

November 21, 2014

MEMORANDUM TO: Chairman Macfarlane
Commissioner Svinicki
Commissioner Ostendorff
Commissioner Baran
Commissioner Burns

FROM: Mark A. Satorius /RA/
Executive Director for Operations

SUBJECT: INTEGRATION OF MITIGATING STRATEGIES FOR BEYOND-
DESIGN-BASIS EXTERNAL EVENTS AND THE REEVALUATION
OF FLOODING HAZARDS

This memorandum provides the Commission with information and recommendations for coordinating requirements to implement mitigation strategies for beyond-design-basis external events with actions, if any, necessary to address reevaluated flooding hazards. In response to the March 2011 accident at Fukushima Daiichi, the U. S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, which directed power reactor licensees to develop, implement, and maintain guidance and strategies (“mitigating strategies”) to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event. In addition, the NRC issued letters to power reactor licensees pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.54(f) (hereafter referred to as the § 50.54(f) letter), which requested that licensees reevaluate the seismic and flooding hazards at their sites using updated hazard information and current regulatory guidance and methodologies. This information was requested to support NRC decisions regarding possible regulatory actions to protect the plants from these reevaluated external hazards.

The mitigating strategies and external hazard reevaluations are not fully independent activities, in that the staff has previously stated that the reevaluated external hazards would inform licensee development of the mitigating strategies, which the staff proposes to reflect in the follow-on rulemaking to Order EA-12-049. Changing the primary focus of the flooding-related response to the § 50.54(f) letters and integrating the decision-making criteria with the development and implementation of mitigating strategies will result in more timely safety enhancements to address reevaluated flooding hazards and improve the effectiveness and efficiency of the regulatory process. The NRC staff is asking the Commission to affirm that licensees for operating nuclear power plants need to address the reevaluated flooding hazards

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within their mitigating strategies, which may include developing targeted or scenario-specific mitigating strategies for some beyond-design-basis events. The staff is also requesting the Commission approve changing the primary focus of the flooding-related response to the § 50.54(f) letters to include ensuring that mitigating strategies capabilities are able to respond to and are protected against the reevaluated flooding hazard.

In response to this proposal, some staff expressed concerns that resulted in two non-concurrences on this memorandum, which are provided as Enclosures 3 and 4. The authors of the first non-concurrence define their concern as follows:

The fundamental concern with the COMSECY is that it proposes a change that bypasses current plans for a deliberate and systematic process for understanding the potential for flooding events to adversely affect nuclear power plants without sufficient regard for the importance of developing insights about flood risks. The COMSECY describes a significant departure from the current, approved process for implementing NTTF [Near-Term Task Force] Recommendation 2.1....

The authors of the second non-concurrence expressed the following concern:

We cannot support the full "integration" of Recommendations 2.1 and 4.2 because of the adverse impact on the re-consideration of flooding protection, as intended under Recommendation 2.1....

The staff made improvements to this memorandum in response to the concerns and comments identified in the non-concurrences and related interactions. The NRC staff considered a variety of factors related to potential safety benefits, timeliness of actions, and management of resources. The staff finds that integrating the activities related to flooding reevaluations and mitigating strategies is a more effective regulatory approach to achieve timely safety enhancements than those described in the non-concurrences and related documents such as 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," and Interim Staff Guidance (ISG) JLD-ISG-2012-05, "Guidance for Performing the Integrated Assessment for External Flooding." The recommendations in this memorandum reflect the NRC staff's conclusion that the best overall results involve an appropriate compromise between information gathering and analysis and actual, timely regulatory actions to achieve safety improvements.

BACKGROUND:

The accident at the Fukushima Daiichi nuclear plant in Japan highlighted the possibility that certain external events may simultaneously challenge the prevention, mitigation, and emergency preparedness measures that provide defense in depth protections for nuclear power plants. NRC's assessment of the lessons learned from the experiences at Fukushima Daiichi led to the conclusion that additional requirements were needed to increase the capability of nuclear power plants to address certain beyond-design-basis external events. As a result, the NRC imposed new requirements to enhance safety, while simultaneously asking licensees to reevaluate seismic and flooding hazards using present day standards and guidance and provide that information to the NRC.

The § 50.54(f) letters describe a two phase approach to support NRC decisions on whether to pursue regulatory actions to increase nuclear power plant capabilities to address flooding events. During the first phase, the NRC staff gathers information related to the reevaluation of flooding hazards, as well as assessing each licensee's proposed response(s) to those newly evaluated hazards. The NRC staff recognized that updated standards, models, and data might result in hazard levels for various flooding mechanisms that exceed those considered during the initial siting and licensing of some nuclear power plants.¹ As discussed in SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," the staff identified that certain flooding scenarios are of special concern because of a potential "cliff edge" effect, in that safety consequences of a flooding event may increase sharply with small increases in the flooding level. With this in mind, the NRC issued § 50.54(f) letters to all licensees to reevaluate the flooding hazards at their sites against present-day regulatory guidance and methodologies used for early site permit and combined license reviews under 10 CFR Part 52.

Licensees for operating nuclear reactors are currently submitting their reevaluated flooding hazards. Under existing plans and guidance, licensees would be expected to complete and submit integrated assessments describing the total plant response to the reevaluated hazard. These integrated assessments would include the potential impact of such events on their facilities and describe how a plant's flood protection and mitigation would maintain key safety functions for the various flooding scenarios. Under Phase 2, the staff would determine whether additional regulatory actions are necessary to protect against the updated hazards (e.g., update the design basis for structures, systems, and components (SSCs) important to safety). This paper is responsive to the staff requirements memorandum related to SECY-11-0124, "Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report," in which the staff was directed to provide the Commission with information about the technical bases and acceptance criteria for implementing Recommendation 2.1.

The staff outlined an approach in SECY-12-0025 as follows:

The NRC staff's goal is to complete Phase 1 and collect sufficient information to make a regulatory decision for most plants within 5 years. It is anticipated that collection of this information for all plants will take no longer than 7 years.

Information collection on hazard protection walkdowns consistent with Recommendation 2.3 will be implemented in a single phase. The results from these walkdowns are expected to capture any degraded, non-conforming conditions, and cliff-edge effects for flooding so that they are addressed by the licensee's corrective action program and will provide input to Recommendation 2.1. It is anticipated that this effort will be completed within approximately 1 year.

¹ During previous actions by the NRC staff to look back at external hazards after siting and licensing of a plant, the new methods sometimes identified hazard levels and associated effects (for the same or similar flooding events or for newly considered flooding mechanisms) in excess of the design or licensing basis. Examples of such activities discussed in Enclosure 1 include the Systematic Evaluation Program and the Individual Plant Examinations of External Events.

The licensees and staff completed the actions related to the Recommendation 2.3 flooding-related walkdowns in July 2014. The staff's current trajectory, under the existing plans and guidance for Recommendation 2.1, will likewise significantly exceed the projected time and resource estimates in SECY-12-0025 for the flooding-related hazard reevaluations associated with the § 50.54(f) requests for information.

Simultaneously with the reevaluation of flooding hazards, licensees were required to develop and implement improved mitigating strategies in accordance with NRC Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." Licensees are developing responsive mitigating strategies using guidance prepared by the nuclear industry and endorsed by the NRC. The primary guidance document is Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping (FLEX) Implementation Guide." The focus of these efforts is to define capabilities to protect against a variety of beyond-design-basis external hazards. The additional capabilities address plant conditions involving an extended loss of all alternating current (ac) power and challenges to the ability to remove heat from the reactor cores and spent fuel pools. As licensees have developed and implemented their mitigating strategies, the NRC has recognized that other Fukushima-related recommendations are being or could be addressed within this activity.²

NRC Order EA-12-049 requires nuclear power plant licensees to put in place mitigating strategies for a variety of beyond-design-basis external events, including flooding. The NRC staff plans to incorporate these requirements into NRC regulations through the mitigation of beyond-design-basis events (MBDBE) rulemaking. This approach ensures that licensees implement additional capabilities for dealing with the reevaluated flooding hazards identified from Recommendation 2.1. However, integrating the results of the Recommendation 2.1 activities could lead to some licensees needing to modify their mitigating strategies in response to the reevaluated flooding hazards after they have implemented plant changes and procedures to comply with Order EA-12-049. There is also a possibility that circumstances at some nuclear power plants may warrant consideration of additional measures to protect against or mitigate postulated flooding scenarios. These additional measures (beyond those imposed by Order EA-12-049 and the related MBDBE rulemaking) could be pursued voluntarily by licensees or imposed by the NRC through the process defined in 10 CFR 50.109, "Backfitting."

Under the current approach for handling the requests for information related to reevaluated flooding hazards, progress has been slower than originally estimated in SECY-12-0025 - with the reevaluations and assessments now expected to significantly exceed the original 5 to 7 year goal. There is notable slow progress in resolving the reevaluated flood hazards and a growing trend for more detailed analysis by licensees and NRC staff for various flooding mechanisms. These more complicated analyses will in turn use more licensee and NRC staff resources to

² Previous examples of integrating and consolidating Fukushima activities are described in COMSECY-13-002, "Consolidation of Japan Lessons Learned Near-Term Task Force Recommendations 4 and 7 Regulatory Activities" and SECY-14-0046, "Fifth 6-Month Status Update on Response to Lessons Learned from Japan's March 11, 2011, Great Tōhoku Earthquake And Subsequent Tsunami (Enclosure 6 - Proposal to Consolidate Post-Fukushima Rulemaking Activities)," and the related staff requirements memoranda.

prepare and review responses to the request for information. The inherent complexities of flood modeling and the evolving body of knowledge of flood hazards contribute to this dynamic situation, which is similar to other generic issues when the NRC and industry found themselves developing new analytical tools and models.

The industry's desire for more precise flood hazard estimates stems in part from the uncertainty surrounding the regulatory outcomes (i.e., lack of a well-defined Phase 2 decision-making process for flooding reevaluations). The uncertainties related to regulatory outcomes result in licensees undertaking additional analyses to avoid potentially overly conservative hazard estimates leading to unwarranted plant modifications. The analytical approaches being taken by licensees in turn change the NRC staff's plans for performing reviews. For example, the industry's expected use of more complex analyses techniques for precipitation-related flooding mechanisms is leading the staff to develop a regulatory review process that emulates a process used by the Federal Energy Regulatory Commission (FERC) and other agencies. The established FERC process takes approximately 18 months to complete and involves an independent board of consultants. This new NRC review process has yet not been established. If adopted, the process would be a first-of-a kind approach for the NRC and would involve revising schedules and further delays in achieving a final determination of the reevaluated flood hazards; an essential prerequisite for a plant-level integrated assessment as described in the current guidance. The possible use of immature technologies such as probabilistic flood hazard analysis introduce additional complexities and likely delays, should those tools be necessary to support risk-informed regulatory decisions under the current Recommendation 2.1 approach. The initial estimated schedule for the NRC's Probabilistic Flood Hazard Assessment Research Plan, which is being developed to help resolve some of these issues, extends into 2019.

DISCUSSION:

The Commission determined that reasonable assurance of adequate protection of public health and safety requires that power reactor licensees and construction permit holders develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. The agency is addressing this through Order EA-12-049 and the related MBDBE rulemaking, which impose additional regulatory requirements on licensees. As a result of the order and the expected rulemaking, licensees have been required to provide capabilities to mitigate extended losses of ac power and challenges to heat removal functions that might be caused by beyond-design-basis external events. Beyond-design-basis events have previously been incorporated into the NRC's regulations as additional risk insights became available from operating experience and analytical studies. Examples of previous instances include regulations for anticipated transients without scram (ATWS), station blackout (SBO), and loss of large areas of the plant due to explosions or fires. The NRC staff intends to use these examples and the associated regulatory processes for developing the requirements for mitigating strategies for beyond-design-basis external events. Enclosure 1 provides background information on how beyond-design-basis issues have been incorporated into the design basis for affected SSCs and treated within the licensing basis of operating nuclear power plants.

The results of the reevaluation of the flooding hazard are important to define the necessary attributes of the mitigating strategies equipment and actions to adequately protect against external events. The NRC staff plans to include this requirement in the pending MBDBE rulemaking. As such, the strategies required by the MBDBE rulemaking cannot be completed without information about the site-specific reevaluated flooding hazards.

Adjusting the primary focus of decision-making to the reliability and performance of the mitigation strategies with respect to the reevaluated flooding hazards would have some practical and positive impacts. It would prioritize developing and implementing robust mitigating strategies capable of responding to the newly identified hazards. Licensees and the NRC staff would be able to leverage their recent experience and lessons learned from implementing Order EA-12-049 in addressing potential changes to the mitigating strategies or developing targeted hazard-specific strategies for specific external events. Licensees and the NRC staff may also be able to avoid more complex flood hazard analyses and assessments because the planned approach establishes clear regulatory criteria involving the ability of mitigating strategies to address identified beyond-design-basis external events. This approach reduces the level of resources necessary to complete this portion of the evaluation, and would allow both the licensees and NRC staff to use their limited resources to resolve other important safety issues. The desire to limit the potential adverse impact on the implementation of mitigating strategies resulting from the delays and uncertainties associated with flooding reevaluations is among the reasons for the integration of activities described in this memorandum.

Focusing the flooding-related Phase 2 decision-making on mitigating strategies means that the integrated (total plant) assessment in Phase 1 is no longer needed in the form described in existing guidance documents. Instead, the mitigating strategies equipment and actions will be confirmed to protect against the reevaluated flooding scenarios. Flood protection features would be verified to provide reasonable confidence that key SSCs (e.g., turbine-driven auxiliary feedwater pumps and direct current power systems) support the ability of mitigating strategies to address the various reevaluated flooding scenarios. There are potential negative aspects to changing the focus of the Phase 1 assessment and Phase 2 decisions for the flooding reevaluations. The planned approach reduces the level of information to be submitted by licensees, and the assessments will focus on mitigating strategies instead of more varied enhancements to protect against a range of flooding conditions. A broader assessment could, for example, identify protective measures for equipment important to safety against some flooding scenarios and thereby reduce the reliance on mitigating strategies to address such events. However, the NRC staff finds that focusing the reevaluated hazards initially on mitigating strategies will produce meaningful and timely safety improvements, while accomplishing the goals of regulatory predictability, stability, and clarity. In addition, the NRC staff will use insights from the flooding reevaluations to assess the possible need to obtain additional information for specific plants and consider flooding protection or mitigation beyond that provided by the requirements for mitigating strategies. The NRC staff provides additional discussion of the integration of activities related to flooding reevaluations and mitigating strategies in Enclosure 2.

Staff's Path Forward on the MBDBE Rulemaking

The NRC staff plans to complete activities currently underway to address lessons learned from the Fukushima accident and describe how the mitigation strategies order, rulemaking, and reevaluated hazards relate to each other now that sufficient information exists to fully describe the process. Primarily, the NRC staff intends to require that licensees' mitigating strategies

address the reevaluated flooding hazards as part of the MBDBE rulemaking. The reevaluation of the flooding hazard will help define the functional requirements and reference bounds of design for the equipment and actions used for the mitigating strategies for beyond-design-basis external events. By focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements, the need to perform a broader assessment of every plant's flooding response as described in the § 50.54(f) letter and related guidance documents is unnecessary. Instead, the NRC staff would evaluate the need to perform a broader assessment of how beyond-design-basis flooding scenarios might impact plant features beyond mitigating strategies on a case-by-case basis. The staff would determine if additional information and potential plant changes should be sought for each plant or site based on the relevant information from the reevaluated flooding hazard and the plant's capabilities. The NRC staff will also evaluate the implications of this approach for flooding on seismic and other hazard reevaluations, generic issues, and other ongoing NRC activities.

The NRC staff conducted several public meetings with the nuclear industry and members of the public regarding the need to consider the reevaluated flooding hazard and possibly revise equipment or strategies to address conditions different than those considered in the implementation of Order EA-12-049. The industry recognized that the coincident performance of the flooding reevaluations and the implementation of the order would subsequently require assessing the mitigating strategies developed to address a variety of external hazards to ensure they provide capabilities sufficient to address the reevaluated flooding hazards from Recommendation 2.1. These discussions helped identify an approach (subsequently described in a letter from NEI dated November 4, 2014) that initially focuses the flooding reevaluations on the mitigating strategies. Licensees will assess the mitigating strategies developed to address Order EA-12-049 against the site-specific flooding scenarios from their Recommendation 2.1 reevaluations. The mitigating strategies and related equipment will be confirmed to adequately address the postulated scenario, or the licensee will revise the mitigating strategies. Changes to the mitigating strategies could involve modifications to the existing equipment and plans developed for multiple hazards or could involve developing a targeted strategy for a specific flooding scenario. The NRC staff is asking the Commission to support the planned approach by affirming that the MBDBE rulemaking needs to require mitigating strategies that are able to address the reevaluated flooding hazards developed in response to the § 50.54(f) letters in order to ensure reasonable assurance of adequate protection of the public health and safety.

It should be noted that in some limited cases, the newly estimated flooding hazards could result in significant damage to a nuclear power plant site and licensees may need to develop scenario-specific strategies. However, even in such extreme cases, licensees will be required by the planned MBDBE regulation to have appropriate mitigating strategies that provide capabilities that can be deployed to prevent fuel damage in reactor cores or spent fuel pools. These scenario-specific strategies may involve an orderly plant shutdown followed by unconventional measures, such as a rapid entry to refueling modes of operation, allowing flood waters into buildings, and pre-staging equipment and personnel to higher elevations. The NRC staff would review any such proposals to ensure the licensee's analyses, assumptions, and planned actions appropriately address the risk from such flooding scenarios. The NRC staff is also seeking Commission affirmation on this general approach for licensees developing mitigating strategies for floods that might result in significant damage to a nuclear power plant site.

Staff's Evaluation of Requirements Beyond Order EA-12-049 and the MBDBE Rulemaking

The NRC staff will use insights from the flooding reevaluations to assess for each operating plant the possible need for additional flooding protection or mitigation beyond that provided by the requirements for mitigating strategies. The staff will review licensees' responses to the flooding-related § 50.54(f) letters, overall integrated plans for mitigating strategies, and other available and relevant information as part of an appropriate assessment of each plant's capabilities to address reevaluated flooding hazards. These assessments will consider information about revised flooding conditions, estimated event frequencies, available response times for identified scenarios, plant-specific configurations and licensing histories, and any other factors relevant to the staff's evaluation of potential regulatory actions. The NRC will address, as a separate matter from mitigating strategies, whether the existing design basis and licensing basis for flooding of any nuclear power plant continues to be acceptable if the re-evaluated flood hazard at any plant is greater than the plant's design basis and licensing basis. The NRC staff will follow the established processes for imposing additional requirements on licenses including Management Directive 8.4, "Management of Facility-specific Backfitting and Information Collection," which describe how to initiate, review, and disposition these types of safety concerns. The evaluation of plant-specific backfits and their potential to improve overall plant safety will, if the Commission affirms the recommendations in this memorandum, consider the benefits from requiring licensees to have mitigating strategies to address the reevaluated flooding hazards. The staff will document the disposition of the flooding reevaluations and inform licensees and other stakeholders about the results, including the possible need for more information or consideration of plant-specific actions.

The current efforts to integrate activities related to mitigating strategies and flooding reevaluations reflect the NRC staff's conclusion that the best overall results involve an appropriate compromise between information gathering and analysis and actual, timely regulatory actions to achieve safety improvements. The NRC staff is requesting that the Commission approve the changes to the Recommendation 2.1 flooding assessments and integration of the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-049 and the related MBDBE rulemaking.

Staff Recommendation

The staff recommends that the Commission affirm the following:

1. Licensees for operating nuclear power plants need to address the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events (Order EA-12-049 and related MBDBE rulemaking),
2. Licensees for operating nuclear power plants may need to address some specific flooding scenarios that could significantly damage the power plant site by developing targeted or scenario-specific mitigating strategies, possibly including unconventional measures, to prevent fuel damage in reactor cores or spent fuel pools, and

3. The staff should revise the Recommendation 2.1 flooding assessments and integrate the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-049 and the related MBDBE rulemaking.

SECY, please track.

Enclosures:

1. [Background - Design-basis Events, Design-basis Information, and External Events](#)
2. [Coordination and Clarification](#)
3. [Non-Concurrence Package 2014-010](#)
4. [Non-Concurrence Package 2014-011](#)

Enclosure 1 – Background

Design-basis Events, Design-basis Information, and External Events

The terminology related to nuclear plant licensing and relationships between design-basis, design-basis events, beyond-design-basis accidents or events, and licensing basis can be difficult to follow. The complexity of the terminology has increased over the last several decades as new methodologies, such as probabilistic risk assessment (PRA), were introduced and as the U.S. Nuclear Regulatory Commission (NRC) and industry responded to specific issues or concerns (e.g., station blackout (SBO)). As explained in “A Short History of Nuclear Regulation, 1946–2009,” the initial design and licensing of nuclear power plants were approached as follows:

Regulators using a deterministic approach simply tried to imagine “credible” mishaps and their consequences at a nuclear facility and then required the defense-in-depth approach—layers of redundant safety features—to guard against them.

These “maximum credible accidents” were, in turn, used to define design-basis events, which were then used to determine the values of controlling design parameters for structures, systems and components (SSCs); the safety classification of SSCs; the contents of licensing-basis documents (such as final safety analysis reports (FSARs) and technical specifications); and needed supporting documents, such as plant procedures. The licensing efforts for early plants focused, therefore, on “design-basis events.” Regulator and licensee attention was centered on the mitigation of anticipated operational occurrences and design-basis accidents and on ensuring that plant structures and layouts addressed design-basis external hazards such that safety-related equipment was designed to withstand or otherwise be protected against such hazards, and plants could proceed from operations to a safe shutdown condition following a design-basis event.¹

The importance of the term “design-basis events” is, in part, because of its use within the definition of “safety-related” SSCs. The term “safety-related” is used to distinguish those SSCs warranting special treatment in terms of quality assurance, environmental qualification, inclusion in FSAR safety analyses, and applicability of various industry codes and standards. In particular, safety-related SSCs must be protected from, or designed to withstand safe shutdown earthquakes (see 10 CFR Part 100, “Reactor Site Criteria,” and 10 CFR Part 50, Appendix S). The definition of “safety-related” SSCs provided in 10 CFR 50.2, “Definitions,” is as follows:

Safety-related structures, systems, and components means those structures, systems, and components that are relied upon to remain functional during and following design basis events to assure:

¹ Design-basis events are defined in 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants,” as follows:

Design-basis events are defined as conditions of normal operation, including anticipated operational occurrences, design-basis accidents, external events, and natural phenomena for which the plant must be designed to ensure functions (b)(1)(i) (A) through (C) of this section [see above items 1, 2 and 3 under definition of safety-related SSCs]

- (1) *the integrity of the reactor coolant pressure boundary;*
- (2) *the capability to shut down the reactor and maintain it in a safe shutdown condition; or*
- (3) *the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1) or 10 CFR 100.11 ["Determination of Exclusion Area, Low Population Zone, and Population Center Distance"] of this chapter, as applicable.*

This general approach was intended to address risks to the public health and safety by identifying potential internal and external design-basis events and ensuring that plant SSCs and personnel were able to respond to such events and prevent or limit the release of radioactive materials.

