR 50.54(f) letter	Project/Program Management	Plant Licensing	0.3	NRR
	Technical	Physical Science	0.3	NRO, NRR
		Hydrology	0.2	NRO, NRR
		Electrical Engineering; Structural Engineering; Plant Systems	0.1	NRR, NRO
	Legal	Plant Licensing	0.1	OGC
II. Evaluate licensee responses to 10 CFR 50.54(f) letter	Project/Program Management	Plant Licensing	0.3	NRR
	Technical	Physical Science	3.8	NRO, NRR
		Hydrology	1.4	NRO, NRR
		Electrical Engineering; Structural Engineering; Plant Systems	3.0	NRR, NRO
	Legal	Plant Licensing	0.2	OGC
III. Issue orders to licensees (if needed)	Project/Program Management	Plant Licensing	0.3	NRR
	Legal	Plant Licensing	0.2	OGC
	Technical	Hydrology	0.1	NRO, NRR
		Electrical Engineering; Structural Engineering; Plant Systems	0.3	NRR, NRO
IV. Conduct inspection activities	Regional Inspection	Inspection	1.0	All Regions
	Project/Program Management	Inspection Program Management	0.3	NRR
	Technical	Hydrology	0.1	NRO, NRR
		Electrical Engineering; Structural Engineering; Plant Systems	0.3	NRR, NRO

V. Close out 10 CFR 50.54(f) letter and orders	Project/Program Management	Project Management	0.3	NRR
	Legal	Plant Licensing	0.2	OGC
Total FTE			**12.8**	