Lessons learned from subsequent studies of nuclear plant risks and operational experience led the NRC to identify plant events and conditions beyond those included in the original licensing of nuclear power plants that could result in the release of radioactive material. Accordingly, the NRC imposed additional requirements in regard to such events. An example is the requirement to better address anticipated transients without scram (ATWS) events. The NRC move to adopt measures to control or reduce risks for the beyond-design-basis events and include these in the licensing basis for nuclear plants began in the 1980s and continues. The move to this approach reflects the longstanding NRC approach that ordinarily affords the applicant or licensee flexibility to choose the method of addressing a safety concern that best suits its purposes. Given the ability to address some newly identified safety concerns without re-defining design-basis events, the NRC has adopted approaches less stringent than those used for design-basis events for NRC regulations to address those safety concerns and plant-specific issues since the 1980s. The NRC plans to continue this approach in addressing the reevaluation of external hazards in the context of their effect on mitigation strategies. The flooding reevaluations would be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events. Exceptions to this approach might be taken on a plant-specific basis if justified by the NRC evaluations performed in accordance with 10 CFR 50.109, "Backfitting." An example where this exception might be considered is a flooding scenario with a relatively high estimated frequency and an associated high probability of the flooding event leading to core damage. In such a case, the NRC staff may find that reliance on mitigating strategies is not sufficient and flood protection or mitigation requirements beyond the MBDBE rulemaking may be warranted. The staff could propose to require the licensee address this issue by revising the design-basis flood and modifying the plant to protect safety-related SSCs.

In contrast to "design-basis events" that relate to the safety classification and special treatment requirements for plant SSCs, the term "design basis" is used in a more general manner as reflected in the following definition from 10 CFR 50.2:

Design basis means that information which identifies the specific functions to be performed by a structure, system, or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted 'state of the art' practices for achieving functional goals, or (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals.

From this broader definition, it is possible to have beyond-design-basis events, such as ATWS and SBO contribute to the analysis of design-basis functions of specific SSCs. Explanations and guidance related to design-basis information are provided in Appendix B to Nuclear Energy Institute (NEI) 97-04, "Design Bases Program Guidelines," which is endorsed by the NRC in Regulatory Guide (RG) 1.186, "Guidance and Examples for Identifying 10 CFR 50.2 Design Basis." NEI 97-04 describes the information usually found in plant FSARs that makes up the functional requirements and the controlling parameters chosen as reference bounds for design that help define the design basis for plant SSCs. The guidance document also defines broader topics that need to be addressed within the design basis for plant SSCs. These topical design-basis issues include the following:

- fire protection
- flooding (internal and external)
- tornadoes and hurricanes
- seismic criteria
- missiles (internal and external)
- separation (Hazards)
- electrical separation and independence
- single failure criteria
- pipe break criteria
- environmental qualification (electrical and mechanical)
- SBO
- ATWS

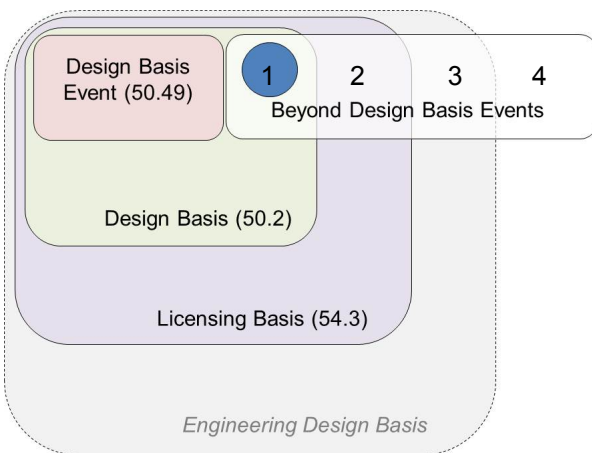
The above topical design issues include several related to external events, including flooding, and also address design features for the beyond-design-basis events of SBO and ATWS. The topical design issues are derived from the following explanation from Appendix B to NEI 97-04:

Relationship of 10 CFR 50.2 Design Bases Functions to Licensing
Basis and Part 50 Requirements

10 CFR 50.2 design bases functional requirements are derived primarily from the principal design criteria for an individual facility (the minimum standards for which are set by 10 CFR Part 50 Appendix A) and NRC regulations such as the Emergency Core Cooling System, SBO and ATWS rules that impose functional requirements or limits on plant design. 10 CFR 50.2 design bases are a subset of a plant's licensing basis. While a plant's licensing basis includes all applicable requirements of Part 50, not all Part 50 requirements have corresponding 10 CFR 50.2 design bases. For example, in Appendix A, several GDC [general design criteria] contain requirements for fabrication, construction, testing, inspection, and quality. These are process requirements on SSCs—not requirements for the performance of intended SSC functions—and are therefore not 10 CFR 50.2 design bases.

Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," and the mitigation of beyond-design-basis events (MBDBE) rulemaking will establish regulatory requirements to govern the performance of installed SSCs and portable equipment in terms of responding to an extended loss of ac electrical power and loss of normal access to the ultimate heat sink resulting from beyond-design-basis external events. Since the rule would require a licensee to protect these SSCs and equipment from beyond-design-basis external events, existing requirements and guidance, including RG 1.186, provides for an effective and efficient path forward and can be used to address possible future issues regarding establishing and controlling licensing basis information.

Figure 1 provides a stylized representation of the relationships between various elements of the licensing basis for a nuclear power plant. An example of how the elements fit together is offered below using a hypothetical plant and an auxiliary feedwater system consisting of one train using an alternating current (ac) driven pump and one train using a turbine driven pump. Both trains are used to address anticipated operational occurrences and other design-basis events involving the failure of plant equipment. Therefore, both trains are categorized as safety related equipment and are required to remain functional during the defined design-basis flood. A review of the established design basis for each train would therefore include pumping capacities and other functional capacities reflected in the final safety analysis report (FSAR) as well as needed protections against external flooding hazards up to the design-basis flood. The design basis for one or both trains may also include functional requirements to address a beyond-design-basis event such as an SBO. For this example, the turbine-driven train is assumed to be used within the licensee's mitigating strategies. If the Commission approves this approach, the licensee would add a design-basis requirement for the turbine-driven train to address the reevaluated flooding hazard. In accordance with existing guidance, the added measures to address the reevaluated flooding hazard would not necessarily need to be categorized as safety related. The auxiliary feedwater system is likely to have testing or inspection-related features defined within the licensing basis for the plant, but these features are not considered to be within the design basis for the system. The licensee may also establish controls or capabilities for the auxiliary feedwater system that go beyond regulatory requirements and which would be captured in their own plant documentation (i.e., engineering design basis in Figure 1).



Note that beyond-design-basis events might warrant:

1. establishing design basis requirements for affected SSCs (e.g., mitigating strategies for flooding reevaluations),
2. a feature or action documented in the licensing basis (e.g., flooding enhancement or interim action captured as regulatory commitment in § 50.54(f) response),
3. inclusion in licensee programs (engineering design basis) outside of regulatory controls (e.g., flood protection for SSCs not important to safety for asset protection reasons), or
4. No action or documentation (e.g., event considered not credible)

Figure 1

Scheduling issues may constrain some licensees to implement changes to comply with Order EA-12-049 before flooding reevaluations for the affected plants are complete. However, the NRC staff interprets Commission direction to be that the appropriate installed and/or

portable equipment and related mitigating strategies ultimately need to address the reevaluated hazards to ensure reasonable assurance of adequate protection of public health and safety. This could result in licensees needing to review and possibly modify SSCs or strategies if the flooding reevaluations result in changes to the functional requirements or reference bounds for design from those previously used to develop and implement plans for Order EA-12-049. The MBDBE rulemaking could codify these expectations consistent with the Commission's intended outcome for the regulatory requirements imposed by the order and related rulemaking.

The NRC staff has had several public meetings with the nuclear industry regarding the need to consider the reevaluated flooding hazard and possibly revise equipment or strategies to address conditions different than those considered in implementing Order EA-12-049. The industry also recognized that the coincident performance of the flooding reevaluations and implementation of the order would require assessing the flexible strategies developed to address multiple hazards to ensure they provide capabilities sufficient to address the Recommendation 2.1 reevaluated flooding hazards.² These discussions have helped to clarify the relationships between the Fukushima-related activities and to support revising guidance documents for addressing the order and flooding reevaluations. As a general matter, the nuclear industry acknowledges that licensees will need to assess the mitigating strategies required by Order EA-12-049 against the flooding scenarios from the Recommendation 2.1 reevaluations. Changes to the mitigating strategies after initial implementation of Order EA-12-049 could involve modifications to the existing equipment and plans developed for multiple hazards or could involve developing a targeted strategy for specific flooding scenarios at a particular facility. The nuclear industry and NRC staff are revising appropriate guidance documents to incorporate the clarifications and assessments of mitigating strategies in light of the flooding reevaluations. The mitigating strategies and related equipment will be confirmed to adequately and reliably address the reevaluated flooding scenarios as part of the activities associated with the MBDBE rulemaking.

Regulatory Requirements Related to External Hazards

The NRC and its predecessor agency, the Atomic Energy Commission, established regulatory requirements for siting and designing nuclear power plants to ensure safety-related SSCs were designed to withstand or otherwise protected against natural hazards, such as earthquakes and floods. Failure to protect SSCs important to safety from natural phenomena with appropriate safety margins has the potential to result in common-cause failures with significant consequences. The accident at Fukushima demonstrated the importance of providing measures to protect a plant from and mitigate external events. However, the approaches to evaluating external hazards have evolved over time as new information regarding site hazards and the potential consequences have become available. As a result, the licensing basis, design, and level of protection from natural phenomena differ among the existing operating reactors in the United States. Much of this variation can be attributed to the time when the plant was constructed and licensed for operation, once the issue of site selection was settled. Except as imposed by the NRC through specific regulations, orders, or license conditions, licensees are not required to assess or modify plant designs to meet new or revised standards. Nor are licensees normally requested to periodically assess possible changes to plant designs or procedures to address external hazards beyond those used in the initial plant siting and licensing decisions.

² See letter dated November 4, 2014, from Mr. Anthony Pietrangelo, Nuclear Energy Institute, to Chairman Macfarlane, entitled "Integration of Mitigating Strategies with Reevaluated External Hazards Information," Agencywide Documents Access and Management System (ADAMS) Accession No. ML14309A544.

The NRC recognized these differences between plants and the need to assess early plants against the evolving standards in the 1970's following the development of the standard review plan (SRP). The agency identified potential safety issues and reviewed the early plant designs against the then-newer SRP guidance under the systematic evaluation program (SEP). The SEP included several flooding issues and resulted in some plant-specific reviews and design or procedure changes implemented by impacted licensees to address potentially higher flooding hazards. Generic Letter 95-04, "Final Disposition of the Systematic Evaluation Program Lessons-Learned Issues," dated April 28, 1995, describes the SEP and the resolution of the issues. Many of the SEP issues were resolved by the subsequent requests for licensees to perform individual plant examinations. Supplement 4 to Generic Letter 88-20, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities – 10 CFR 50.54(f)," addressed some of the flooding issues. The actions taken by licensees to address potential vulnerabilities or other flooding concerns were not subsequently incorporated into regulations or operating licenses. In recognition that the NRC's regulations do not include requirements for licensees to periodically update plant designs to newer standards, revised estimates of external hazards, or other risk insights, Generic Letter 88-20 identified that the IPEEE might lead to the following assessment:

If NRC consideration indicates that plant design or operation could be enhanced by substantial additional protection beyond NRC regulations, appropriate enhancement will be recommended and supported with backfit analysis in accordance with 10 CFR 50.109.³

In the 1990's, the NRC identified issues with the control of licensing basis information. The NRC staff recommended specific actions in SECY-97-036, "Millstone Lessons Learned Report, Part 2: Policy Issues," dated February 12, 1997, to improve the understanding and control of licensing basis information. In a staff requirements memorandum dated May 20, 1997, the Commission directed the staff, in part; to issue guidance for complying with requirements in 10 CFR 50.71(e) so that updated final safety analysis reports (UFSARs) reflect changes to the design bases and address the effects of other analyses performed since original licensing. In response, the NRC staff issued RG 1.181, "Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e)." RG 1.181 endorsed industry guidance provided in the document NEI 98-03, "Guidelines for Updating Final Safety Analysis Reports." These guidance documents identified as "historical information" industry or other data obtained to support or develop the original plant design bases, including that relating to natural or manmade phenomena such as geography, meteorology, hydrology, geology, seismology, population density, and nearby facilities.⁴ The guidance defines historical information as that information that was accurate at the time the plant was originally licensed, but is not intended or expected to be updated for the life of the plant. Even though the NRC anticipated that this information would not need to be updated during the licensed period, licensees remain obligated to inform the

³ Backfitting is permitted only after a formal, systematic review to ensure that changes are properly justified and suitably defined. The requirements of this process are intended to ensure order, discipline, and predictability and to optimize the use of NRC staff and licensee resources. With limited exceptions such as changes needed to ensure reasonable assurance of adequate protection of public health and safety, the NRC must determine that the proposed backfit will substantially increase the overall protection of public health and safety or the common defense and security and that the direct and indirect costs for the facility are justified in view of the increased level of protection.

⁴ This information is typically found in Chapter 2 of the UFSAR.

NRC of issues that they determine to have a significant implication for public health and safety (see 10 CFR 50.9, "Completeness and Accuracy of Information").

Two relatively recent events—the August 2011 earthquake near the North Anna Power Station nuclear plant in Virginia and the flooding of the Missouri River in June 2011 that impacted the Fort Calhoun Station nuclear plant—have led the NRC to review regulatory requirements related to external events. Both events challenged or slightly exceeded the design-basis events established for protection against natural phenomena for the two plants. Each event also involved the NRC assessing the regulatory requirements in support of decisions related to the restart of the plants. In keeping with the established agency positions, the NRC did not alter the design-basis events used during the initial siting and licensing of these plants. As part of the process of gaining NRC approval for restart, the licensees for both stations did, however, improve capabilities to deal with the specific external event that had affected their facility. Licensees made changes to UFSARs or made regulatory commitments to capture these changes in the appropriate licensing basis documents.

Although licensees are not generally required to identify and address changes to external hazards to their nuclear power plants, the NRC has well-established programs to address potential safety issues identified from operating experience and hazard studies performed by other Federal agencies. Two examples related to external hazards are Generic Issue (GI) 199, "Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants," and GI-204, "Flooding of Nuclear Power Plant Sites Following Upstream Dam Failure." The NRC's programs include various steps to identify issues, assess the safety significance, determine needs for information collection, and evaluate possible regulatory actions. Both of these GIs were being pursued prior to the Fukushima accident and the NRC staff subsequently incorporated them into the broader activities related to lessons learned from Fukushima.

The accident at the Fukushima Daiichi nuclear plant in Japan resulted in additional NRC assessments of the regulatory requirements associated with protecting nuclear power plants in the United States from natural phenomena, such as large earthquakes and floods. The NRC undertook a number of actions to address lessons learned from the accident in Japan, including imposing several new requirements to enhance safety, and requiring licensees to submit information on the reevaluation of seismic and flooding hazards using present-day standards and guidance. In addition to the actions initiated by the NRC, Congress directed the agency in Section 402 of the Consolidated Appropriations Act, 2012, (Public Law 112-074, dated December 23, 2011), to require reevaluation of licensees' design bases for external hazards and expands the scope to include other external events, as described below:

The Nuclear Regulatory Commission shall require reactor licensees to reevaluate 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.

The NRC is responding to the above Congressional direction through its activities related to seismic and flooding reevaluations under the Near-Term Task Force (NTTF) Recommendation 2 and the required implementation of mitigating strategies. Insights from the seismic and flooding reevaluations and the ongoing activities related to implementation of Order EA-12-049 will be used to develop plans to address other external hazards (e.g., wind-related events). As previously discussed, the reevaluations of flooding and other hazards will help to define the functional requirements and reference bounds for design (i.e., design-basis) that are applicable to specific SSCs used within licensees' mitigating strategies for beyond-design-basis external events. The possible performance of periodic evaluations of the risks posed to nuclear power plants by external events is being considered under a separate activity (NTTF Recommendation 2.2). The NRC staff will assess possible approaches for such periodic evaluations and make recommendations to the Commission in a future paper. The staff will also assess the implications that implementing the approach described in the memorandum for flooding reevaluations has on other hazard reevaluations, generic issues, and related NRC activities.

Enclosure 2 – Coordination and Clarification

Licenses are currently evaluating flooding hazards using present-day standards and guidance and submitting reports to the U.S. Nuclear Regulatory Commission (NRC) in accordance with Phase 1 of the activities associated with the Near-Term Task Force's (NTTF's) Recommendation 2.1. In addition to the hazard reevaluation, each licensee who determines that the hazard for its plant exceeds the current design-basis flood level was requested to describe interim actions taken or planned that address the specific flooding issues identified by the reevaluation. The request for information and related guidance also call for affected licensees to perform an integrated assessment of the effects of higher flood levels on the nuclear power plant site. The integrated assessment was initially intended to evaluate the total plant response to the flood hazard and identify vulnerabilities and actions to address them. The integrated assessment could consider multiple and diverse capabilities such as physical barriers, temporary protective measures, and operational procedures. The capabilities being developed and implemented as part of the mitigating strategies required by Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," could also be considered as part of an integrated assessment.

As licensees were performing their reevaluations of seismic and flooding hazards, questions arose regarding the regulatory treatment of flood levels that were potentially higher than those established as design- or licensing-basis events for specific facilities. These questions translate to how the NRC staff would determine if regulatory actions are necessary under Phase 2 of the program and how those decisions are integrated with other Fukushima-related activities. A challenge in answering such questions is that the NRC response to the Fukushima accident involves the concurrent imposition and implementation of new requirements and the collection and assessment of information, such as the reevaluations of external hazards. The NRC staff has provided some guidance and plans regarding the decision-making process and integration of Fukushima-related activities to address specific questions during the reevaluation of external events and the implementation of mitigating strategies. The collection and assessment of information related to flooding hazards as part of the NRC's resolution of the NTTF's Recommendation 2.1 would (if Commission affirms staff's recommendations) help establish functional requirements and reference bounds for design to address external event scenarios in accordance with the generic mitigating strategies requirements. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies could, in many cases, improve the efficiency of the NRC's regulatory process by eliminating the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments.

In keeping with the established policies that reevaluated hazards are not automatically incorporated into the licensing basis for operating reactors, but instead would be assessed in accordance with the NRC's regulation for considering new regulatory requirements (i.e., 10 CFR 50.109, "Backfitting"), the Director of the NRC's Office of Nuclear Reactor Regulation provided supplemental information in letters dated March 1, 2013, regarding flooding reevaluations and February 20, 2014, for seismic reevaluations. The letter, dated March 1, 2013, stated:

The staff considers the flood hazard re-evaluations being performed pursuant to the 50.54(f) letter to be beyond the current design/licensing basis of operating plants. Consequently, the results of the analysis performed using present-day regulatory guidance, methodologies, and information would not generally be expected to call into question the operability or functionality of SSCs. Therefore, the results are not expected to be reportable pursuant to 10 CFR 50.72, "Immediate notification requirements for operating nuclear power reactors," and 10 CFR 50.73, "Licensee event report system." However, as with any new information that may arise at a plant, licensees are responsible for evaluating and making determinations related to operability and any associated reportability on a case-by-case basis.

and:

Notwithstanding the preceding discussion, and as noted in the 50.54(f) letter, based upon the results of the review of the responses and other available information, the staff may impose additional requirements to protect against the re-evaluated flood hazard. As always, the safety of the operating plants is of paramount importance. The NRC staff will follow established regulatory processes, including the backfit rule, in determining whether additional requirements are warranted. Further, as with any submittal to the NRC, licensees should evaluate the content to determine if it requires special treatment (e.g., security-related, proprietary, etc.) and request the information be withheld from public disclosure, as appropriate.

As licensees and the NRC staff were assessing the reevaluations of external hazards, they were also working on implementing the order that required the development and implementation of mitigating strategies for beyond-design-basis external events. The initial plans for the mitigating strategies allowed the use of the most recent site flood analysis (e.g., the design-basis flood) because the licensees had not yet completed the Recommendation 2.1 hazard reevaluations. However, the need for the mitigating strategies to address external hazards (especially flooding) exceeding the original design-basis levels for some facilities had been recognized during discussions on implementation of Order EA-12-049 and this point was incorporated into staff and industry guidance documents. The incorporation of the beyond-design-basis external hazards into measures being taken to control risks via implementation of improved mitigating capabilities and strategies is reflected in the regulatory basis document published for the mitigation of beyond-design-basis events (MBDBE) rulemaking activity. The NRC staff described the linkage between the reevaluation of hazards and the planned requirements for mitigating strategies as follows in the published regulatory basis document:

Since the purpose of the SBOMS [Station Blackout Mitigating Strategies (SBOMS) now referred to as MBDBE] rulemaking would be to provide mitigation capability for extreme external events, information from NTTF Recommendation 2.1 regulatory activities or other re-evaluations of site-specific hazards would be relevant and need to be addressed and could result in changes to the facility. These changes could include changes to: installed equipment; portable equipment; portable equipment connections; and/or guidance and strategies.

Consistent with Order EA-12-049 and related regulatory guidance, it is expected that the SBOMS rule would contain requirements to maintain the SBOMS capabilities, including the protection afforded the equipment consistent with any updated hazard analyses. The supporting SOC and regulatory guide would indicate that the meaning and intent of this provision would be to ensure that new information or operating experience feedback (e.g., new information about a re-evaluated hazard) that impacts the SBOMS equipment and strategies would need to be addressed, and the SBOMS strategies and equipment protection would be updated accordingly.

The relevant hazard information would be taken into account in showing that adequate time for use of portable equipment can reasonably be met as described in [Nuclear Energy Institute] NEI 12-06, Section 3.2.1.7, Principle 6, and clarified in JLD-ISG-2012-01's Staff Position of Section 2.1.¹ The establishment of an appropriate hazard is, therefore, an important element of the strategies that requires maintenance of mitigation capability for changes in the facility that could impact the identified time constraints. As such, the staff expects that NTTF Recommendation 2.1 activities, for licensees having re-evaluated hazards that exceed their current design basis, could have a significant impact on their SBOMS equipment and strategies. For example, the industry and the NRC are currently considering an expedited approach for the treatment of seismic issues to address NTTF Recommendation 2.1, and the result of that effort could impact the SBOMS equipment and strategies related to this rulemaking. The SBOMS rule could serve to codify the requirement for establishing and addressing re-evaluated hazards and their impact on mitigation equipment and strategies.

The completion and submittal of flooding reevaluations and the development and implementation of mitigating strategies for beyond-design-basis external events are bringing to the forefront the issue of the regulatory treatment of hazards that exceed existing design-basis flood levels. Licensees have developed interim actions and are undertaking additional analyses and plant changes to address the potential effects of beyond-design-basis natural events on equipment important to safety, and in particular on equipment used as part of the mitigating strategies associated with Order EA-12-049 and the MBDBE rulemaking. The reevaluation of flooding hazards will likely raise questions from both internal and external stakeholders regarding the mitigation of risks from water levels significantly above the original design bases for individual facilities. The NRC staff has, therefore, engaged the nuclear industry and developed a general approach for Phase 2 of Recommendation 2.1 on flooding and the process by which the flooding reevaluations will be incorporated into the overall response to lessons learned from the Fukushima Daiichi accident. As discussed above, the flooding reevaluation activities are supporting (1) the establishment of design basis functions and reference bounds for design for mitigating strategies and, if warranted, (2) support for plant-specific evaluations of other possible regulatory actions (i.e., potential plant-specific backfits). The use of the flooding reevaluations from Recommendation 2.1 primarily to define functional requirements and

¹ NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," is the industry guidance document for implementing NRC Order EA-12-049 and was endorsed in NRC interim staff guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events."

reference bounds for mitigating strategies is a change from existing guidance and descriptions provided in briefings and reports to the Commission and the preliminary draft proposed rule does not require action in this regard. This integration of activities is an appropriate way to provide reasonable confidence that key safety functions are maintained during flooding scenarios while improving the efficiency and effectiveness of addressing lessons learned from the Fukushima accident.

The NRC staff finds that the integration of the activities will provide the desired outcome in terms of meaningful and assured safety improvements. The recommended approach also provides benefits in terms of establishing regulatory clarity and stability, reducing demands on schedules and resources, and ensuring timely responses to the lessons learned from the Fukushima accident. Primarily, the NRC staff proposes that the Commission require that licensees' mitigating strategies address the reevaluated flooding hazards as part of the MBDBE rulemaking. The reevaluation of the flooding hazard will help define important attributes of the equipment and actions used for the mitigating strategies for beyond-design-basis external events. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements could reduce the need for a broader assessment of the plant response as described in the current flooding-related guidance documents. There may be circumstances where the staff concludes that the flooding reevaluations warrant investigating the need for additional protection or mitigation beyond that provided by mitigating strategies. The current efforts to coordinate activities related to mitigating strategies and flooding reevaluations would improve the efficiency of implementing ongoing safety improvements. The NRC staff is requesting that the Commission approve the revised focus of Phase 1 flooding assessments and integration of Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-049 and the related MBDBE rulemaking.

Establishing Design-Basis Functions and Values for Mitigating Strategies SSCs

A major part of addressing the lessons learned from the Fukushima accident for nuclear power plants in the United States is the development and implementation of mitigating strategies for beyond-design-basis external events. Figure 2.1 provides a simplified representation of the issue and resultant mitigating strategies. The figure shows how a beyond-design-basis event, such as a flooding scenario exceeding the values used to protect safety-related SSCs, can initiate a plant upset (Point 1). Nuclear power plants are designed with multiple safety systems to ensure that important safety functions, such as core cooling, are provided and protected against design-basis events (Point 2). However, postulated beyond-design-basis events can not only initiate a plant upset but can also challenge the availability of equipment performing key safety functions (Point 3). The Fukushima accident is an example of such an event where a tsunami exceeded the established flood protection features, caused the loss of electrical power and other safety systems, and ultimately a loss of safety functions needed to maintain the integrity of the reactor core and containment structures. The mitigating strategies put in place to address such external events therefore include measures (primarily location and separation) to protect some equipment from beyond-design-basis external events and thereby provide capabilities to prevent fuel damage in the reactor core or spent fuel pool and a significant release of radioactive material from the affected plant should the site be faced with external events more severe than previously analyzed (Point 4).

Simplified Representation
Mitigating Strategies for Beyond Design Basis External Events

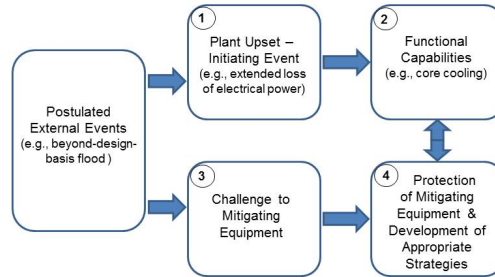


Figure 2-1

The following Figure 2-2 expands on this simple representation and includes the primary path related to ensuring mitigating strategies are developed for beyond-design-basis external events (Point 3), as well as the conditional path if consideration of additional plant-specific backfits might be warranted (Point 6). The availability of reevaluated flooding hazard information and the possible differences between reference bounds for design assumed for compliance with Order EA-12-049 and the MBDBE rulemaking are reflected in the letter “a” and “b” designations. Finally, Point 7 simply reflects that any evaluation of a potential backfit would need to consider the requirements imposed for improved mitigating strategies and the possibility that a plant-specific backfit might be addressed by enhancements to the established mitigating strategies.

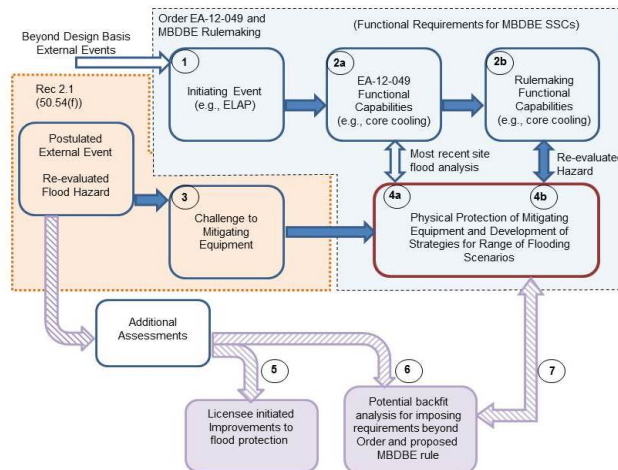


Figure 2-2

The industry and NRC staff were faced with challenges related to the schedules for implementing Order EA-12-049 and the re-evaluation of flooding hazards using present day standards and guidance. The need to develop and implement plans for mitigating strategies for beyond-design-basis external events prior to completing the reevaluation of seismic and flooding hazards led the NRC staff to accept for the purpose of Order EA-12-049 that the functional requirements for installed and portable equipment could, if other information was not

available, be established at conditions associated with the most recent site flood analysis.² There is, however, a general consensus that the desired end state following completion of the hazard reevaluations and implementation of the MBDBE rulemaking is that licensees have mitigating strategies to address the scenarios identified from the Recommendation 2.1 assessments. Guidance documents and the regulatory basis for the MBDBE rulemaking have included statements that the mitigating strategies are expected to address beyond-design-basis events, including the flooding reevaluations resulting from the Recommendation 2.1 requests for information. However, incorporating the flooding reevaluations and integrated assessments into the process to define functional requirements for mitigating strategies equipment may require licensees to perform additional evaluations of installed equipment, structures, and the placement of portable equipment to reconcile the mitigating strategies plans and the results from the flooding assessments.

Although the focus for the reevaluated flooding hazards is related to assessing the capabilities for mitigating strategies, the activities related to the flooding reevaluations may result in the NRC staff identifying safety concerns and the need to consider regulatory actions beyond those being implemented in accordance with Order EA-12-049 and the related MBDBE rulemaking. The NRC staff will use established processes such as those defined in Management Directive (MD) 8.4, "Management of Facility-specific Backfitting and Information Collection" to initiate, review, and disposition any such safety concerns. MD 6.4, "Generic Issues Program," defines the process for raising and resolving generic safety concerns.

The planned increased integration of the re-evaluation of flooding into the mitigating strategies activities will serve to enhance the plant improvements being implemented in response to the lessons learned from the Fukushima Daiichi accident. The NRC staff described in the § 50.54(f) letter and related guidance an approach where Phase 1 of the flooding assessments (hazard reevaluation, interim actions, and integrated assessment) would support a subsequent NRC decision on appropriate regulatory actions. Those regulatory actions could include requiring licensees to prevent flooding of safety-related SSCs by improving flooding protection (akin to redefining the design-basis flood), requiring mitigating capabilities for cases where the availability of safety-related SSCs are challenged by flood waters, or some combination of actions to prevent or mitigate the risks from the reevaluated flooding hazards. As discussed above, the relationship between the external hazard re-evaluations and the development of mitigating strategies for such events has become clearer as both activities have developed over time, and the planned integration of the activities will support a more efficient and effective resolution of the issues. The NRC staff undertook improved coordination of the activities given that both centered on providing key safety functions during challenging external events. This paper responds to the staff requirements memorandum related to SECY-11-0124, "Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report," in which the staff was directed to provide the Commission with information about the technical bases and acceptance criteria for implementing Recommendation 2.1.

² NEI 12-06 includes guidance for screening and considering external events, including flooding scenarios that states "The equipment should be stored in one or more of the following configurations: (a) Stored above the flood elevation from the most recent site flood analysis. The evaluation to determine the elevation for storage should be informed by flood analysis applicable to the site from early site permits, combined license applications, and/or contiguous licensed sites...."

The integrated assessments envisioned by the original guidance provided an opportunity for licensees and the NRC staff to gain insights into plant responses to flooding beyond testing capabilities to mitigate the event. Although the assessment of flooding hazards would now be focused primarily on the mitigating strategies capabilities (including necessary installed SSCs), the revised approach does not rule out the possibility that some licensees may perform the more detailed integrated flooding assessment as described in the current guidance documents (i.e., assessing plant impacts beyond maintaining mitigating strategy capabilities). These assessments could support licensees' consideration of asset protection measures (Figure 2.2; Point 5) or identify possible cost savings associated with traditional flood protection versus revised mitigating strategies. The staff may also undertake detailed assessments of flood protection and mitigation capabilities beyond Order EA-12-049 and the MBDBE rulemaking if needed to support evaluating the possible pursuit of plant-specific requirements in accordance with NRC's backfit regulation. The NRC staff will, on a case-specific basis, consider information about the reevaluated hazards; available response times for identified scenarios; plant-specific configurations and licensing histories; and other factors when defining an appropriate assessment of flooding scenarios to support evaluating a potential plant-specific backfit.

The assessments of mitigating strategies equipment and actions would ensure protection against various flooding mechanisms and conditions identified from the flooding reevaluations. Mitigating strategies would therefore need to address scenarios that could range from slightly above the design-basis flood to significantly above the design-basis flood and depending on the site, scenarios involving different warning times, debris loads, and event durations. The NRC staff has had several public meetings with the nuclear industry regarding the need to consider the reevaluated flooding hazard and possibly modify equipment or strategies to address conditions different than those considered in the implementation of Order EA-12-049. The industry provided a framework generally consistent with that proposed by the NRC staff in terms of assessing new hazard information and evaluating mitigating strategies and related equipment to either confirm the various flooding scenarios are adequately addressed or to identify possible revisions to the strategy to address the reevaluated flooding hazard. Changes to the mitigating strategies could involve modifications to the existing equipment or the locations and structures in which they are stored and plans developed for a variety of external hazards or could involve developing a targeted strategy for specific flooding scenarios.

An example of revising the existing equipment and plans developed for multiple external hazards would be to raise the elevation of a connection or storage location to accommodate higher flood levels that might be calculated when using present day standards and guidance. The assessment of new hazard information would consider not only the flooding conditions but also the timing of the event in terms of the ability of a licensee to be warned of an impending flood and ability to prepare. Licensees may be able to address some flooding scenarios by taking advantage of the available warning time to shut down the plant and optimize the use of the mitigating strategies developed to address all external hazards.

It is clear that for some flooding scenarios, licensees may need to develop targeted or scenario-specific mitigating strategies to deal with events that far exceed their original design-basis flood and the approaches developed for other external hazards. For example, some low-probability, but conceivable flooding scenarios could challenge a licensee's access to many plant SSCs, including those used to mitigate most beyond-design-basis external events. A possible scenario that would warrant a targeted mitigating strategy is the failure of one or more major dams upstream of a nuclear plant.

In addition to the expected damage to the nuclear power station, such a flooding scenario would – in and of itself - have major adverse impacts on public health and safety, regional economic activities, and other socio-economic conditions. However, measures would still be needed to ensure that the damage to the nuclear facility would not adversely impact the scope of the damage to the local community resulting from the disaster by introducing additional complexities resulting from a large release of radioactive materials. In the event of such an unlikely, but very large flood, the goal of protecting public health and safety by providing additional capabilities to prevent damage to fuel assemblies in the reactor core and the spent fuel pool is considered acceptable.

Licensees may develop a scenario-specific plan for some postulated flooding events that would identify the necessary actions, including the orderly shutdown of the reactor, to support the unit(s) achieving and maintaining a manageable shutdown condition. The targeted strategy would address the time from initial notification throughout the period of degrading conditions, loss of access to important plant areas and equipment, and receding water levels. As appropriate, the scenario-specific mitigating strategy would include provisions to address the following:

- Facility structures (containments, reactor and fuel buildings, etc.) and key systems (e.g., reactor vessel and spent fuel pool). The targeted strategy should address possible actions to help maintain overall structural and system configurations and integrity to support achieving and maintaining a manageable shutdown condition. Configuration control can, as appropriate, rely on the ability of structures and systems to withstand the static and dynamic forces associated with an overwhelming flood or include administrative actions, such as opening flowpaths for the flood waters to travel through a building. If flood waters are expected to enter buildings, the targeted strategy should address the ability of key systems to maintain a configuration that supports a manageable shutdown condition (i.e., prevents loss of cooling to fuel assemblies in the core and spent fuel pool).
- Cooling functions. The mitigating strategies should address those measures (design characteristics, installed equipment, portable equipment, etc.) providing cooling functions for the reactor core and spent fuel beginning with the notification of the initiating event (e.g., dam failure), throughout the plant shutdown, and ultimately achieving and maintaining a manageable shutdown condition.
- The targeted or scenario-specific mitigating strategy would identify key steps (including equipment and personnel) for the following:
 - Preparing for the arrival of the flood waters (e.g., reaching cold shutdown or refueling mode).
 - Providing cooling for the reactor core and spent fuel for the range of possible flooding levels—addressing the various potential stages of losing access to plant structures and equipment.

- o Maintaining a manageable shutdown condition for the range of possible flooding levels—addressing equipment (including needed fuel supplies and supporting functions), access and movement to staging areas, and personnel support and safety (including food and water). As with other aspects of mitigating strategies, the plan should address maintaining the manageable shutdown condition using onsite portable equipment until such time as support can reasonably be expected from offsite resources.

The NRC staff is implementing the above approach as part of its activities related to Recommendation 2.1 on flooding reevaluations and Recommendation 4 on improving plant capabilities to deal with SBO events and mitigating strategies for beyond-design-basis external events. These approaches are consistent with longstanding policies on the treatment of design-basis events and safety enhancements to address beyond-design-basis events. The integration of the reevaluated flooding hazards with the ongoing mitigating strategies activities and the related rulemaking effort provide the most effective and efficient path for the timely resolution of Fukushima-related issues and implementation of safety enhancements at nuclear power plants.

Enclosure 3

COMSECY: Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards

Non-Concurrence NCP-2014-010

NON-CONCURRENCE PROCESS COVER PAGE

The U.S. Nuclear Regulatory Commission (NRC) strives to establish and maintain an environment that encourages all employees to promptly raise concerns and differing views without fear of reprisal and to promote methods for raising concerns that will enhance a strong safety culture and support the agency's mission.

Employees are expected to discuss their views and concerns with their immediate supervisors on a regular, ongoing basis. If informal discussions do not resolve concerns, employees have various mechanisms for expressing and having their concerns and differing views heard and considered by management.

Management Directive, MD 10.158, "NRC Non-Concurrence Process," describes the Non-Concurrence Process (NCP), <http://nrcweb.nrc.gov:8600/policy/directives/catalog/md10.158.pdf>.

The NCP allows employees to document their differing views and concerns early in the decision-making process, have them responded to (if requested), and attach them to proposed documents moving through the management approval chain to support the decision-making process.

NRC Form 757, "Non-Concurrence Process" is used to document the process.

Section A of the form includes the personal opinions, views, and concerns of a non-concurring NRC employee.

Section B of the form includes the personal opinions and views of the non-concurring employee's immediate supervisor.

Section C of the form includes the agency's evaluation of the concerns and the agency's final position and outcome.

NOTE: Content in Sections A and B reflects personal opinions and views and does not represent official factual representation of the issues, nor official rationale for the agency decision. Section C includes the agency's official position on the facts, issues, and rationale for the final decision.

At the end of the process, the non-concurring employee(s):

- Concurred
 - Continued to non-concur
 - Agreed with some of the changes to the subject document, but continued to non-concur
 - Requested that the process be discontinued
-
- The non-concurring employee(s) requested that the record be non-public.
 - The non-concurring employee(s) requested that the record be public.



NON-CONCURRENCE PROCESS

NCP-2014-010

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT
Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluati
ADAMS ACCESSION NO.
ML14238A616

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DOCUMENT AUTHOR DOCUMENT CONTRIBUTOR DOCUMENT REVIEWER ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR
Christopher Cook

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Branch Chief
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NRO/DSEA/RHM1

I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C.
 I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY.

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM: PUBLIC NON-PUBLIC

REASONS FOR NON-CONCURRENCE AND PROPOSED ALTERNATIVES (use continuation pages or attach Word document)
See attached document.

Additional non-concurring employees:
Suzanne Schroer (NRO/DSRA/SPRA) non-concur via email dated 10/09/14
Marie Pohida (NRO/DSRA/SPRA) *Marie Pohida*
Malcolm Patterson (NRO/DSRA/SPRA) *Malcolm Patterson*
Valerie Barnes (RES/DRA/HFRB) non-concur via email dated 10/09/14
Joseph Kanney (RES/DRA/ETB) *Joe Kanney*
Jeffery Mitman (NRR/DRA/APHB; currently on rotation to RES/DRA/PRAB) non-concur via email dated 10/09/14
David Desaulniers (NRO/DCIP) *David Desaulniers*
George Lapinsky, NRR/DRA/APHB - non-concur via email dated 10/15/14
Fernando Ferrante, NRR/DRA/APHB - non-concur via email dated 10/16/14
Kenneth See, NRO/DSEA/RHM1 - non-concur via email dated 10/20/14
Jacob Philip, RES/DRA/ETB- non-concur via email dated 10/31/14

SIGNATURE
Michelle T. Bensi
DATE
10/9/14

Section A – Reasons for Non-Concurrence and Proposed Alternatives

Several members of the working group established to address the Near-Term Task Force Recommendation 2.1 (Flooding) do not concur with the proposed COMSECY titled “Relationship between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards,” which was circulated for concurrence on October 7, 2014.

Congress and the Commission directed the staff to understand and address reevaluated flooding events and to consider whether changes to the design basis, or other actions, are needed to protect nuclear power plants from the hazards that flooding presents. If issued in its current form, the COMSECY would depart from the approved, systematic process that is already in place to accomplish that objective.

Moreover, the COMSECY does not recognize the importance of understanding total plant response to flooding hazards. This is not consistent with operating experience and evidence that flooding hazards are in some cases larger and more likely than was believed when plants were licensed.

Recommendation 4 of the NTTF Report ultimately resulted in strategies to mitigate the consequences of extended loss of ac power and loss of access to the ultimate heat sink as a surrogate for a beyond design basis external event. Storage and deployment considerations for external events are part of these strategies. The COMSECY presumes that the resulting enhancements will be sufficient to deal with specific flooding hazards. As a result, the COMSECY proposes to eliminate the systematic evaluation that is necessary to determine if additional regulatory actions are needed to protect a given plant from flooding hazards.

Such significant departures from the path that the staff has been following for several years call for the input and direction of the Commission.

This document describes twelve specific concerns regarding the COMSECY:

1. It departs from the intent of NTTF Recommendation 2.1.
2. It departs from previous Commission and Congressional direction.
3. It deviates from the implementation process currently established for reevaluating flooding hazards and plant response.
4. It may create regulatory inconsistencies.
5. It presumes a conclusion that adequate protection has been achieved and, in most cases, additional regulatory actions are either not expected or not warranted.
6. It does not elicit sufficient information to support a staff conclusion regarding the need for additional regulatory action.
7. It does not incorporate lessons learned from operating experience.
8. It fails to distinguish between the intended purpose of the integrated assessment and activities for mitigating strategies and does not recognize the differences between guidance associated with the two activities.
9. It does not adequately distinguish between consequential floods and the reevaluated flood hazard.
10. It is vague in its description of “targeted mitigating strategies.”
11. It is not responsive to external recommendations by regarded experts.
12. It creates inconsistency regarding the manner in which different external hazards are treated by NRC under Recommendation 2.1.

1. Introduction

After the accident at the Fukushima Dai-ichi Nuclear Power Plant, the U.S. Nuclear Regulatory Commission (NRC) directed the staff to conduct a systematic and methodical review of its processes and regulations. This review was conducted by the Near-Term Task Force (NTTF), which developed a comprehensive set of recommendations documented in the enclosure to SECY-11-0093 (Ref. [1]). An interdisciplinary working group was established to address flooding hazards identified in NTTF Recommendation 2.1 in 2012. It was comprised of staff from several offices including individuals with expertise in hydrology, probabilistic risk assessment, engineering, and human factors. Recommendation 2.1 states:

Order licensees to **reevaluate** the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis SSCs [structures, systems, and components] important to safety **to protect against the updated hazard** [emphasis added].

Since 2012, the members of the working group have been interacting with industry to establish an effective process for responding to Recommendation 2.1. Instead of issuing an order, the NRC issued a letter pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54, “Conditions of licenses” in March 2012 (50.54(f) letter hereafter). The 50.54(f) letter requested nuclear power plant licensees to reevaluate flooding hazards and, if the reevaluated flooding hazard is more severe than the plant’s design basis, to perform an integrated assessment of total plant response to the reevaluated flood hazard.

The draft COMSECY titled “Relationship between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards,” which was circulated for concurrence on October 7, 2014, describes a significant change to the path forward for implementation of NTTF Recommendation 2.1 that was developed by the staff working group and industry. This document enumerates the concerns of the named working group members regarding the proposed COMSECY. These concerns are both technical and procedural.

The fundamental concern with the COMSECY is that it proposes a change that bypasses current plans for a deliberate and systematic process for understanding the potential for flooding events to adversely affect nuclear power plants without sufficient regard for the importance of developing insights about flood risks. The COMSECY describes a significant departure from the current, approved process for implementing NTTF Recommendation 2.1. It likewise proposes a departure from associated guidance that was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. The events at Fukushima were caused by a flood event and U.S. operating experience further speaks to the importance of understanding plant response to flooding hazards. Despite this knowledge, the COMSECY describes a truncation of the process established to evaluate plant response to reevaluated flooding hazards that are more severe than the plant design basis. Moreover, it asserts that mitigating strategies (originally developed and evaluated as an additional defense-in-depth measure) generally provide an appropriate response and “first line of defense” against the reevaluated hazard. It precludes systematic evaluations that would support regulatory actions to strengthen plant protections against flooding risks, where justified. While mitigating strategies provide an

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important contribution to implementing the lessons learned from Fukushima, their existence does *not* negate the need to evaluate the total site-specific plant response to the reevaluated hazard. The proposed path forward creates a deficiency in knowledge because it precludes the systematic collection of information necessary to understand whether additional regulatory actions are needed. Moreover, the COMSECY lacks clarity and thus the intent and consequences of the proposed path forward are not well-defined in the paper. Finally, the COMSECY does not request a Commission vote on the proposed significant change in course for implementing Recommendation 2.1.

The above leads to the following twelve specific concerns, which are further described in Section 2 of this document:

1. It departs from the intent of NTF Recommendation 2.1 (Section 2.1).
2. It departs from previous Commission and Congressional direction (Section 2.2).
3. It deviates from the implementation process currently established for reevaluating flooding hazards and plant response (Section 2.3).
4. It may create regulatory inconsistencies (Section 2.4).
5. It presumes a conclusion that adequate protection has been achieved and, in most cases, additional regulatory actions are either not expected or not warranted (Section 2.5).
6. It does not elicit sufficient information to support a staff conclusion regarding the need for additional regulatory action (Section 2.6).
7. It does not incorporate lessons learned from operating experience (Section 2.7).
8. It fails to distinguish between the intended purpose of the integrated assessment and activities for mitigating strategies and does not recognize the differences between guidance associated with the two activities (Section 2.8).
9. It does not adequately distinguish between consequential floods and the reevaluated flood hazard (Section 2.9).
10. It is vague in its description of “targeted mitigating strategies” (Section 2.10).
11. It is not responsive to external recommendations by regarded experts (Section 2.11).
12. It creates inconsistency regarding the manner in which different external hazards are treated by NRC under Recommendation 2.1 (Section 2.12).

Finally, in Section 3, the authors of this non-concurrence propose a solution that resolves all of the concerns expressed in this paper.

2. Basis for non-concurrence

Each of the following subsections describes an important concern regarding the content of the draft COMSECY.

2.1. Deviation from the intent of NTF Recommendation 2.1

2.1.1. Description of concern

NTF Recommendation 2.1 is for the NRC to “[o]rder licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if

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necessary, update the design basis and SSCs [structures systems and components] important to safety to protect against the updated hazards.” Thus, at the core of Recommendation 2.1 is the reevaluation of flooding hazards and, if needed, updating a plant’s design basis to ensure protection of SSCs important to safety. Recommendation 2.1 was implemented via the issuance of the 50.54(f) letter in March 2012, as described above. The reevaluation of flooding hazards is responsive to the first portion of Recommendation 2.1, while the integrated assessment provides the relevant information regarding plant response to support an NRC decision regarding the need to change the design or licensing basis of the plant to protect SSCs important to safety or to take other regulatory action.

In light of the intent of Recommendation 2.1, four key issues emerge regarding the COMSECY:

1. The COMSECY represents a significant departure from the intent of Recommendation 2.1.
2. The paper provides no technical or safety basis for departing from Recommendation 2.1.
3. The COMSECY does not clearly and explicitly state, for the benefit of external stakeholders and the Commission, that the proposed path will no longer meet the intent of Recommendation 2.1.
4. The COMSECY does not request a Commission vote on the proposed path forward despite the aforementioned departures.

2.1.2. Supporting information

As described above, the NTTF conducted a systematic and methodical review of the NRC regulations and processes and determined if the agency should make additional improvements to these programs in light of the events at Fukushima Dai-ichi. As a result of this review, the NTTF developed a comprehensive set of recommendations, documented in the enclosure to SECY-11-0093 (Ref. [1]). The NTTF made several important flooding-related observations in their report:

- *Evolution in understanding of hazards and consequences over time:* The NTTF observed that NRC’s regulatory framework for natural hazards assessment has evolved as new information regarding hazards and their consequences has become available. Consequently, there are inconsistencies among sites with respect to the design basis for natural hazards. In the context of flooding, this has led to differences with regard to the hazards considered as well as the estimated magnitudes of those hazards.
- *Overreliance on less robust systems and strategies:* The NTTF observed that “some plants have an overreliance on operator actions and temporary flood mitigation measures such as sandbagging, temporary flood walls and barriers, and portable equipment to perform safety functions.”
- *Concern regarding cliff-edge effects:* The NTTF observed that flooding risks are of concern due to a “cliff-edge effect,” in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level.

Based on the above, the NTTF concluded that it would be “**very beneficial to safety for all licensees to confirm that SSCs important to safety are adequately protected from floods**” and that “[t]his reevaluation should consider all appropriate internal and external flooding

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sources...” Moreover, the NTTF observed that, due to changes in flooding hazard data and models over time, there would be a continuing benefit for operating reactors to reevaluate the implications of updated flooding hazards at appropriate intervals.

With regard to the consequences of flooding hazards, the NTTF observed the following:

[f]ailure to adequately protect SSCs important to safety from appropriate design-basis natural phenomena with appropriate safety margins has the potential for common-cause failures and significant consequences as demonstrated at Fukushima.

The aforementioned insights led the NTTF to make the following recommendation:

Recommendation 2: The Task Force recommends that the NRC require licensees to reevaluate and upgrade as necessary the design-basis seismic and flooding protection of SSCs for each operating reactor.

Based on Recommendation 2, the NTTF recommended that the Commission direct three actions to ensure adequate protection from natural phenomena.

- 2.1 Order licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis and SSCs important to safety to protect against the updated hazards.
- 2.2 Initiate rulemaking to require licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. If necessary, update the design basis for SSCs important to safety to protect against the updated hazards.
- 2.3 Order licensees to perform seismic and flood protection walkdowns to identify and address plant-specific vulnerabilities and verify the adequacy of monitoring and maintenance for protection features such as watertight barriers and seals in the interim period until longer term actions are completed to update the design basis for external events.

As described above, NTTF Recommendation 2.1 is of particular relevance to the COMSECY.

However, the COMSECY represents a significant deviation from Recommendation 2.1. For example, the COMSECY (Enclosure 1, p. 2) states that design basis changes are *not expected* and the reevaluated hazard will instead be used to define requirements and bounds for mitigating strategies:

[T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which most safety-related SSCs would need to be protected. The flooding reevaluations will, however, be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events.

Under the proposed path forward, consideration of the need to take actions beyond changes to mitigating strategies (e.g., updating of protection of SSCs important to safety) is only a secondary purpose. For example, the COMSECY states (Enclosure 2, p. 1):

The collection and assessment of information related to flooding hazards as part of the NRC's resolution of the NTTF's Recommendation 2.1 can be viewed as serving two

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purposes. The **first purpose is to establish functional requirements and reference bounds for design to address external event scenarios in accordance with the generic mitigating strategies requirements**. Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will **reduce the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments**. Where warranted, the flooding reevaluations can, however, continue to serve the purpose of supporting assessments of additional regulatory actions as potential plant-specific backfits [Emphasis added].

The COMSECY does not describe the process for taking such additional actions. Moreover, sufficient information will not be available under the new proposed path to inform such a decision (Section 2.6 expands on this concern).

Table 1 provides an assessment of NRC's implementation of the key components of Recommendation 2.1, describes the staff's current implementation, and highlights potential concerns with the proposed path described in the COMSECY.

Finally, the main body of the COMSECY does not present a full-characterization of the NRC's assessment of the lessons learned from Fukushima. For example, the COMSECY (p.1) states:

The accident at the Fukushima Daiichi nuclear plant in Japan highlighted the possibility that certain external events may simultaneously challenge the prevention, mitigation, and emergency preparedness measures that provide defense in depth protections for nuclear power plants. **NRC's assessment of the lessons learned from the experiences at Fukushima Daiichi led to the conclusion that additional requirements were needed to increase the capability of nuclear power plants to address certain beyond-design-basis external events**. As a result, the NRC undertook actions that imposed new requirements to enhance safety. The NRC also requested that licensees reevaluate seismic and flooding hazards using present-day standards and guidance [Emphasis added].

The characterization of lessons learned in the main body of the COMSECY does not describe the NTF's assessment and recommendations related to the need to reevaluate seismic and flooding hazards and, if necessary, update the design basis to protect SSCs important to safety. Moreover, the NTF does not characterize these reevaluated hazards "beyond design basis." However, the NTF did separately recommend, as part of Recommendation 4, that "NRC strengthen station blackout mitigation capability at all operating and new reactors for design-basis and beyond-design-basis external events." Within the context of Recommendation 4, the NTF report includes the following statement:

A beyond-design-basis flood could be established through extensive, probabilistic hazards analysis. As a practical matter, and to prevent undue delays in implementing additional SBO [station blackout] protections, the Task Force concludes that locating SBO mitigation equipment in the plant one level above flood level (about 5 to 6 meters (15 to 20 feet)) or in watertight enclosures would provide sufficient enhanced protection for this level of defense-in-depth.

The distinction between the purposes of the various recommendation is not clear in the COMSECY's description of lessons learned from the events at Fukushima.

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Table 1: Key components of Recommendation 2.1, staff implementation, and concerns

Key component of NTTF R2.1	Current implementation of NTTF R2.1	Concern regarding proposed path forward
NTTF R2.1 recommends that NRC <i>order</i> licensees to reevaluate flooding hazards	Rather than issue an order related to the reevaluation of flooding hazards, a 50.54(f) letter was issued. With respect to NTTF R2.1, the letter requested the reevaluation of flooding hazards and, if the reevaluated hazard is more severe than the design basis, the subsequent performance of an integrated assessment.	The COMSECY paper describes a process wherein the implementation approach described in the 54.54(f) letter would be significantly truncated.
NTTF R2.1 recommends (if necessary) updating of the design basis	The 50.54(f) letter identified that, once all relevant information has been received in response to the 50.54(f) letter, “the NRC staff will determine whether additional regulatory actions are necessary (e.g., update the design basis and SSCs important to safety) to provide additional protection against the updated hazards.”	The COMSECY does not propose updating the design or licensing basis for flooding. In fact, it essentially precludes the need for changes to the design basis. Moreover, by reducing the information that will be collected as part of licensee responses to the 50.54(f) letter under the proposed path forward described in the COMSECY, there will be a significant reduction in the information available to support regulatory decisionmaking.
NTTF R2.1 recommends that licensees <i>protect</i> against flooding hazards	The process described in the integrated assessment interim staff guidance (Ref. [2]) allows licensees to consider both the protection and mitigation capabilities of the site in responding to the reevaluated flooding hazard. Because the reevaluated hazard flooding scenarios are defined based on present-day guidance and methods, the interim staff guidance outlines a systematic process for evaluation of licensees’ proposed approaches.	The COMSECY prescribes the use of mitigating strategies as the primary response to the reevaluated hazard with no protection considered for safety-related equipment unless (1) such equipment is directly associated with mitigating strategies and (2) the reevaluated hazard includes events for which there is little or no warning prior to arrival of floodwaters on site. Moreover, the COMSECY proposes a less comprehensive evaluation approach than the one described in the integrated assessment interim staff guidance (Ref. [2]).

2.2. Deviation from the previous Commission and Congressional direction

2.2.1. Description of concern

There has been clear Commission and Congressional direction regarding implementation of Recommendation 2.1. The COMSECY outlines a proposed path forward that significantly deviates from the current path for implementation of Recommendation 2.1. The following issues are observed:

1. The COMSECY does not clearly and explicitly describe the previous Commission and Congressional direction regarding the need to reevaluate flooding hazards, identify plant vulnerabilities under the new hazard, and (as needed) take further regulatory action in response to Recommendation 2.1.
2. The main body of the COMSECY does not clearly acknowledge that the proposed path forward for implementation of Recommendation 2.1 represents a significant deviation

from the previous Commission and Congressional direction regarding Recommendation 2.1.

3. The paper does not ask the Commission to vote on the change in direction that is proposed in the COMSECY.

2.2.2. Supporting information

The following description provides an overview of previous Commission and Congressional direction related to Recommendation 2.1. The current path for implementation of Recommendation 2.1 was formulated through a series of communications with the Commission and in response to Congressional direction.

SECY-11-0093 (July 2011)

In July 2011, the NTTF Report was issued as an enclosure to SECY-11-0093 (Ref. [3]). Section 2.1 summarizes the content of the report related to flooding. The staff requirements memorandum (SRM) associated with SECY-11-0093 (Ref. [1]) directed staff to engage promptly with stakeholders to review and assess the recommendations of the NTTF in a comprehensive and holistic manner for the purpose of providing the Commission with fully informed options and recommendations. As described in Section 2.1, the proposed path forward no longer meets the intent of Recommendation 2.1.

SECY-11-0124 (September 2011)

SECY-11-0124 (Ref. [4]) documents the NTTF recommendations that the staff concluded can and should be initiated without delay. The staff determined the near-term regulatory actions based on its judgment of the potential and relative safety enhancement of each of the recommendations. SECY-11-012 identified Recommendation 2.1 as a recommended near-term action. The enclosure notes the following with regarding the flooding hazards under Recommendation 2.1:

The assumptions and factors that were considered in flood protection at operating plants vary. In some cases, the design bases did not consider the effects from the local intense precipitation and related site drainage. In other cases, the probable maximum flood is calculated differently at units co-located at the same site, depending on the time of licensing, resulting in different design-basis flood protection. The NTTF and the staff noted *that some plants rely on operator actions and temporary flood mitigation measures such as sandbagging, temporary flood walls and barriers, and portable equipment to perform safety functions*. For several sites, the staff noted that all appropriate flooding hazards are not documented in the Updated Final Safety Analysis Report. The NTTF and the staff also noted that flooding risks are of concern because of a *“cliff-edge” effect*, in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level. *Therefore, all licensees should confirm that SSCs important to safety are adequately protected from floods* [emphasis added].

In SECY-11-0124, staff proposed actions regarding Recommendation 2.1 for flooding:

1. Initiate stakeholder interaction to discuss application of present-day regulatory guidance and methodologies to the reevaluation of flooding hazards at operating reactors. These

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methods are used for reviews of early site permit (ESP) or combined license (COL) applications.

2. Develop and issue a request for information to licensees pursuant to 10 CFR 50.54(f) to:
 - o **Reevaluate site-specific flooding hazards** using the present-day methodologies.
 - o Identify actions that have been taken or are planned in order to **address plant-specific vulnerabilities** associated with the updated flooding hazards.
3. Evaluate licensee responses and take appropriate **regulatory action to resolve vulnerabilities** associated with updated site-specific hazards.

In the SRM to SECY-11-0124 (Ref. [5]), the Commission approved the staff's proposed actions to implement, without delay, the NTTF recommendations as described in SECY-11-0124, with several comments. For Recommendation 2.1, the Commission provided the following comment:

For Recommendation 2.1, when the staff issues the requests for information to licensees pursuant to 10 CFR 50.54(f) to identify actions that have been taken or are planned to address plant-specific vulnerabilities associated with the reevaluation of seismic and flooding hazards, the staff should explain the meaning of "vulnerability." The staff should inform the Commission, either through an Information Paper or a briefing of the Commissioners' Assistants, when it has developed the technical bases and acceptance criteria for implementing Recommendations 2.1, 2.3, and 9.3.

SECY-11-0124 focuses on three key components of the NRC response to Recommendation 2.1 for flooding: (1) licensees reevaluate flooding hazards using present-day guidance and methods, (2) licensees identify vulnerabilities and actions taken or planned to address those vulnerabilities, and (3) staff evaluates responses and initiates appropriate regulatory actions to resolve vulnerabilities.

In contrast to the recommendations in SECY-11-0124, the COMSECY proposes to reduce the scope of the assessment of plant response (i.e., the integrated assessment) and thus will not identify or resolve identified plant vulnerabilities. For example, the COMSECY (Enclosure 1, p. 2) states:

Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will, in many cases, improve the efficiency of the NRC's regulatory process by ***eliminating the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments*** [emphasis added].

SECY-11-0137 (October 2011)

The purpose of SECY-11-0137 (Ref. [6]) was to transmit the staff's proposed prioritization of the NTTF recommendations to the Commission. SECY-11-0137 prioritized the NTTF's recommendations into three tiers. Tier 1 includes all the actions identified in SECY-11-0124 (including Recommendation 2.1) and two additional items. SECY-11-0137 also describes implementation, schedule, and resource challenges.

With regard to NTTF Recommendation 2.1 related to flooding, SECY-11-0137 states:

The assumptions and factors that were considered in flood protection at operating plants vary. In some cases, the design bases did not consider the effects from the local intense

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precipitation and related site drainage. In other cases, the probable maximum flood is calculated differently at units co-located at the same site, depending on the time of licensing, resulting in different design-basis flood protection. The NTTF and the staff noted that ***some plants rely on operator actions and temporary flood mitigation measures such as sandbagging, temporary flood walls and barriers, and portable equipment to perform safety functions.*** For several sites, the staff noted that all appropriate flooding hazards are not documented in the Updated Final Safety Analysis Report (UFSAR). The NTTF and the staff also noted that flooding risks are of concern because of a ***“cliff-edge” effect***, in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level. ***Therefore, all licensees should confirm that SSCs important to safety are adequately protected from floods*** [emphasis added].

In SECY-11-0137, the staff further concluded that Recommendation 2.1 should be considered Tier 1 because **“this recommendation would improve safety”** and sufficient resource flexibility exists. SECY-11-0137 included the following recommendations related to Recommendation 2.1:

- Interact with stakeholders to inform NRC’s process for defining guidelines for the application of present-day regulatory guidance and methodologies to the reevaluation of flooding hazards at operating reactors. These present-day methods are used for reviews of early site permit (ESP) or combined license (COL) applications.
- Develop and issue a request for information to licensees pursuant to 10 CFR 50.54(f):
 - Reevaluate site-specific flooding hazards using the present-day methodologies.
 - Identify actions that have been taken or are planned to address plant-specific issues associated with the updated flooding hazards (**including potential changes to the licensing or design basis of a plant**).
- Evaluate licensee responses and take appropriate regulatory action to resolve issues associated with updated site-specific hazards.

While the language above is similar to that contained in SECY-11-0124, in the later SECY (SECY-11-0137), the concept of vulnerabilities was generalized. Importantly, specificity was added regarding potential actions to address identified issues, including potential changes to the licensing or design basis of the plant. In addition, SECY-11-0137 laid out a schedule and milestones for the implementation of Recommendation 2.1. Milestones for flooding include:

- Develop 10 CFR 50.54(f) letter
 - Stakeholder interaction and technical development
 - Develop 10 CFR 50.54(f) letter
 - Issue 10 CFR 50.54(f) letter
- Evaluate licensee responses to 10 CFR 50.54(f) letter
 - Write safety evaluation or NUREG to document staff conclusions
- Issue orders to licensees (if needed)
 - Develop regulatory basis and draft orders
 - Issue orders
- Inspection Activities
 - Develop temporary instruction

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- Conduct inspections and document results
- Update SPAR models
- Issue letters to close out 10 CFR 50.54(f) letter and/or orders

In the SRM to SECY-11-0137 (Ref. [7]), the Commission approved the staff's proposed prioritization of the NTTF recommendations and supported action on the Tier 1 and Tier 2 recommendations, subject to the direction contained in the SRM to SECY-11-0124, and provided two comments particularly relevant to the subject of this document:

In the absence of a fully developed justification for a proposed new requirement, the Commission finds it premature to initiate actions on the Near Term Task Force recommendations under the premise of assuring or redefining the level of protection of public health and safety that should be required as adequate in accordance with the backfit rule. The Commission will evaluate the staff's basis for imposing new requirements when documented in notation vote papers for any new requirements promulgated by orders or rulemaking.

:

The Staff should consult with the Commission via notation vote papers before issuing any orders that would lead to a change in the design basis of licensed plants. The staff should inform the Commission 5 business days before issuing letters under 10 CFR 50.54(f) associated with the regulatory activities outlined in SECY-11-0137.

The Commission also provided comments related to several other topical areas not related to NTTF Recommendation 2.1 for flooding.

SECY-11-0137 focuses on three key components of NRC response to Recommendation 2.1 for flooding, which differ slightly from those identified in SECY-11-0124: (1) licensees reevaluate flooding hazards using present-day guidance and methods, (2) licensees evaluate actions taken or planned to address plant-specific issues (including **potential changes to the licensing or design basis of a plant**), and (3) staff evaluates responses and initiates of appropriate regulatory actions to address identified issues. SECY-11-0137 specifically refers to the issuance of orders, if needed.

In contrast to the recommendations in SECY-11-0137, the COMSECY proposes to reduce the scope of the assessment of plant response and states that the NRC does not expect to change the plant design basis or make changes to flood protection of safety-related SSCs (e.g., the COMSECY states "the NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected").

Consolidated Appropriations Act (December 2011)

On December 23, 2011, the Consolidated Appropriations Act, Public Law 112-074 (Ref. [8]), was signed into law. Section 402 of the law requires a reevaluation of licensees' design basis for external hazards, and expands the scope 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

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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** [emphasis added].

In contrast, the COMSECY explicitly states (and implies throughout) that NRC is not expecting to take any regulatory actions related to changes to the design-basis flooding hazards or flood protection of safety-related SSCs. For example, the COMSECY (Enclosure 1, p. 2) states:

[t]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected. The flooding reevaluations will, however, be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events [emphasis added].

In Enclosure 2 (p.4), the COMSECY notes the departure from existing guidance and the process described in previous communications to the Commission:

The use of the flooding reevaluations from Recommendation 2.1 primarily to define functional requirements and reference bounds for mitigating strategies **is a change from existing guidance and from briefings and reports provided to the Commission** [emphasis added].

Regarding the Consolidated Appropriations Act, the COMSECY (Enclosure 1, p. 7) states:

The NRC is responding to the above Congressional direction through its activities related to seismic and flooding reevaluations under the Near-Term Task Force Recommendation 2.1. In addition, insights from the seismic and flooding reevaluations and the ongoing activities related to implementation of Order EA-12-049 will be used to develop plans to address other external hazards (e.g., wind-related events). As previously discussed, the reevaluations of flooding and other hazards will help to define the functional requirements and reference bounds for design (i.e., design basis) that are applicable to specific SSCs used within licensees' mitigating strategies for beyond-design-basis external events.

Thus, the COMSECY suggests that the intent of the Consolidated Appropriations Act is met by reevaluating flooding hazards and then changing the functional requirements and reference bounds for mitigating strategies. It is not clear that this was the intent of Congress when the language was added to the Consolidated Appropriations Act regarding the need to ensure the each plant “meets the requirements of its license, current applicable Commission requirements and guidance for such license” and “update the design basis for each reactor, if necessary.” Moreover, the proposed path forward to responding to Congressional direction is not consistent with the way in which staff stated NRC would be addressing Congressional direction as described in previous communications with the Commission in SECY-12-0025 (see below).

SECY-12-0025 (February 2012)

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SECY-12-0025 (Ref. [9]) provides, for Commission consideration, the NRC staff's proposed orders in response to lessons learned from the events at Fukushima. The staff recommended the Commission approve issuance of the proposed orders. The proposed orders were attached to SECY-12-0025 and staff recommended that the Commission redefine the level of protection regarded as adequate and require actions of licensees to meet that new level of protection. SECY-12-0025 provides justification for redefining the level of adequate protection.

The paper also provided, for Commission awareness, the requests for information (50.54(f) letters) that the staff planned to send to (1) reactor licensees, (2) construction permit holders, and (3) combined license (COL) holders as of March 9, 2012. Per direction in SECY-11-0137, the staff informed the Commission of the issuance of the 50.54(f) letter related (in part) to the reevaluation of flooding hazards. In SECY-12-0025, the staff noted the following:

Under 10 CFR 50.54(f), when information is not sought to verify compliance with a facility's current licensing basis, the staff is required to prepare a reason or reasons for each information request prior to issuance to ensure that the burden to be imposed on respondents is justified in view of the potential safety significance of the issue to be addressed in the requested information. As noted in the body of the enclosed letter, ***protection of plants from natural phenomena is critical for continued safe operation of nuclear power plants***. Given that new information has been developed on natural phenomena hazards since the licensing basis of the operating plants was established, the ***staff finds that it is necessary to confirm the adequacy of the hazards assumed for U.S. plants and their ability to protect against them***. Further, the staff finds that the accident at Fukushima highlights a need to verify the adequacy of emergency planning to address a prolonged SBO and multiunit events. ***Finally, the reevaluation and related information analysis will serve to meet the NRC's obligation under the Consolidated Appropriations Act, for 2012 (PL 112-74), Section 402*** [emphasis added].

In SECY-12-0025, the staff replied to the Commission's request in the SRM to SECY-11-0124 that the staff define the term "vulnerability." The following definition was provided:

Plant-specific vulnerabilities are those features important to safety that when subject to an increased demand due to the newly calculated hazard evaluation have not been shown to be capable of performing their intended safety functions.

The staff further noted that:

The [above] definition [of vulnerability] is broad enough to capture both prevention and mitigation aspects and also includes features of protection such as hardware, procedures, temporary measures, and potentially available offsite resources. This definition allows the NRC staff to ***assess plant response to a natural hazard event as an integrated system*** providing consideration for all available resources. ***Information resulting from such an evaluation will help the staff decide upon the most appropriate regulatory action focusing on the most beneficial safety enhancements*** [emphasis added].

The above concept of assessing plant response as an integrated system to provide information to support regulatory evaluation of beneficial safety enhancements led to the subsequent development of the integrated assessment for external flooding. SECY-12-0025 included the 50.54(f) letter as an enclosure, which referenced the integrated assessment.

SECY-12-0025 states that staff finds it “**necessary to confirm the adequacy of the hazards assumed for U.S. plants and their ability to protect against them.**” This justified the burden of the information requested as part of the 50.54(f) letter in light of the safety significance of the issue to be address.

The SRM for SECY-12-0025 (Ref. [10]) approved the issuance of orders subject to changes and comments described in the SRM. The SRM also made several comments regarding reevaluation of seismic hazards under the 50.54(f) letter and provided additional comments on other topics. The Commission did not provide any comments related to the portions of the 50.54(f) letter related to flooding.

The judgment by the staff articulated in SECY-12-0025 is contradicted by the COMSECY paper, which proposes that, in the interest of efficiency, it is appropriate to focus on using the reevaluated hazard to define the requirements and bounds for mitigating strategies, but *not* consider a “broader assessment” of the effects of the flood event on the plant or whether it is appropriate to systematically consider improved protection of safety-related SSCs in light of the reevaluated hazard. Specifically, the COMSECY (Enclosure 2, p. 1) states:

Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will, in many cases, improve the efficiency of the NRC’s regulatory process by ***eliminating the need for a broader assessment of the plant response*** as described in current plans and staff guidance for integrated assessments [emphasis added].

As described above, SECY-12-0025 states that the current implementation process for Recommendation 2.1 addresses the requirements of the Consolidated Appropriations Act (i.e., SECY-12-0025 states: “the reevaluation and related information analysis will serve to meet the NRC’s obligation under the Consolidated Appropriations Act, for 2012 (PL 112-74), Section 402”). The COMSECY proposes an alternate means of addressing the Consolidated Appropriations Act (as shown in the quote above). However, the COMSECY is not explicit about this change in path forward and does not request that the Commission vote to approve such a change.

2.3. Deviation from the current implementation process for Recommendation 2.1

2.3.1. Description of concern

The COMSECY describes a change from the implementation process for Recommendation 2.1. The following issues arise:

- The COMSECY does not, for the awareness of the Commission and external stakeholders, clearly and explicitly articulate that the COMSECY proposes a significant change to the current implementation process for Recommendation 2.1.
- The COMSECY does not clearly articulate a sound basis, technical or otherwise, for the changes to the implementation process.
- The COMSECY does not describe the consequences of the proposed changes to the implementation process (Sections 2.4 through 2.11 describe the consequences of changes to the process).

2.3.2. Supporting information

Current implementation process for NTTF Recommendation 2.1

Under the current process, Recommendation 2.1 is being implemented in two phases. Phase 1 includes the gathering of information related to the reevaluation of flooding hazards as well as the assessment of total plant response to those hazards (including evaluation of both protection and mitigation capabilities). Phase 2 involves regulatory decisionmaking based on the information gathered under Phase 1 and may include decisions related to updating the design or licensing basis of a plant. Regulatory decisions are expected to focus on whether there is reasonable confidence in the ability of plants to shut down the reactor and maintain it in that state with appropriate defense in depth for the entire flood event duration.

As mentioned above, Phase 1 of the Recommendation 2.1 implementation involves information gathering. Phase 1 was implemented by the issuance of the 50.54(f) letter. Phase 1 is implemented in two stages:

- Stage 1 – Hazard reevaluation using present-day licensing criteria
- Stage 2 – Integrated assessment of plant response to external flooding

Stage 1, “Hazard Reevaluation,” consists of the reevaluation of flooding hazards using present-day guidance and methods that are used as the licensing criteria used for siting of new reactors. These criteria are considered appropriate to support reasonable assurance findings for new reactors. The reasonable assurance finding concludes that the safety of the public and environment is protected from natural hazards, consistent with General Design Criterion 2, “Design bases for protection against natural phenomena” (GDC 2). Present-day licensing criteria¹ use a limited number of deterministic, stylized event combinations to develop estimates of flooding hazards. For some sites, the flood hazard reevaluation may result in estimation of flooding hazards that are more severe than those used to establish the plant’s current design basis. These sites are subsequently requested to perform an integrated assessment for external flooding under Stage 2 of Phase 1. In addition, these sites are requested to consider whether it is appropriate to implement interim actions to address the reevaluated hazard while the integrated assessment is being performed.

Stage 2, “Integrated Assessment,” is a systematic, flood-specific evaluation of the total plant response to the reevaluated flooding hazards. The interim staff guidance for the integrated assessment (Ref. [2]) describes a graded approach to ensure the assessment is appropriate for the unique characteristics of a given site and commensurate with the complexity of the strategy used to respond to a flood event. Depending on site characteristics, the graded approach results in assessments that range from conventional engineering evaluations of flood protection²

¹ Present-day regulatory guidance is contained in Regulatory Guide 1.59, “Design Basis Floods for Nuclear Power Plants” (last updated in 1977, Ref. [30]) and industry consensus standards (last issued in 1992, Ref. [31]). Staff also issued two interim staff guidance documents related to dam failure (Ref. [32]) and storm surge, seiche, and tsunami (Ref. [33]) to supplement existing guidance and assist licensees in responding to the 50.54(f) letter.

² If licensees can demonstrate that flood protection is reliable with margin under the scenarios resulting from the reevaluated flooding hazards, no further evaluation is required.

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to flood-specific mitigation³ evaluations based on one of three available evaluation options. The three evaluation options include a scenario-based evaluation (i.e., a conservative, but primarily qualitative evaluation), a margins-type evaluation, and a full probabilistic risk assessment (PRA). In all cases, the integrated assessment systematically evaluates the total plant response using risk-informed concepts and techniques for the specific conditions associated with the reevaluated flood hazards. Under the integrated assessment, licensees can take credit for all available resources including flood protection and mitigation, as appropriate. It is important to note that the term “mitigation” under the integrated assessment is not synonymous with the mitigating strategies referred to in the COMSECY. Under the integrated assessment, mitigation may include use of strategies associated with Order EA-12-049⁴ as well as alternate strategies developed specifically to respond to the reevaluated flooding hazard. The integrated assessment provides licensees with the opportunity to demonstrate the effectiveness of proposed protection and mitigation strategies for addressing the specific conditions of the reevaluated hazard as characterized by flood height, associated effects (e.g., waves, debris, sedimentation, erosion), and flood event duration (e.g., warning time and period of inundation). Thus, the integrated assessment provides a comprehensive and realistic assessment of plant capability and identifies effective safety enhancements.

Proposed site-specific responses to the reevaluated flood hazards may include enhancements to flood protection as well as use of non-traditional strategies, significant manual actions, and use of commercial grade equipment (including those proposed in response to Order EA-12-049). In exceptional circumstances, some licensees may propose strategies that intentionally defeat barriers (including secondary and primary containment as well as reactor coolant system boundaries), allow safety-related structures, systems, and components (SSCs) to flood, and rely on extensive manual actions. Although the staff expects that these strategies will be employed only in exceptional circumstances, it is important that they be rigorously evaluated in light of their use for responding to the reevaluated flood hazard. As described above, the integrated assessment requires systematic and appropriately rigorous, flood-specific evaluations thereby providing confidence that the strategies will be effective.

Phase 2, “Regulatory Decision-Making,” of the current Recommendations 2.1 implementation process uses the information gathered under Phase 1 to support decisions regarding whether additional regulatory actions are needed. Recommendation 2.1 and the Consolidated Appropriations Act direct NRC staff to consider the need to change the design basis of operating reactor sites. However, if necessary and appropriate, changes to a plant’s licensing

³ In the context of the integrated assessment, mitigation capability refers to the capability of the plant to maintain key safety functions in the event that a flood protection system(s) fails (or is otherwise not available). A mitigation evaluation is only necessary if (1) a site does not have flood protection to protect against the reevaluated hazard or (2) it cannot be shown the flood protection is reliable with margin under the reevaluated flooding hazard. The term mitigation under the integrated assessment is not synonymous with the mitigating strategies referred to in the COMSECY.

⁴ NEI 12-06 provides implementation guidance for mitigation strategies developed in response to Order EA-12-049. NEI 12-06 describes the objective of the strategies, which is to establish “an indefinite coping capability to prevent damage to the fuel in the reactor and spent fuel pools and to maintain the containment function by using installed equipment, on-site portable equipment, and pre-staged off-site resources.”

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basis may represent a more practical response. If capabilities beyond the current licensing basis are needed, then NRC staff will consider licensee commitments or evaluate the need for changes to the licensing basis using existing NRC processes in accordance with Title 10 of the *Code of Federal Regulations*, Part 50, Paragraph 109 (10 CFR 50.109), “Backfitting” (the Backfit Rule). Considerations will include the adequate protection and compliance exceptions and the cost-justified backfit. NRC staff will initiate regulatory analyses and associated backfits on a site-specific basis.

Proposed path forward described in the COMSECY

The proposed path forward outlined in the COMSECY will eliminate or significantly reduce the scope of Recommendation 2.1 Phase 1, Stage 2 activities (i.e., integrated assessment) and will eliminate or greatly reduce Phase 2. Specifically, the COMSECY (p. 3-4) states:

The collection and assessment of information related to flooding hazards as part of the NRC’s resolution of NTTF Recommendation 2.1 can be viewed as serving two purposes. ***The first purpose is to establish functional requirements and reference bounds for design to address external event scenarios in accordance with the generic mitigating strategies requirements.*** Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will ***reduce the need for a broader assessment of the plant response as described in current plans and staff guidance for integrated assessments.*** Where warranted, the flooding reevaluations can, however, continue to serve the purpose of supporting assessments of additional regulatory actions as potential plant-specific backfits [emphasis added].

The COMSECY specifies that the integrated assessment will be reduced such that the flooding hazard reevaluations will serve the primary purpose of providing an input to mitigating strategies (i.e., the flood hazard reevaluation will serve to define functional requirements and reference bounds for mitigating strategies). This differs from the currently defined purpose of the hazard reevaluations, which is to support a decision related to changes to the design or licensing basis of the plant. Under the proposed path forward described in the COMSECY, flood protection or other cost-effective safety enhancements (e.g., protection of emergency diesel generators using temporary barriers to avoid reliance on FLEX strategies as the primary means to address the reevaluated hazard) will not be systematically considered. Section 2.6 provides additional discussion on this topic.

The following excerpt from the COMSECY (Enclosure 2, p. 1) is another example of a statement implying changes to the “initial intent” of the integrated assessment:

The ***integrated assessment was initially intended to evaluate the total plant response*** to the flood hazard, including the capabilities being developed and implemented as part of the mitigating strategies required by Order EA-12-049, “Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” considering multiple and diverse capabilities such as physical barriers, temporary protective measures, and operational procedures. It is further noted that the above excerpt implies that the integrated assessment would, by default, evaluate mitigating strategies. However, as described above, the integrated assessment first evaluates flood protection and only considers mitigation if flood protection cannot be shown to be reliable with margin [emphasis added].

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In Enclosure 2 (p.4), the COMSECY explicitly acknowledges the departure from existing guidance and from briefings to the Commission:

The use of the flooding reevaluations from Recommendation 2.1 primarily to define functional requirements and reference bounds for mitigating strategies ***is a change from existing guidance and from briefings and reports provided to the Commission*** [emphasis added].

In further contrast to Phase 2 of the current Recommendation 2.1 implementation process, the COMSECY essentially precludes the consideration of changes to the design basis and protection of safety-related SSCs under the reevaluated hazard (based on present-day licensing criteria) by stating:

[T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected.

Moreover, as described in Section 2.6, sufficient information will not be collected under the proposed path forward in order to fully understand the total plant response to the hazard to support a backfit analysis.

2.4. Regulatory inconsistencies

2.4.1. Description of concern

The proposed path forward may lead to several potential regulatory inconsistencies:

- The treatment of increased flooding hazards from dam failures may differ between (1) sites for which there is ongoing regulatory activity that may lead to changes in the protection of the plant or other backfits and (2) sites for which regulatory activity is not already ongoing.
- The treatment of new information about different flood mechanisms may differ. For example, NRC may treat new information about increased flooding hazards from dam failures (at some sites) differently than new information about increased flooding hazards from other mechanisms such as storm surge and local intense precipitation.

Recent regulatory activity at Oconee Nuclear Station provides an illustration of regulatory actions related to dam failure that were initiated before the events at Fukushima. Actions were taken by NRC in response to new information about flooding hazards from dam failure and resulted in documented staff concerns regarding whether the plant was adequately protected. Staff concerns resulted in the initiation of activities to build protective features at the site. In contrast to treatment of new information regarding flooding hazards at Oconee, under the proposed path forward for Recommendation 2.1 described in the COMSECY, all new hazard information would be broadly classified as “beyond design basis,” without consideration of whether the design or licensing basis of the plant should be updated to protect SSCs important to safety. Instead, mitigating strategies would serve as the primary “defense” against the reevaluated hazard defined using present-day guidance and methods used to define the design basis of new reactors.

Experience with Oconee contributed, in part, to the proposal (and subsequent designation) of Generic Issue 204 related to flooding of nuclear power plants following upstream dam failure. The activities related to Generic Issue 204 as well as other site-specific regulatory activities were subsumed by the NTTF Recommendation 2.1 activities. However, the proposed path forward for NTTF Recommendation 2.1 will not provide information to support resolution of the issues subsumed by Recommendation 2.1 activities and thus they would require use of other processes to ensure resolution.

Finally, the COMSECY describes the systematic evaluation program (SEP) and invokes it as regulatory precedent. The description of the program and the resulting implications for Recommendation 2.1 is not clear and may be misleading.

2.4.2. Supporting information

A number of ongoing regulatory activities were subsumed by the implementation of NTTF Recommendation 2.1. These include activities related to site-specific regulatory actions (beyond findings under the reactor oversight process) and staff decisions related to increased flood hazards as well as Generic Issue 204. The information below describes one particular example of a site-specific regulatory action at Oconee Nuclear Station, which led to more generic actions.

Oconee Nuclear Station

There were no dam failures postulated in the original licensing/design basis of Oconee. In 2006, the NRC began asking questions regarding the adequacy of the flood protection barrier for the standby shutdown facility and concluded that the licensee had incorrectly estimated the frequency of dam failure and thus inappropriately “screened out” dam failure as a flooding hazard for the site. In June 2008, the NRC issued a request for information Oconee (ML081640244) to seek “additional information regarding external flooding of the Oconee site, including the consequences of a Jocassee Dam failure.” The licensee provided a response in September 2008 (ML082750106) with additional information related to the consequences of dam failure. In April 2009, NRC issued a letter (ML09057077) stating: “Based on the NRC staff’s review of the information provided by Duke to date, the NRC staff remains concerned that Duke has not demonstrated that Oconee will be adequately protected in the long term from external flooding events.” In January 2010, Duke submitted a letter to the NRC (ML100210199) that describes interim compensatory measures until all site modifications have been completed. In June 2010, NRC issued a confirmatory action letter (ML101730329) associated with the interim compensatory measures and described dates by which the licensee would provide information about permanent modifications. In April 2011, Duke provided a response (ML111460063) that lists modifications, including flood protected power, a power block floodwall, and diversion features.

In the April 2011 letter, Duke noted that failure of Jocassee Dam was a “beyond design basis event.” In August 2011, NRC staff issued a request for additional information (ML11174A138) requesting that Duke “[p]rovide justification for the statement in the April 29, 2011 letter that suggested the postulated failure of the Jocassee Dam is considered a beyond-design-basis event.” In the reply (ML11294A341), Duke stated:

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Within the April 29, 2011 letter (Response Reference 1), the statement related to the postulated failure of the Jocassee Dam ***being beyond design basis was a historical discussion*** relative to the Updated Final Safety Analysis Report (UFSAR) Criterion 2. From a historic perspective, the failure of the Jocassee Dam was not postulated within the Oconee licensing or design basis and therefore, would have been a beyond design basis event. As discussed in previous correspondence and below, ***Duke Energy plans to incorporate external flooding resulting from a postulated Jocassee Dam failure into the Oconee licensing basis*** [emphasis added].

Recent regulatory decisionmaking at Oconee provides a relevant precedent for regulatory decisionmaking under Recommendation 2.1, which is not noted in the COMSECY.⁵ As described in Section 2.5 of this paper, there are several common reasons that flooding hazards may increase under the hazard reevaluations. These include:

1. Hazard mechanisms were not considered under the design basis but are considered under the Recommendation 2.1 flood hazard reevaluations
2. Reassessment of the credibility of hazards
3. New modeling and analysis tools lead to the understanding that flood scenario parameters associated with the same events considered in the design basis for a site are more severe than previously estimated

Therefore, in the case of Oconee, an event that was not within the design or licensing basis of the site was later determined to have been “screened out” inappropriately at initial licensing (i.e., there was a reassessment of the credibility of the hazard). NRC then began taking actions over concerns that the plant was not *adequately protected* against that hazard. Plant actions in response include modifications to provide *protection* to the site. This differs from how the COMSECY proposes to address the reevaluated hazard only through use of mitigating strategies and perpetual designation of the reevaluated flooding hazard as beyond design basis. For example, the COMSECY states (Enclosure 1, p. 2):

[T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected. The flooding reevaluations will, however, be used to define functional requirements and reference bounds for those specific SSCs used to support key safety functions within the mitigating strategies for beyond-design-basis external events.

Generic implications

The lessons learned from Oconee led, in part, to several follow-on actions including:

- Initiation of Generic Issue 204 (GI-204) related to the potential generic safety implications of flooding of nuclear power plant sites from upstream dam failure (Ref. [11]). GI-204 was subsequently subsumed (Ref. [12]) by the activities being performed in response to the 50.54(f) letter requested in response to Recommendation 2.1.

⁵ While the COMSECY does not mention the recent regulatory decisions made relative to Oconee, the COMSECY does reference the systematic evaluation program (SEP). Additional discussion of the COMSECY’s characterization of the SEP is provided below.

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- Issuance of Information Notice 2012-02, “Potentially Nonconservative Screening Value for Dam Failure Frequency in Probabilistic Risk Assessments” (Ref. [13]), which alerted “addressees of a potentially nonconservative screening value for dam failure frequency that originated in 1980’s reference documents which may have been referenced by licensees in their probabilistic risk assessment (PRA) for external events.”

Both of the above activities resulted when NRC learned that the potential for more severe safety consequences from increased flooding hazards from dam failure was generic. NRC recognized the need to potentially take further regulatory action as demonstrated by the designation of GI-204. However, as noted above, the resolution of GI-204 was subsumed by Recommendation 2.1 activities. In addition, there are other site-specific regulatory actions related to increased flooding hazards (e.g., backfits or changes to plant licensing basis) under consideration at sites such as Fort Calhoun Station and Watts Bar Nuclear Plant. These actions were initiated based on knowledge about increased flooding hazards that were estimated using the same methods that are being used under Recommendation 2.1. These site-specific activities have been subsumed into the Recommendation 2.1 activities based on the current path for implementation. Changes to the path forward for implementation of Recommendation 2.1 may require revisiting these site-specific actions outside of the Recommendation 2.1 process.

As noted previously, the path forward for NTF Recommendation 2.1 in the COMSECY proposes to focus on evaluation of the impact of the reevaluated hazard on mitigating strategies. This narrowed focus would significantly reduce information available to the staff regarding the effects of the reevaluated flooding hazards on plants as well as information regarding the breadth of potential cost-effective safety enhancements that may be appropriate. Moreover, the proposed path forward will likely not collect a sufficient amount, nor the correct type, of information to support a conclusion regarding the need for additional regulatory action in response to increased flooding hazards. This would be inconsistent with previous treatment of information at Oconee. It would also mean that resolution of regulatory activities related to dam failure subsumed by Recommendation 2.1 for flooding activities would need to be resolved by other processes. Finally, it would lead to inconsistency in the treatment of different flooding mechanisms.

Description of the Systematic Evaluation Program

The COMSECY notes that “the licensing basis, design, and level of protection from natural phenomena differ among the existing operating reactors in the United States.” The COMSECY goes on to describe the SEP:

The NRC recognized these differences between plants and the need to assess early plants against the evolving standards in the 1970s following the development of the standard review plan (SRP). ***The agency identified potential safety issues and reviewed the early plant designs against the then-newer SRP guidance under the systematic evaluation program (SEP).*** The SEP included several flooding issues and resulted in some plant-specific reviews and design or procedure changes implemented by impacted licensees to address potentially higher flooding hazards. Generic Letter 95-04, “Final Disposition of the Systematic Evaluation Program Lessons-Learned Issues,” dated April 28, 1995, describes the SEP and the resolution of the issues. Many of the

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SEP issues were resolved by the subsequent requests for licensees to perform individual plant examinations. The flooding issues were addressed within Supplement 4 to Generic Letter 88-20, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities – 10 CFR 50.54(f)." ***The actions taken by licensees to address potential vulnerabilities or other flooding concerns were not subsequently incorporated into regulations or operating licenses***[emphasis added].

The above is not clear with respect to the outcomes of the SEP and may be interpreted to mean that no changes were made to the design or licensing basis of plants as a result of the SEP. This does not comport with licensee statements regarding the SEP and effects of plant design bases. For example, in describing the design-basis flood elevations for river flooding, the Dresden Nuclear Power Station flood hazard reevaluation report (Ref. [14]) states the following:

The current design basis is defined in the DNPS UFSAR (Dresden UFSAR) and by reference to an NRC Systematic Evaluation Program (SEP) (FRC 1982).

:

The UFSAR (Dresden UFSAR) by reference to the SEP (FRC 1982) identifies that a flow rate of 490,000 cfs in the Illinois River at the DNPS site would result in a stillwater flood elevation of 525 feet msl. Adding wave runup to the stillwater flood elevation yields a site PMF [probable maximum flood] elevation of 528 feet msl. Safe operation of the plant during the PMF is accomplished via implementation of flood emergency procedures.

By reference to the SEP, the PMF is based on a 72-hour PMP [probable maximum precipitation] storm duration. The PMP is developed using USACE [U.S. Army Corps of Engineers] guidance. The approximate 7300 square mile watershed is divided into 13 sub-basins and HEC-1 software is used to transform rainfall to runoff using calibrated hydrographs. The Standard Step Method is used to determine the water surface elevation. HEC-2 software is used to evaluate the reach of the Illinois River between the Dresden Island Lock and Dam and the confluence of the Kankakee and Des Plaines River.

In addition, the Recommendation 2.3 flooding walkdown report (Ref. [15]) for Dresden states the following:

The design-basis flood hazard level for the Dresden site has been evaluated by the NRC as part of the Systematic Evaluation Program (SEP) Topics II-3.A, II-3.B, II-3.B.1 and II-3.C, which was completed in 1982. The results of the SEP study were presented in the Safety Evaluation Report (Enclosure 1) and Technical Evaluation Report (Enclosure 2). Based on the information provided in the SEP report, the design-basis flood hazard level is associated with the PMF, which results in a peak stillwater elevation of 524.5 ft MSL. Coincidental 2-year wind generated waves and wave run-up would increase the maximum water surface elevation to approximately 528 ft MSL. Both flood elevations are significantly above the grade elevation (517.0 ft MSL), the elevation of non-watertight openings in walls of safety-related structures (517.5 ft MSL), and the lowest sub-grade floor containing equipment important to safety (Crib House) (509.0 ft MSL).

The statements above, made by the licensee, suggest that the design basis for Dresden was updated to incorporate the results of the SEP. This differs from the implications of the COMSECY that design changes in response to new information about flood hazards are unnecessary because mitigating strategies will be available and once again demonstrates the

regulatory precedent for changing a plant's design basis in response to new information about flood hazards.

2.5. Safety conclusions are pre-judged

2.5.1. Description of concern

As described in the previous sections, Phase 1 of the implementation process for NTTF Recommendation 2.1 is intended to gather sufficient information about (1) the reevaluated flooding hazard for a site, (2) the effects of the hazard on the site, and (3) the plant's proposed response to a hazard (e.g., protection, mitigation, or some combination). This information is gathered so that NRC can ensure that plants are adequately protected and make decisions regarding safety enhancements. It is important to note the typical reasons that flooding hazards have increased as a result of the NTTF Recommendation 2.1 flood hazard reevaluations. These reasons for increase include:

1. Hazard mechanisms were not previously considered (e.g., local intense precipitation events not considered when the plant was sited are evaluated as part of the NTTF Recommendation 2.1 hazard assessment)
2. Reassessment of or new information regarding the credibility of hazards (e.g., dam failure events previously considered not credible based on an assessment of dam failure frequencies are reassessed as credible)
3. New modeling and analysis tools lead to the understanding that flood height, associated effects, or flood event duration associated with the same events considered in the design basis for a site are more severe than previously estimated (e.g., estimation of higher flood levels resulting from same dam failure events already included within the design basis)

The COMSECY proposes to truncate the current Recommendation 2.1 implementation process and focus on mitigating strategies (originally developed to provide additional defense in depth) as the first line of defense against the reevaluated flooding hazard. The COMSECY prejudices the outcomes of Phase 2 of the implementation process for NTTF Recommendation 2.1 and states that NRC does not expect to redefine the design basis for protection of safety-related SSCs. This may conflict with NRC's obligation to continually assess whether there is adequate protection of public health and safety.

2.5.2. Supporting information

The document makes several statements that pre-judge the outcomes of Recommendation 2.1 activities and the regulatory actions that may be needed as a result of the hazard reevaluations and associated integrated assessments. For example, the COMSECY states (Enclosure 1, p. 2):

[T]he NRC staff does not expect to use the reevaluated flooding hazards to redefine the design-basis flood against which safety-related SSCs would need to be protected.

The above exclusion of consideration of whether it is appropriate to change the design (or licensing) basis is not consistent with the intent of NTTF Recommendation 2.1 and does not appear to be consistent with the language of the Consolidated Appropriations Act, Public Law

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112-074 (Ref. [8]). Section 402 of the law requires a NRC consider whether it is necessary to update plant design bases for external hazards (e.g., the law states, in part: “the Commission shall require licensees to update the design basis for each reactor, if necessary”).

As another example, the COMSECY (p. 5) states:

In some cases, the newly estimated elevated [sic] flooding levels, should they occur, might result in **significant damage to a nuclear power plant** and warrant scenario-specific strategies. However, even in such extreme cases, licensees will be required by the planned [mitigating beyond-design-basis events] regulation to have mitigating strategies that provide capabilities that can be deployed to prevent fuel damage in reactor cores or spent fuel pools and the resultant large release of radioactive materials to the environment. **In addition to satisfying the requirements of the NRC regarding radiological health and safety concerns, the above approach provides confidence that the nuclear power plant will not significantly complicate the response to and recovery from the extreme natural disaster.** The NRC staff is also seeking Commission affirmation on this general approach for licensees developing mitigating strategies for floods that might result in significant damage to a nuclear power plant site [emphasis added].

The above excerpt implies that use of scenario-specific mitigation strategies in response to an event causing significant damage to the nuclear plant satisfies “the requirements of the NRC regarding radiological health and safety concerns” and “provides confidence that the nuclear power plant will not significantly complicate the response to and recovery from the extreme natural disaster.” This can be interpreted to imply a pre-judgment that NRC requirements are met and further regulatory action (e.g., additional protection) would not be required.

The COMSECY also states:

Except as imposed by the NRC through specific regulations, orders, or license conditions, licensees are not required to assess or modify plant designs to meet new or revised standards. Nor are licensees normally requested to periodically assess possible changes to plant designs or procedures to address external hazards beyond those used in the initial plant siting and licensing decisions.

Although the COMSECY is correct that the NRC has not previously required licensees to periodically reassess external hazards, this does not preclude the NRC from considering the need to take actions to improve the protection of plants in light of new information about the severity of natural hazards. With regard to the definition of adequate protection, the NTTF report (Ref. [1]) notes the evolving nature of the standard:

Adequate protection has been, and should continue to be, an evolving safety standard supported by new scientific information, technologies, methods, and operating experience. This was the case when new information about the security environment was revealed through the events of September 11, 2001. Licensing or operating a nuclear power plant with no emergency core cooling system or without robust security protections, while done in the past, would not occur under the current regulations. As new information and new analytical techniques are developed, safety standards need to be reviewed, evaluated, and changed, as necessary, to insure [sic] that they continue to address the NRC’s requirements to provide reasonable assurance of adequate protection of public health and safety. The Task Force believes, based on its

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review of the information currently available from Japan and the current regulations, that the time has come for such change [emphasis added].

Moreover, several court cases (e.g., [16] and [17]) are consistent with the NTF's statement and note both the evolving standard of adequate protection to keep pace with developing information and the legal obligation of NRC to consider adequate protection before considering the cost-justification of any particular regulatory action.

As described in Section 2.3, the intent of Recommendation 2.1 and associated implementation activities is to determine whether additional regulatory actions are appropriate. The proposed path forward described in the COMSECY will truncate the information-gathering steps needed to make this decision. The COMSECY advocates this truncation based on an assumption that the reevaluation of this hazard will not generally give the NRC cause to reexamine the current design or licensing basis.

2.6. Insufficient information to support a staff decision

2.6.1. Description of concern

The proposed path forward described in the COMSECY truncates the Recommendation 2.1 implementation process by reducing the scope and rigor of the integrated assessment, or eliminating the integrated assessment altogether. As a result, important insights about plant response will not be gathered at sites for which the reevaluated hazard is more severe than the design basis. Information about the increase in hazard alone is not sufficient to determine whether additional regulatory actions should be pursued. Therefore, the proposed path forward described in the COMSECY will not provide sufficient information to support staff decisions regarding whether to take additional regulatory action (beyond providing functional requirements and reference bounds for Order EA-12-049 mitigating strategies) to ensure adequate protection of public health and safety or as cost-justified substantial safety enhancements.

2.6.2. Supporting information

As described in Section 2.3.2, the integrated assessment will provide information to support a staff decision regarding whether to take additional regulatory action to ensure adequate protection of public health and safety or as cost-justified substantial safety enhancements. The COMSECY proposes to eliminate (or reduce) the integrated assessment and notes that a significant amount of information will no longer be collected under the proposed path. For example, in Enclosure 2 (p.6), the COMSECY states the following:

The integrated assessments envisioned by the original guidance provided an opportunity for licensees and the NRC staff to gain insights into plant responses to flooding beyond testing capabilities to mitigate the event. Although the assessment of flooding hazards will now be focused primarily on the mitigating strategies capabilities (including necessary installed SSCs), the revised approach does not rule out the possibility that some licensees may perform the more detailed integrated flooding assessment as described in the current guidance documents (i.e., assessing plant impacts beyond maintaining mitigating strategy capabilities). These assessments could support licensees' consideration of asset protection measures ... or identify possible cost

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savings associated with traditional flood protection versus revised mitigating strategies. Detailed integrated assessments that assess flood protection and mitigation capabilities beyond Order EA-12-049 and the MBDBE [mitigation of beyond design basis events] rulemaking may also be undertaken if needed to support evaluating the possible pursuit of plant-specific requirements in accordance with NRC's backfit regulation. The NRC staff will, on a case-specific basis, consider information about the reevaluated hazards; available response times for identified scenarios; plant-specific configurations and licensing histories; and other factors when defining an appropriate integrated assessment of flooding scenarios to support evaluating a potential plant-specific backfit [emphasis added].

The statement in the COMSECY acknowledges the *possibility* that additional evaluations, beyond a “check” of mitigating strategies, may be performed at the discretion of licensees or on a case-by-case basis to support backfit analysis. However, this is presented as something that will happen in an ad hoc manner because the COMSECY does not make it clear how the NRC will initiate these “more detailed” assessments. The COMSECY also does not establish how licensees would be requested to perform such assessments or the basis by which licensees would be selected. It is noted that, under the current Recommendation 2.1 implementation process, a criteria for requiring an integrated assessment has already been established (i.e., licensees are requested to perform an integrated assessment when the reevaluated hazard is not bounded by the design basis). The COMSECY provides no basis for deviating from the established criteria. Thus, COMSECY introduces unnecessary ambiguity and an ad hoc approach into what is currently well-established and systematic process. Moreover, it is noted that it would also be challenging for the staff to require these analyses outside of the 50.54(f) letter response. Finally, as described in Section 2.3.2, the integrated assessment interim staff guidance (Ref. [2]) already facilitates a graded approach that ensures the complexity of the evaluation is commensurate with the complexity of the strategy employed under the reevaluated hazard.

In addition to the above except from the COMSECY, similar statements are made elsewhere in the document that specify that mitigating strategies will be acceptable as the primary response to reevaluated hazard. The need for additional actions will be based only on information related to the reevaluated hazards and will not include information about plant response. As described later in this section, information regarding the hazard alone does not provide sufficient information to support a backfit analysis. For example, the COMSECY (p. 5) states:

Much of the focus for the reevaluated flooding hazards is related to assessing the capabilities for mitigating strategies. Nonetheless, the activities related to the flooding reevaluations may result in the NRC staff identifying other safety concerns and the need to consider additional regulatory actions beyond those being implemented by licensees in accordance with Order EA 12 049 and the related MBDBE [mitigation of beyond design basis events] rulemaking. The NRC staff will use established processes such as those defined in Management Directive (MD) 8.4, “Management of Facility-specific Backfitting and Information Collection” to initiate, review, and disposition these types of safety concerns.

The COMSECY further states:

Focusing the flooding reevaluations on the SSCs serving key safety functions within the mitigating strategies requirements will **reduce the need for a broader assessment** of

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the plant response as described in current plans and staff guidance for integrated assessments. Where warranted, ***the flooding reevaluations can, however, continue to serve the purpose of supporting assessments of additional regulatory actions as potential plant-specific backfits*** [emphasis added].

Thus, the COMSECY suggests that (1) focusing on mitigating strategies reduces the need for the broader integrated assessment and (2) that information about the hazard alone (without information about the effects of the hazard on the site) would be sufficient to understand whether a backfit would be appropriate. This is not consistent with Commission direction and is not technically justifiable. Moreover, it is important to note that there is a bi-directional causality issue associated with the logic in the referenced statements in the COMSECY and the COMSECY overall (i.e., there is a “chicken or the egg problem”). In order to understand whether a backfit is appropriate, it is necessary to understand risk insights about the problem. However, without performance of the integrated assessment (as describing in current guidance), this information will not be gathered. Therefore, under the proposed path forward, it would be challenging for staff to systemically understand when a backfit should be considered because information regarding the hazard alone is not sufficient to make a determination regarding the appropriateness of backfit (e.g., a small increase in hazard at one site may be consequential whereas another site may be able to accommodate large changes in the magnitude of the hazard).

As stated in NUREG/BR-0058, “Regulatory Analysis Guidance of the U.S. Nuclear Regulatory Commission” (Ref. [18]),⁶ risk (or risk insights) is an important part of regulatory decisionmaking:

Assessing the risk of potential changes to public safety has always been a fundamental part of regulatory decisionmaking. In the early development of regulations, this assessment was based on qualitative analysis, simple reliability principles and practices (such as worst-case analysis), defense in depth, and the single-failure criterion. The frequency or probability of the hazard was not an explicit factor, primarily because the overall state-of-the-art of probabilistic risk assessment (PRA) technology was not sufficiently advanced and accepted. Because of the advancements made and an increased confidence in PRA, regulators have progressively relied more on the insights and results from risk assessment in managing regulatory activities. The safety goals for the operation of nuclear power plants, which are in the “Policy Statement on Safety Goals for the Operation of Nuclear Power Plants,” published in August 1986 by the NRC, are a clear example of this change, and these goals established a guide for regulatory decisionmaking [emphasis added].

⁶ It is noted that the above excerpt from p. 5 of the COMSECY refers to Management Directive (MD) 8.4 when referring to the process for backfitting of plants. MD 8.4 refers to NUREG/BR-0058 and other documents. For example, MD 8.4 (p. 34) states: “[f]or a complete discussion of NRC’s regulatory analysis requirements, the staff is directed to the latest versions of NUREG/BR-0058, “Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission,” and NUREG/BR-0184, “Regulatory Analysis Technical Evaluation Handbook.” For a thorough discussion of NRC’s backfit analysis requirements, the relevant document is the latest version of NUREG-1409, “Backfitting Guidelines.”

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Understanding risks requires information about both the hazard and the consequences of that hazard. Under the proposed path forward described in the COMSECY, information about consequences will not be collected nor fully understood.

In addition, it is important to note that flood hazards reevaluated under present-day regulatory guidance are primarily deterministic. For this reason, conventional risk analyses (e.g., PRA) are not fully applicable. However, this does not preclude the ability of technical staff to use risk insights in decisionmaking. Thus, it is important to understand: (1) the magnitude and characteristics of the reevaluated hazard, (2) detailed information regarding the impact of the hazard on the site, and (3) the effectiveness of strategies for response including potential options for addressing the hazard. In developing the integrated assessment interim staff guidance, staff recognized that it was necessary to understand the above items in order to inform a backfit analysis. Therefore, the integrated assessment was developed to provide the following insights:

- Whether flood protection is reliable with margin, whether equipment is reliable, and whether associated actions are both feasible and reliable.
- An understanding of: the balance between protection/prevention and mitigation realized during the flood event, whether defense in depth is maintained, and whether there is redundancy and diversity in proposed strategies.
- Identification of whether there are adverse consequences from smaller and more likely flood events and identification of the characteristics of the strategies used to respond to these smaller events (e.g., whether flood protection barriers are “overtopped” at flood elevations lower than the magnitude of the reevaluated flooding hazard).
- Identification of whether there is an early transition to a reliance on mitigation for smaller, more likely flood events resulting in a significant increase in plant risk from external flooding (e.g., identification of cliff-edge effects).
- Identification of effective/efficient strategies for addressing floods (e.g., installation of flood protection such as flood gates rather than sacrificing equipment to “go straight to FLEX”).

Under the proposed path forward described in the COMSECY, the information gathered under Phase 1 would be limited to understanding the magnitude and characteristics of the reevaluated hazard. Insights regarding the impact of the hazard on the site, the effectiveness of strategies for response, and potential efficient and effective options for addressing the hazard would *not* be obtained under the path proposed in the COMSECY. As described above, the information gathered on the hazard alone is not sufficient to determine whether a backfit is appropriate to undertake. For this reason, the proposed path forward described in the COMSECY does not provide generally sufficient information to take regulatory action beyond defining functional requirements and reference bounds for mitigating strategies.

2.7. Lessons learned from operating experience are not incorporated

2.7.1. Description of concern

Operating experience has demonstrated the potential hazards posed to nuclear power plants by flood events as well as the importance of ensuring plants can appropriately protect against flooding events. NRC operating experience in this area stretches back decades. Several examples of this past experience include the impact of Hurricane Andrew on Turkey Point (Ref. [19]), deficient flood panels at Prairie Island (Ref. [20]), and flooding of Cooper Nuclear Station (Ref. [21]). In addition there have been a number of recent events involving flooding of sites or structures, as well as recent “greater than green” findings under the reactor oversight process and recent non-cited violations and licensee event reports. This operating experience has brought to the forefront the importance of carefully evaluating flood protection. Recent flooding events have involved (1) failed or missing seals that resulted in the inundation of areas containing safety-related equipment, (2) the effect of rising water levels on instrumentation and information availability during a hurricane event, and (3) storm surge and debris effects. Recent findings under the reactor oversight process have involved missing seals, inadequate procedures, and infeasible manual actions. Although there can be some solace taken in the fact that some of these events have been discovered under the reactor oversight process, it is important to note that the purpose of the reactor oversight process is to inspect, measure, and assess plant performance, not to systematically evaluate plant response to new information regarding increased hazards. All of these insights arising from operating experience would be addressed as part of the integrated assessment. However, the proposed path forward described in the COMSECY would significantly reduce or eliminate the assessment of plant response that is performed under Recommendation 2.1 activities.

2.7.2. Supporting information

Recent events:

The summaries below provide an overview of several recent events involving flooding hazards:

- **St. Lucie (2014):** On January 9, 2014, the St. Lucie site experienced heavy rainfall and storm drain blockage caused water to backup within the emergency core cooling system pipe tunnel. Water entered the reactor auxiliary building (RAB) through two degraded conduits that lacked internal flood barriers. Specifically, the water was observed entering the RAB through an electrical junction box, which was below the elevation for which the RAB flood protection was designed. The extent of condition identified four more conduits with the same legacy installation issue. The licensee identified a previous similar event involving degraded penetration seals associated with LER 355-2012-010.
Source: St. Lucie LER 2014-001-02
- **ANO (2013):** On March 31, 2013, the collapse of the temporary crane resulted in the rupture of an eight-inch fire main in the turbine building train bay. Water from the fire suppression system migrated to several areas of the turbine building on both the Unit 1 and Unit 2 sides, and leaked through floor hatches in the train bay into the Unit 1 auxiliary building. The water from the firewater system leaked past the flood barriers

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installed in hatches in the train bay and filled the building sump, eventually accumulating on the 317-foot elevation of the Unit 1 auxiliary building. The loss of offsite power prevented the auxiliary building sump pumps from operating. The water rise in the auxiliary building stopped when operators secured the fire water system. The licensee deployed temporary air-driven sump pumps to the 317-foot elevation of the Unit 1 auxiliary building to remove the accumulated water. Although this event involved internal flooding, it highlighted external flooding vulnerabilities because the turbine building is allowed to flood during certain flood events. From its extent of condition review, the licensee identified other paths for water to get into the auxiliary building, which included:

- drains in the turbine building
- a sump from the solid radioactive waste storage building (located in the switchyard) to the Unit 1 auxiliary building sump
- unprotected penetrations in the auxiliary building annex
- unprotected electrical conduits entering into the auxiliary building
- unsealed holes in the auxiliary building from the turbine building
- the tendon gallery access hatches.

Source: ML14083A409 and ML13158A242

- **Fort Calhoun (2011):** Missouri River flooding in the summer of 2011 significantly challenged plant operation at Fort Calhoun, even though it was less than the design basis. Significant challenges were encountered during the event including seal failures, a breaker fire, aqua berm rupture, and issues with site access and security. In addition, it was discovered during the event that protocols were not established for briefings between the dam operators and the site.
- **Oyster Creek (2012):** An alert was declared at Oyster Creek during Hurricane Sandy due to high water levels at the intake. In addition, an offsite power line tripped and a caused a trip of the spent fuel pool cooling system. The modem that was transmitting intake level data to the control room failed and control room operators had to rely on secondary indicators (i.e., personnel stationed at the intake structure using local pressure indicators) to make emergency action level decisions. Eventually, personnel at the intake structure could not monitor for the entire event due to rising water levels. Offsite power was lost causing a trip of the shutdown cooling system and diesel generators automatically aligned to restore power to emergency buses.
Source: ML13010A470
- **Salem (2012):** Salem, Unit 1 experienced a loss of 4 of 6 circulating water pumps due to heavy river debris from Hurricane Sandy. The reactor was manually tripped (0109 hours). An automatic start of the Auxiliary Feedwater system occurred as expected on unit trip due to low Steam Generator water levels. Later (0118 hours) the remaining two circulating water pumps were tripped due to continuing debris build up. Main Steam Line Isolation was manually initiated (0513 hours) in response to a loss of condenser vacuum.
Source, Salem LER no. 2012-004-0 (event date: 10-30-12, report date 12-26-12)
- **Vermont Yankee (2013):** On March 19, 2013, with the plant in the cold shutdown condition during a refueling outage, Vermont Yankee discovered water from dredging

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operations inside two electrical manholes located in the Vital Switchgear Rooms. On March 23, 2013, it was identified that the water had entered the two manholes through a partially dislodged flood seal in an underground spare conduit that communicates with the Switchgear Room manholes. On March 27, 2013, during an extent of condition review, an additional water intrusion pathway into the Switchgear Rooms via an abandoned sump pump discharge line was discovered. The dislodged flood seal and sump pump discharge line compromised the interior flood design controls for the Switchgear Rooms. The causes of the dislodged flood seal were due to the seal not being conservatively sized or tested for the application it was used in and failure to take timely corrective actions following a similar event reported in LER 2012-001-01.

Source: Vermont Yankee LER no. 2013-001-00 (event date 03-19-2013; report date 05-16-2013)

Recent greater than green findings:

The summaries below provide an overview of several recent “greater than green” findings involving flooding hazards:

- **Ginna (2014):** In April 2014, Ginna was issued a white finding with notice of violation involving failure by the licensee to assure prompt identification and correction of conditions adverse to quality concerning two cable penetrations between manhole 1 and battery room 'B' at Ginna which were not hydrostatically sealed as required. The missing seals were identified in May 2013 but were not promptly corrected.
Source: ML14107A080
- **Point Beach (2013):** In August 2013, Point Beach was issued a white finding with notice of violation involving failure to implement external flooding wave runup protection design features as described in the Final Safety Analysis Report. Associated procedures would not protect safety-related equipment in the turbine building or pump house.
Sources: ML13169A212 and ML13221A187
- **Monticello (2013):** In August 2013, Monticello was issued as yellow finding and notice of violation involving the licensee's failure to maintain a procedure addressing all of the effects of an external flooding scenario on the plant (i.e., the licensee failed to maintain flood procedures such that it could support the timely implementation of flood protection activities within the 12-day timeframe credited in the design basis as stated in the updated safety analysis report).
Source: ML13240A435
- **Dresden (2013):** In July 2013, Dresden was issued a white finding with notice of violation for failure to establish a procedure addressing all of the effects of an external flooding scenario on the plant (i.e., the flood-specific procedure did not account for reactor vessel inventory make-up during an external flooding scenario up to and including the probable maximum flood event which could result in reactor vessel water level lowering below the top of active fuel).
Source: ML13213A073
- **Three Mile Island (2013):** In April 2013, Three Mile Island was issued a white finding with notice of violation associated with the TMI external flood barrier in which electrical cable couplings located in the Air Intake Tunnel were not flood sealed, as designed, to

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protect against a flood. Inspectors identified that Exelon failed to identify and correct the issue during external flood barrier walkdowns.

Sources: ML13120A040 and ML13042A277

- **Watts Bar (2013):** In June 2013, Watts Bar was issued a white finding and notice of violation associated with the failure to establish and/or maintain an Abnormal Operating Instruction (AOI) procedure to mitigate onsite the effects of a probable maximum flood event. The procedure was inadequate to mitigate the effects of a PMF event in that earthen dams located upstream of the facility could potentially overtop, causing a subsequent breach. Failure of the earthen dams during a PMF event would have resulted in onsite flooding and subsequent submergence of critical equipment, such as the emergency diesel generators, resulting in an ineffective flood mitigation strategy for these PMF events.

Source: ML13155A572

In June 2013, Watts Bar was issued a yellow finding and notice of violation associated with failure to establish and/or maintain an AOI procedure for the plant to be reconfigured and systems realigned within 27 hours of notification of a significant flooding event, consistent with Technical Requirements Manual (TRM) 3.7.2 and Watts Bar Updated Final Safety Analysis Report (UFSAR) Section 2.4. The licensee was initially unable to demonstrate timely implementation of AOI-7.1 to reconfigure and realign systems necessary for flood mitigation within 27 hours. The walkdown identified spool piece fit-up issues, inability to locate staged equipment, and, in general, lack of thorough understanding of the collective workload, workflow, and labor requirements for completing flood preparation tasks. As a result, the flood mitigation strategy for certain design-basis flooding events, including PMF events, was inadequate.

Source: ML13155A572

- **Sequoyah (2013):** In June 2013, Sequoyah was issued a white finding and notice of violation involving failure to properly establish an adequate abnormal operating procedure (AOP) to mitigate the impact of a PMF. The procedure was inadequate to mitigate the effects of a PMF event, in that, earthen dams located upstream of the facility could potentially overtop, causing a subsequent breach. Failure of the earthen dams during a PMF event would have resulted in onsite flooding and subsequent submergence of critical equipment, such as the emergency diesel generators, resulting in an ineffective flood mitigation strategy for these PMF events.

Source: ML13155A560

In June 2013, Sequoyah was issued a white finding and notice of violation involving failure to translate the design basis related to onsite flooding protection into specifications, drawings, procedures, and instructions. Sequoyah's existing design documentation, including current licensing documents and configuration controlled drawings for the Essential Raw Cooling Water (ERCW) pumping station, did not contain sufficient information to identify the penetrations seals as flood barriers to prevent flood water from entering the building during design-basis flood (DBF) events. As a result of degraded or missing flood penetration seals, the ERCW pump station would not have remained functional when subjected to the design-basis PMF and other less severe flooding events. Flooding of the ERCW Pumping Station would have resulted in

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submerging service water equipment relied on during DBF events which would have compromised the function of the emergency diesel generators (EDGs). Failure of the EDGs would have resulted in an ineffective flood mitigation strategy to prevent core damage.

Source: ML13155A560

- **Brunswick (2011):** In December 2011, Brunswick was issued a white finding and notice of violation associated with failure to identify and correct a condition adverse to quality associated with the entrance enclosures for the emergency diesel generator (EDG) fuel oil tank rooms (i.e., the enclosures contained openings which would adversely impact their ability to mitigate external flooding of the EDG fuel oil tank rooms in the event of an external event (hurricane)).

Source: ML113610594

Fort Calhoun (2010, 2013): In March 2013, Fort Calhoun was issued a notice of violation associated with a finding that was identified involving the failure to classify the river sluice gates as Safety Class 3. The significance of this finding was bounded by the previously issue yellow finding and therefore was not characterized by color significance.

Source: ML13070A399

In October 2010, Fort Calhoun was issued a yellow finding and notice of violation for failure to maintain procedures for combating a significant flood as required by technical specification. Procedures did not adequately prescribe steps to mitigate external flood conditions in the auxiliary building and intake structure up to 1014 feet mean sea level, as documented in the Fort Calhoun Updated Final Safety Analysis Report.

Source: ML102800342

Additional recent licensee event reports and green findings:

The list below provides references for additional licensee event reports and green findings involving flooding hazards:

- Three Mile Island: ML13042A277 and ML13042A277
- Watts Bar (2013): ML13155A572
- Millstone (2013): ML13016A194 and ML13312A992
- Fort Calhoun (2011, 2012): Fort Calhoun LER 2011-003-01 (event date 02-03-2011; report date 05-16-2011); ML12366A158; and Fort Calhoun LER 2012-001-1 (event date 02-10-12; report date 05-17-13)
- Brunswick: ML14149A149
- Browns Ferry (2009): Browns Ferry LER 2013-001-01 (event date 02-06-2013, report date 06-12-2013)
- Ginna (2013): Ginna LER no. 2013-003-1 (event date: 09-20-2013, report date 12-13-2013)
- Monticello (2013): Monticello LER no. 2013-003-02 (event date 05-31-2012; report date 01-28-2014)
- Vermont Yankee (2012, 2013): Vermont Yankee LER no. 2012-001-01 (event date 05-24-2012; report date 09-12-2012); Vermont Yankee LER no. 2013-002-00 (event date 11-07-2013; report date 12-31-2013)

- Prairie Island (2012, 2013): Prairie Island LER no. 2012-001-00 (event date 02-15-2012; report date 04-12-2012); Prairie Island LER no. 2013-002-00 (event date 09-19-2013; report date 11-18-2013)

2.8. Lack of clarity regarding differences in the intended purposes of the integrated assessment versus the mitigating strategies activities and associated guidance

2.8.1. Description of concern

The integrated assessment interim staff guidance (Ref. [2]) describes the set of evaluations and documentation necessary to support licensees' assessments of their proposed strategies for evaluating the total plant response to any increased flooding hazards identified as a result of the hazard reevaluation using present-day guidance and methods applicable to defining the design basis for new reactors. The interim staff guidance (ISG) was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. In recognition that operating reactors are already sited and cannot be redesigned, the ISG allows licensees to credit (with appropriate justification) both protection and mitigation capabilities. Figure 1 provides a conceptual illustration of the integrated assessment process described in the ISG. Although the ISG allows licensing to credit mitigation (including FLEX or alternate strategies), the "level of review" described in the integrated assessment interim staff guidance requires a more detailed and rigorous evaluation than that required for the evaluation of mitigating strategies under Order EA-12-049. This is appropriate in light of the differences in intended goals of the integrated assessment and mitigating strategies evaluations (intended to provide broad capabilities for defense in depth). The COMSECY does not recognize these differences nor reflect the necessity of using the process described in the integrated assessment to develop the information required for staff to determine, with adequate technical justification, that a licensee's proposed approach to responding to the reevaluated hazard (whether using protection or mitigation) will be effective.

2.8.2. Supporting information

The discussion below highlights the differences in the intended purposes of mitigating strategies and the integrated assessment. The discussion also notes the resultant differences in the associated guidance.

Mitigating strategies

The purpose of mitigating strategies in response to EA-12-049 is to provide "**strategies and guidance for additional defense-in-depth measures to supplement the capabilities of permanently installed plant structures, systems, and components that could become unavailable following a beyond-design-basis event**" (Ref. [22]). The additional capabilities provided by mitigating strategies address plant conditions involving an extended loss of ac power and loss of access to the ultimate heat sink as a *surrogate* for a beyond-design-basis

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(external) event.⁷ Mitigating strategies are not generally tied to any specific damage state or mechanistic assessment of external events, but the guidance provides storage and deployment considerations for external hazards (Refs. [23] and [22]). To date, external hazards considered under mitigating strategies have been defined according to the design-basis external hazards for the site. This is due to the implementation of Order EA-12-049 prior to the completion of activities in response to Recommendation 2.1.

In light of the intended use of mitigating strategies to provide additional defense in depth that supplements installed equipment (rather than to serve as the primary defense against a hazard), the supplemental staff guidance for evaluation of mitigating strategies (Ref. [22]) provides guidance to help staff understand the appropriate level of their review. For example, the cover memo states:

As NRC staff only rarely reviews documents associated with beyond-design-basis events, this should assist in achieving the proper level of review.

Later, the supplemental staff guidance (Ref. [22]) states:

The staff is expected to use considerable engineering judgment and reliance upon existing knowledge and expertise in determining the acceptability of the mitigation strategies. The review is expected to be substantially different from the review of design-basis accidents, wherein acceptability is often based on endorsement of deterministic engineering codes and standards or compliance with existing staff positions for design-basis accidents.

The types of evaluations performed by licensees as well as the level of review performed by staff of mitigating strategies is thus less rigorous than a design basis review, commensurate with the intended use of mitigating strategies as a defense-in-depth measure. However, this does not mean the mitigating strategies have been developed, evaluated, and reviewed in a manner that is commensurate with the use of these strategies as a “first line of defense” against the reevaluated hazard defined under Recommendation 2.1.

Integrated assessment

The integrated assessment guidance provides a graded approach to evaluate plant response in which licensees will evaluate the protection and/or mitigation capabilities (if needed) of the plant in light of the reevaluated hazard. In the context of the integrated assessment, evaluation of mitigation may include capabilities provided under Order EA-12-049 or alternate flood-specific strategies. However, under the integrated assessment, mitigation is only evaluated if existing or proposed flood protection cannot be shown to be reliable with margin. Compared to mitigation being used as a “first line of defense” against the reevaluated flood hazard, the integrated assessment provides a systematic, flood-specific, and appropriately rigorous evaluation of mitigation capabilities that involves:

⁷ Ref. [22] specifically states: “While the initiating event is undefined, it results in an extended loss of all ac power (ELAP) with loss of normal access to the ultimate heat sink (LUHS), which should be considered a surrogate for a beyond-design-basis external event.”

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- Complete characterization of the flood event (i.e., i.e., flood height, associated effects, flood event duration associated with multiple mechanisms)
- Plant conditions during the specific flood events (e.g., site accessibility, event timeline, plant mode)
- Assessment of the performance of existing or planned flood protection (e.g., definition of credible flood protection failures and consequences such as affected safety-related SSCs or mitigating strategies equipment)
- Assessment of manual actions (i.e., whether actions are feasible *and reliable* using performance shaping factors and timing analysis derived using concepts that have been employed to evaluate ex-control room manual actions for fire events)
- Assessment of equipment (e.g., whether equipment is functional, available, accessible, and reliable)
- Integration of aspects of response (e.g., use of system models to capture dependencies and identify diversity/redundancy)

Subject matter experts from across NRC, supported by a large number of public interactions with members of the public and industry, developed the integrated assessment ISG to include an appropriately rigorous evaluation that will (1) allow NRC to fully understand the capability of plants to withstand a flooding hazard defined based on present-day guidance and methods and (2) provide sufficient information to support a backfit analysis (if needed). Specifically, the integrated assessment will yield important insights such as:

- Assessment of whether flood protection is reliable with margin and there is confidence in mitigation approaches (if mitigation is needed)
- Cliff-edge effects
- Whether there is defense in depth, redundancy, and diversity
- The balance between protection and mitigation
- Whether there is a reliance on mitigation (rather than protection) for smaller, more frequent flooding events

It is also important to note that the integrated assessment was developed to address many of the issues identified by an assessment of relevant operating experience related to flooding (Section 2.7 describes recent operating experience).

The integrated assessment is intended to provide the NRC staff with sufficient information to determine whether there is *confidence* that a site can withstand a well-defined, reevaluated flood hazard specified based on present-day methods for defining the design basis at new reactors, regardless of whether protection or mitigation (or some combination) is employed. This means that, even if the licensee is not using conventional flood protection, the NRC has confidence that strategies are appropriately reliable. As discussed in the NTTF report, the purpose of Recommendation 2.1 is to ensure that plants have adequate protection from seismic and flooding hazards, consistent with the current state of knowledge and analytical methods.

As described in Section 2.3, the level of effort/rigor associated with the integrated assessment is intended to be commensurate with the challenges posed by the licensee's strategy. For example, the integrated assessment requires conventional, engineering evaluations (including crediting existing design-basis evaluations) in situations where licensees rely on permanently

installed passive flood protection. The integrated assessment appropriately and necessarily increases the level of rigor and amount of supporting information required when there is heavy reliance on manual actions and non-safety-related equipment. This may include the use of conservative but rigorous deterministic methods *or* the use of more realistic assessments though PRA techniques. This level of rigor is particularly important in light of the concerns cited in the NTTF report regarding the heavy reliance on manual actions by some plants to adequately cope with design or licensing basis floods.

Comparison of guidance documents

As a result of the differences in the intended purposes of mitigating strategies and the integrated assessment, there are consequently differences in the manner in which evaluations and reviews are performed. Several examples are provided below.

Mitigating strategies are not generally tied to any specific damage state or mechanistic assessment of external events, but the guidance provides storage and deployment considerations for external hazards (Refs. [23] and [22]). For example, Ref. [23] specifies that “[i]t is not the intention to define precise time windows, simply to gauge the timing so that plant response actions can be considered.” The guidance in Ref. [23] does not include provisions related to evaluation of the technical basis for warning time or evaluation of durable agreements needed to ensure warning time for flooding events. The guidance associated with mitigating strategies also does not define or describe means to address associated effects (e.g., wind waves, runup, debris, sedimentation, and erosion). This differs from the integrated assessment, which provides a mechanistic and scenario-driven assessment of flooding with detailed event timelines. The integrated assessment defines flood events using flood height, associated effects, and flood event duration (e.g., warning time and period of inundation). The integrated assessment also requires consideration of different flood mechanisms with differing flood scenario parameters or plant response strategies (e.g., use of different types of flood protection to respond to different flooding mechanisms).

Mitigating strategies are developed to provide general capability and manual actions are assessed with a feasibility rather than reliability target. For example, the FLEX manual action validation guidance (Ref. [24]) outlines a process “to reasonably assure required tasks, manual actions and decisions for FLEX strategies **are feasible** and may be executed within the constraints identified in the [licensees integrated plan for Order EA-12-049].” As noted in Ref. [25], a feasible action⁸ differs from a reliable action.⁹ For example, “performing an action

⁸ Feasible action- An action that is analyzed and demonstrated as being able to be performed within an available time so as to avoid a defined undesirable outcome. As compared to a reliable action (see definition), an action is considered feasible if it is shown that it is possible to be performed within the available time (considering relevant uncertainties in estimating the time available); but it does not necessarily demonstrate that the action is reliable. For instance, performing an action successfully one time out of three attempts within the available time shows that the action is feasible, but not necessarily reliable (Ref. [25]).

⁹ Reliable action- A feasible action that is analyzed and demonstrated as being dependably repeatable within an available time, so as to avoid a defined adverse consequence, while considering varying conditions that could affect the available time and/or the time to perform the action. As compared to an action that is only feasible (see definition), an action is considered to be reliable as well if it is shown that

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successfully one time out of three attempts within the available time shows that the action is feasible, but not necessarily reliable.” In addition, validation of manual action in accordance Ref. [24] does not include all manual actions and makes assumptions regarding the availability of resources. For example, Ref. [24] states:

Anticipatory actions taken for [beyond-design-basis] external events that have warning (e.g., plant shutdown, pre-staging FLEX equipment, extra personnel and/or staffing of TSC/OSC, etc.) **are excluded from the validation process** [emphasis added].

:

Phase 3 activities, tasks occurring greater than 24 hours after the event, and tasks performed while units are in a shutdown mode, will not be time validated. In each case additional personnel and equipment will be available either from off site [sic] response, or in the case of an outage, additional onsite personnel, such that resources would not be a factor [emphasis added].

Moreover, the endorsed guidance for assessing staffing and communication capabilities (Refs. [26] and [27]) makes several assumptions regarding staffing and site accessibility:

The event impedes site access as follows:

- A. Post event time: 6 hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use different travel routes, mobilize alternate transportation capabilities (e.g., private resource providers or public sector support), etc.
- B. Post event time: 6 to 24 hours – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).
- C. Post event time: 24+ hours – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.

The above assessment of mitigating strategies under Order EA-12-049 differs from the manual action evaluation described in the integrated assessment ISG. The ISG describes a process for assessing whether all manual actions are **feasible and reliable** through a qualitative evaluation of performance shaping factors and a detailed timing analysis of available margin under site-specific flood conditions. There are no a priori assumptions made regarding the availability of resources or site accessibility. All assumptions and conclusions must be justified under the conditions expected to prevail during the flood event.

Guidance associated with mitigating strategies (Ref. [23]) does not include guidance for evaluation of flood protection features. The IA ISG provides guidance to support evaluation of a range of flood protection features, including: earthen embankments; flood walls; sea walls; concrete barriers; plugs and penetration seals; flood doors and hatches; temporary protection

it can be dependably and repeatably [sic] performed within the available time, by different crews, under somewhat varying conditions that typify uncertainties in the available time and the time to perform the action, with a high success rate. All reliable actions need to be feasible, but not all feasible actions will be reliable (Ref. [25]).

(e.g., sandbags); pumps and valves; and associated manual actions. The IA ISG also includes guidance to support three different types of evaluations of flood-specific mitigation capability.¹⁰ Thus, the integrated assessment ISG includes guidance to support conventional engineering evaluations of flood protection (e.g., appropriate codes/standards for flood protection) in response to the reevaluated hazard, as well as equipment reliability assessment, manual action evaluations, and use of PRA concepts and tools (e.g., event and fault trees).

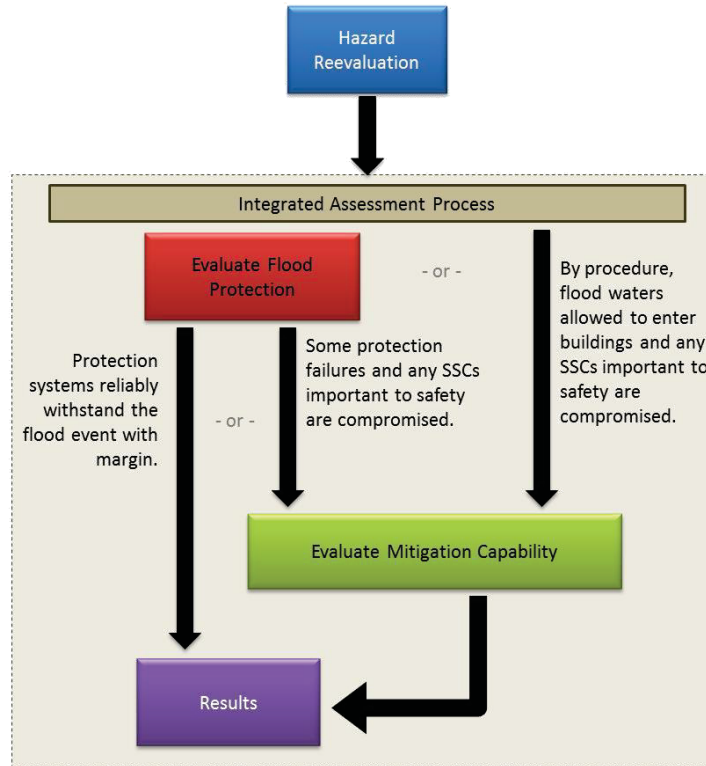


Figure 1: Conceptual illustration of integrated assessment implementation process (Ref. [2])

2.9. Lack of appreciation of differences between consequential floods and the reevaluated flood hazard

2.9.1. Description of concern

The draft COMSECY does not appropriately address the importance of understanding the capability of flood protection, cliff-edge effects, and whether there is a premature reliance on mitigating strategies for smaller and more frequent flooding events.

¹⁰ The three types of evaluation methods are:

- Scenario-based evaluation: A systematic, rigorous, and conservative, (although primarily qualitative) evaluation used to demonstrate that there is high confidence that key safety functions can be maintained
- Margins-type evaluation: A quantitative evaluation that uses conditional core damage probability (CCDP) and conditional large early release probability (CLERP) as output (more realistic than a scenario-based evaluation)
- PRA

2.9.2. Supporting information

NRC’s regulatory guidance for flooding hazards uses a framework for evaluation that is primarily deterministic. These deterministic methods rely on a limited number of stylized event combinations to develop estimates of flooding hazards. When used deterministically, these combinations are considered appropriate for establishing a sufficiently severe flood for consideration. However, an operating reactor may be vulnerable to events that are smaller in magnitude than these “maximum credible” events and this insight is important to support regulatory decisionmaking.

The COMSECY focuses primarily on this single maximum credible flood but does not address the importance of smaller events that still may be consequential to a site. Figure 2 shows an illustration of the difference between the reevaluated flooding hazard and the hazard that may be consequential to a site as a result of, for example, overtopping of flood barriers. This information about a “cliff-edge” significantly below the maximum credible flood height (as defined by the reevaluated flooding hazard) provides an important insight into whether additional regulatory actions are appropriate. However, under the proposed path described in the COMSECY, this type of information will not be collected. Moreover, it will not be clear whether there is a premature reliance on mitigating strategies for smaller, more frequent flooding events. Finally, under the proposed path described in the COMSECY, it will not be clear if relatively simple and potentially inexpensive actions (e.g., use of temporary berms, sandbags, or flood gates) could protect against the reevaluated hazard or smaller events and may represent a cost-justified safety enhancement.

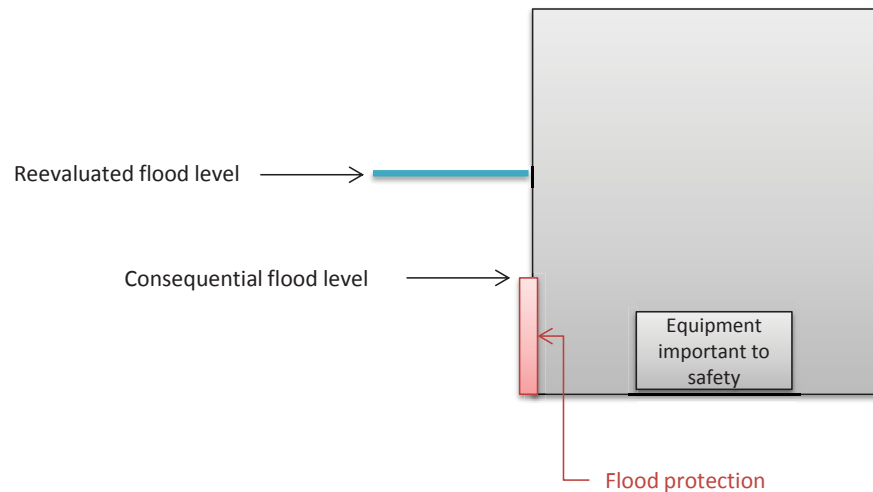


Figure 2: Illustration of the difference between the reevaluated flood level and the consequential flood level

2.10. Vague description of “targeted mitigating strategies”

2.10.1. Description of concern

The COMSECY provides a vague description of strategies that licensees may employ under floods that “might result in significant damage to the nuclear power plant.” The description

provided in the COMSECY is not sufficiently explicit to inform the Commission and external stakeholders regarding the types of strategies that may be employed.

2.10.2. Supporting information

The COMSECY provides the following general statement regarding the proposed approaches that may be applied under “targeted mitigating strategies:”

In some cases, the newly estimated elevated flooding levels, should they occur, might result in significant damage to a nuclear power plant and require scenario-specific strategies. However, even in such extreme cases, licensees will be required to show as part of implementation of mitigating strategies that they have developed capabilities that can be deployed to prevent fuel damage in reactor cores or spent fuel pools and the resultant large release of radioactive materials to the environment. The above approach provides confidence that the nuclear power plant will not significantly complicate the response to and recovery from the extreme natural disaster. The NRC staff is also seeking Commission affirmation on this general approach for licensees developing mitigating strategies for floods that might result in significant damage to a nuclear power plant site.

Enclosure 2 (p.8) indicates that scenario-specific mitigation strategies would include facility structures and cooling functions. They would involve certain key steps: (1) preparing for the arrival of the flood waters; (2) providing cooling for the reactor core and spent fuel for the range of possible flooding levels; and (3) maintaining a manageable shutdown condition for the range of possible flooding levels.

However, the COMSECY is not appropriately explicit to inform the Commission and external stakeholders of the types of approaches that are being proposed as part of targeted mitigating strategies. In affirming the approaches licensees may take as part of mitigating “floods that might result in significant damage,” it is important that the Commission be informed that, in response to reevaluated hazards significantly in excess of the design basis, some licensees may propose strategies that are targeted to maintain core and spent fuel cooling but that may result in the inundation of all or a significant portion of safety-related equipment and the intentional breaching or disabling of radiological barriers (including primary or secondary containment and the reactor pressure boundary), in order to minimize offsite radiological consequences. It is noted, these strategies have been adopted at a small number of sites as a result of past increase in estimates of flooding hazards.

2.11. Lack of responsiveness to external recommendations

2.11.1. Description of concern

As described in Sections 2.1 and 2.2, the proposed path forward for Recommendation 2.1 described in the COMSECY is no longer meeting the intent of Recommendation 2.1 and is not consistent with previous Commission and Congressional direction. Moreover, the proposed path forward (1) does not comport with the NRC’s response to a recent report from the United States Government Accountability Office and (2) is not responsive to one of the key observations from a recent National Academies of Sciences report.

2.11.2. Supporting information

In April 2012, the United States Government Accountability Office (GAO) released a Report to Congressional Requesters titled “Nuclear Regulatory Commission - Natural Hazard Assessments Could Be More Risk-Informed” (Ref. [28]). The study was initiated because the accident at Fukushima Dai-ichi raised questions about the threats of natural hazards to U.S. commercial nuclear power plants. GAO was asked to (1) determine the extent to which PRA is applied to natural hazards at operating U.S. reactors and (2) describe expert views on and suggested changes, if any, to NRC processes for assessing natural hazards at such reactors. GAO recommended that NRC analyze whether licensees of operating reactors should be required to develop PRAs that address natural hazards. NRC agreed with the recommendation and stated it will conduct the analysis in the context of ongoing initiatives. In its reply to the GAO (Ref. [28]), the NRC cited the ongoing activities related to implementation of Recommendation 2.1:

[The March 12, 2012 50.54(f) letter] includes a request that licensees reevaluate both the seismic and flooding hazards at nuclear power plants using updated seismic and flooding hazard information and present-day regulatory guidance and methodologies, including risk assessment approaches, as appropriate. The NRC staff will evaluate the licensees’ responses to this request for information, and will determine whether additional regulatory actions are necessary to provide additional protection against the updated hazards.

Although the status of this item is currently “open,” the GAO website notes “[a]s of March 12, 2014, NRC reported that it had several initiatives underway directly related to this recommendation. NRC stated that it would conduct and document the analyses GAO recommended in the context of the agency's follow-on actions for those ongoing initiatives.” The proposed path forward for Recommendation 2.1 described in the COMSECY will no longer be consistent with the aforementioned response to the GAO because the integrated assessment (based on PRA concepts), where needed, will no longer be performed in accordance with the integrated assessment ISG.

The National Academies of Sciences report on lessons learned from the events at Fukushima (Ref. [24]) noted the following factors that contributed to the overall severity of the accident:

Failure of the plant owner (Tokyo Electric Power Company) and the principal regulator (Nuclear and Industrial Safety Agency) to protect critical safety equipment at the plant from flooding in spite of mounting evidence that the plant’s current design basis for tsunamis was inadequate.

Comparable to the NTTF report and Congressional direction, the National Academies of Science report emphasized the importance of considering changes to protect safety-related equipment in the face of significant new information regarding the flooding hazards that may affect a site. This will not be considered under the proposed path forward described in the COMSECY.

2.12. Inconsistency with Recommendation 2.1 process for seismic hazards

2.12.1. Description of concern

Approximately parallel implementation processes are being used for seismic and flooding hazards under Recommendation 2.1. There are, of course, necessary adaptations to the processes to account to differences in the state of practice between the two hazards. The COMSECY proposes significant changes to the implementation process for flooding. It does not describe whether similar changes will be implemented for other external hazards. It remains unclear why, in light of recent operating experience, flooding hazards would be treated differently (and potentially less rigorously) than other external hazards.

2.12.2. Supporting information

The overall implementation frameworks for Recommendation 2.1 are approximately analogous for seismic and flooding hazards with adaptations to account for differences (including limitations) in the state of practice for each hazard. Each process consists of the following key components:

1. *Revaluation of hazards using present-day guidance methods:* Revaluations for Recommendation 2.1 for seismic hazards will use probabilistic seismic hazard analysis (PSHA). Revaluations for flooding hazards will use a primarily deterministic hazard framework.
2. *Determination of whether further evaluation is needed:* For seismic hazards, a screening criterion is applied to assess whether further evaluation is needed. For flooding hazards, additional evaluation is needed if the reevaluated flood hazards are not bounded by the design basis.
3. *Assessment of plant response:* Plant response to the reevaluated hazard is assessed using a seismic PRA or seismic margins assessment. The flooding integrated assessment is used to evaluate the total plant response to the reevaluated flooding hazards considering protection and/or mitigation.
4. *Development of risk insights:* The seismic PRA or seismic margins assessment will yield both qualitative and quantitative risk insights. The integrated assessment will yield insights as described in Section 2.3 and 2.6, which are intended to facilitate a backfit analysis, if needed. The degree to which the insights are qualitative or quantitative will depend on the evaluation method selected by the licensee. For example, a scenario-based evaluation of mitigation capability will yield primarily qualitative insights with some quantitative reliability information. A margins-type or PRA will yield information analogous to a seismic PRA or seismic margins analysis.
5. *Regulatory decisionmaking*

The COMSECY proposes that there will be a significant modification to the implementation process for flooding but is silent with respect to the treatment of other hazards. The COMSECY states (Enclosure 2, p. 7):

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The staff will also assess the implications that implementing the approach described in the memorandum for flooding reevaluations has on other hazard reevaluations and related NRC activities.

It remains unclear how other external hazards (e.g., seismic hazards) will be addressed if the changes proposed in the COMSECY are adopted for flooding hazards. Moreover, in light of recent operating experience regarding flooding events, it is not clear why evaluation of plant response to flooding hazards would be treated differently (and potentially less rigorously and less systematically) than seismic or other external hazards.

3. Proposed resolution to concerns expressed in this paper

3.1. Current content of COMSECY

The current COMSECY addresses three key topics:

1. The paper proposes that licensees for operating nuclear power plants would address the reevaluated flooding hazards from Recommendation 2.1 within their mitigating strategies (Order EA-12-049 and related rulemaking).
2. The paper notes that licensees for operating nuclear power plants may need to develop targeted or scenario-specific mitigating strategies to prevent fuel damage in reactor cores or spent fuel pools to address some specific flooding scenarios. The flooding scenarios could significantly damage the power plant site and nearby environments.
3. The paper proposes to alter the implementation process for Recommendation 2.1 by changing the information that will be collected under Phase 1, Stage 2 (i.e., the integrated assessment) and not undertaking a systematic analysis of effects under Phase 2 (i.e., regulatory decisionmaking). Instead, under the proposed path forward, the flood hazard reevaluations would be used to define the “functional requirements and reference bounds” for mitigating strategies and information would not be collected regarding other facets of plant response (e.g., impacts of the flood on the site and consideration of flood protection for equipment not associated with mitigating strategies).

The COMSECY requests a Commission vote on items (1) and (2) but does not request a vote on item (3). However, item (3) is the primary subject of contention in the non-concurrence.

3.2. Understanding of impetus for changes to NTTF Recommendation 2.1

The authors of this document understand that NRC would like to minimize the burden on licensees regarding the number of analyses performed under the post-Fukushima activities. This is particularly relevant in light of the fact that some licensees may propose to use mitigating strategies as part of their response to the reevaluated flooding hazard. In that case, under current implementation processes, the assessment of the mitigating strategies would be evaluated as part of the implementation of the mitigation of beyond design basis events (MBDBE) rule (using NEI 12-06, Ref. [23]) as well as under the integrated assessment (using the integrated assessment ISG, Ref. [2]). However, the approach described in the COMSECY, which significantly changes the intent of NTTF Recommendation 2.1, is not necessary to

resolve this concern regarding the potential for duplicative assessments. An alternative approach is proposed below.

3.3. Proposed approach

Consistent with Commission and Congressional direction related to Recommendation 2.1, the purpose of the flooding hazard reevaluation and integrated assessment is to support a regulatory decision about whether additional regulatory actions are necessary (e.g., update the design basis and SSCs important to safety) to provide additional protection against the updated hazards. In this context, changes to the design or licensing basis would be considered as plant-specific backfits. The proposed approach described herein resolves the concerns expressed in this non-concurrence and can simultaneously meet the following objectives:

1. Maintain fidelity of NTF Recommendation 2.1
2. Ensure that mitigating strategies are not rendered ineffective under the reevaluated flooding hazard
3. Reduce the need to perform multiple evaluations of mitigating strategies under the reevaluated hazard

The approach proposed by the authors of this non-concurrence recognizes that licensees may propose a variety of approaches to respond to the reevaluated flooding hazards. The list below describes the three high-level approaches licensees may choose as well as the proposed mechanisms for evaluation such the above three objectives are met:

1. Use of flood protection: Licensees may propose to implement new flood protection (e.g., temporary flood protection measures such as portable berms or flood gates) to protect safety-related equipment under the reevaluated flooding hazard or may be able to justify the continued capability of existing protection under the reevaluated hazard (e.g., existing flood protection may be demonstrated to be capable of withstanding the larger hydrostatic and hydrodynamic loads associated with the reevaluated hazard). In such cases, the existing or proposed flood protection would be evaluated under the integrated assessment. The integrated assessment would not assess mitigation capability, if the flood protection is shown to be reliable with margin under the reevaluated hazard. However, in accordance with the proposed path forward on the pending mitigation of beyond design basis events (MBDBE) rulemaking, any necessary changes to mitigating strategies would be separately evaluated using NEI 12-06 (Ref. [23]), which (as described previously) provides a generally non-mechanistic assessment of strategies that is intended to ensure mitigating strategies provide additional defense in depth. This would ensure plants are appropriately protected for the reevaluated hazard (as demonstrated via the integrated assessment) and that mitigating strategies continue to provide additional defense in depth under the reevaluated flooding hazard (as demonstrated using the guidance in NEI 12-06).
2. Use of mitigation: A licensee may propose to rely on mitigation as the primary means to address the reevaluated hazard rather than use of protection. To avoid the potential for assessments of mitigating strategies using two different guidance documents (i.e., in accordance with NEI 12-06, as well as under the integrated assessment using JLD-ISG-

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2012-05), it is proposed that NRC prescribe the use of the flood-specific integrated assessment methodology rather than the more general NEI 12-06 guidance. This ensures that the strategies are assessed using a mechanistic and scenario-specific evaluation that is commensurate with the use of mitigating strategies as the *primary* means by which a licensee will respond to the specific plant conditions defined by the reevaluated flooding hazard (Section 2.8.2 provides additional information regarding differences between the guidance documents). Additionally, this would ensure sufficient information and insights (e.g., identification of whether mitigation is relied upon for less severe, more frequent events than those defined by the deterministic reevaluated hazard) are gathered to support a regulatory decision related to backfit in light of the reevaluated hazard, if necessary. In this case, assessment of mitigating strategies for flood events using NEI-12-06 would not be necessary in light of the integrated assessment that was performed under Recommendation 2.1.

3. Use of a combination of protection and mitigation: Licensees may propose to use protection for smaller, more frequent flooding events and transition to a mitigation-based approach for larger events. In this case, the integrated assessment guidance describes the appropriate, flood-specific evaluation process to address this “combination approach.”

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Section A – Reasons for Non-Concurrence and Proposed Alternatives

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NRC FORM 757
NRC MD 10.158
(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NCP TRACKING NUMBER

NON-CONCURRENCE PROCESS

NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT

Relationship Between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation

ADAMS ACCESSION NO.

ML14238A616

NAME

Christopher B. Cook

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ORGANIZATION

NRO/DSEA/RHM1

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

See attached document.

SIGNATURE



DATE

10/27/2014

Section B - Comments for the NCP Reviewer to Consider (Supervisor)

Introduction

I supervise Dr. Michelle (Shelby) Bensi and Mr. Kenneth See, who are among those who prepared NCP-2014-010 (NCP) to document their views on the draft COMSECY titled "Relationship between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards."

I support each of the twelve concerns documented in NCP-2014-010.

As one of the authors of the 50.54(f) letter implementing Near-Term Task Force (NTTF) Recommendations 2.1 and 2.3, I would also like to provide additional comments. These comments are discussed to some degree in the NCP, and I've included pointers to the relevant NCP sections in an effort to be helpful. I hope my comments are beneficial to the NCP Reviewer when considering improvements to the final COMSECY.

I would like to express my appreciation of all staff who contributed to developing the comprehensive and thoughtful documentation of non-concurrence. This is an important subject and I appreciate their willingness to use the non-concurrence process to put their views forward.

Comment 1: Strategies for Floods that may Damage the Nuclear Power Plant

NCP Section 2.10 discusses a portion of the draft COMSECY describing strategies a licensee may employ to cope with reevaluated floods that "might result in significant damage to the nuclear power plant." However, as noted in NCP Section 2.10.2, "...the COMSECY is not appropriately explicit to inform the Commission and external stakeholders of the type of approaches that are being proposed." I completely agree.

I recommend that the final COMSECY explicitly inform the Commission that in response to reevaluated floods significantly in excess of the current design basis, some licensees may propose strategies with the goals of maintaining reactor core cooling and spent fuel cooling. To achieve these goals, licensees may propose intentionally breaching or disabling one or more key radiological barriers during the flood event, such as the reactor containment (including primary or secondary containment) and the reactor coolant pressure boundary. As noted in NCP Section 2.10, similar strategies have already been adopted at a small number of nuclear power plant sites as a result of past increases in flooding hazard estimates. My recommendation is to expand the discussion of these strategies in the final COMSECY. The expanded discussion should explicitly request the Commission affirm future application of strategies that intentionally breach or disable one or more key radiological barrier(s) as suitable options for licensees to propose for coping with reevaluated flooding hazards.

Comment 2: Reevaluated Flood Hazards and Regulatory Inconsistency

For many sites, the flooding hazard scenario being reevaluated as part of Recommendation 2.1 is the same hazard scenario as described in the site's current Final Safety Analysis Report (FSAR). If a difference exists in flooding level as a result of the hazard reevaluation, the difference is likely due to new information regarding the credibility of the hazard (e.g., sunny-day dam failure) or the existence of new modeling and analysis tools (e.g., existence of computer models). The methodologies and regulatory guidance being applied as part of Recommendation 2.1 do not include any additional margin or safety factor beyond what would be applied as part

Section B - Comments for the NCP Reviewer to Consider (Supervisor)

of a new reactor application. As discussed in NCP Section 2.5 (Safety Conclusions are Pre-Judged) and Section 2.4 (Regulatory Inconsistencies), the fact that staff currently considers the Recommendation 2.1 reevaluated hazards to be 'beyond-design-basis' is a product of NRC's regulatory structure. Use of the term "beyond-design-basis" should not imply any additional flooding height or safety factor is added 'beyond' the standard hydrologic analysis.

As discussed in NCP Sections 2.4.1 and 2.4.2, several sites have ongoing regulatory activities evaluating the same flood hazard scenarios as considered by Recommendation 2.1. To be efficient, these activities were subsumed by Recommendation 2.1 (see NCP Section 2.4.2). However, if implementation of Recommendation 2.1 is now truncated and focused on mitigating strategies (which was developed to provide additional defense-in-depth) as described in the draft COMSECY, results from the focused-scope implementation will not provide sufficient information to support resolution of all subsumed activities. Therefore staff may be required to restart these processes to ensure timely resolution of these subsumed activities.

I recommend that the final COMSECY address these regulatory inconsistencies and potential inefficiencies. One suggestion is provided in NCP Section 2.6.2 (Insufficient Information to Support a Staff Decision: Supporting Information), which recommends the final COMSECY explicitly describe specified conditions under which additional information will be gathered (i.e., when a licensee will be required to perform an Integrated Assessment [ML12311A214] in addition to performing the focused-scope assessment of mitigating strategies) instead of the *ad hoc* case-specific basis proposed in the draft COMSECY.

Comment 3: Confusion between a Consequential Flood and the Maximum Flood Height

NRC's July, 2011, NTF Report concluded that "flooding risks are of concern due to a 'cliff-edge' effect, in that the safety consequences of a flooding event may increase sharply with a small increase in the flooding level" (pg. 29). This concept was incorporated into both Recommendation 2.3, Flooding Walkdowns (see 50.54(f) letter, Enclosure 4, Purpose, bullet 5), and Recommendation 2.1, Flooding Hazard Reevaluation. As discussed in NCP Section 2.9, there is a lack of appreciation in the draft COMSECY for the difference between a consequential flood (i.e., one that exceeds a cliff-edge height) and the maximum flood height postulated at a reactor site. In other words, a reactor may have plant-specific vulnerabilities to flooding events that are smaller in magnitude than this 'maximum postulated' event. It is further noted that the term 'vulnerability' is defined in footnote 1 of the 50.54(f) letter, Enclosure 2, as "those features important to safety that when subject to an increased demand due to the newly calculated hazard evaluation have not been shown to be capable of performing their intended functions". The concepts of cliff-edge effects and plant-specific vulnerabilities were incorporated into the Integrated Assessment guidance (ML12311A214). However, as described in NCP Section 2.8.2 (Supporting Information: Comparison of Guidance Documents), there are differences in approach between the guidance documents developed to address Order EA-12-049 and the Integrated Assessment. The NCP correctly states in Section 2.9 that, "[t]he COMSECY focuses primarily on this single maximum credible flood but does not address the importance of smaller events that still may be consequential to a site."

The draft COMSECY should be modified to incorporate the key Recommendation 2.1 concepts of cliff-edge effects and plant-specific vulnerabilities. An alternative is for the final COMSECY to

Section B - Comments for the NCP Reviewer to Consider (Supervisor)

explicitly state the original intent of Recommendation 2.1 is no longer going to be met. Likewise, any guidance applied to verify the mitigation strategies used to cope with the Recommendation 2.1 flooding hazards should incorporate the concepts of cliff-edge effects and plant-specific vulnerabilities.

Summary and Overarching Issues

The staff did a wonderful job developing the NCP, which includes twelve overarching concerns that are supported by extensive information for each. In this Section B document, I have attempted to amplify three concerns. However, I could not think of a better way to summarize my overarching concerns than to reiterating the four key issues expressed by the non-concurring staff regarding Recommendation 2.1 (see NCP Section 2.1, Deviation from Intent of Recommendation 2.1). My overarching issues with the draft COMSECY are as follows:

1. The draft COMSECY represents a significant departure from the intent of Recommendation 2.1.
2. The paper provides no technical or safety basis for departing from Recommendation 2.1.
3. The draft COMSECY does not clearly and explicitly state, for the benefit of external stakeholders and the Commission, that the proposed path will no longer meet the intent of Recommendation 2.1.
4. The draft COMSECY does not request a Commission vote on the proposed path forward despite the aforementioned departures.



NON-CONCURRENCE PROCESS

NCP-2014-010

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT
Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation

ADAMS ACCESSION NO.
ML14238A616

DOCUMENT SIGNER

Mark A. Satorious

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NRO/DCIP

DOCUMENT AUTHOR

DOCUMENT CONTRIBUTOR

DOCUMENT REVIEWER

ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR

Andrea Valentin

TITLE

Deputy Director

ORGANIZATION

NRO/DCIP

I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C.

I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY.

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM:

PUBLIC

NON-PUBLIC

REASONS FOR NON-CONCURRENCE AND PROPOSED ALTERNATIVES (use continuation pages or attach Word document)

See group non-concurrence submitted by Michelle Bensi dated 10/9/14. That document provides my signature as a non-concurring individual and the associated documentation.

SIGNATURE

DATE

10/14/14

NON-CONCURRENCE PROCESS

NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT

Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation

ADAMS ACCESSION NO.

MI.14238A616

NAME

ANDREA D. VALENTIN

TITLE

Deputy Director, Division of Construction Inspection and Operational Programs

TELEPHONE NUMBER

(301) 415-0210

ORGANIZATION

NRO

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

I have read the document provided with this non-concurrence., and I support the conclusions.

SIGNATURE

Andrea D. Valentin

DATE

10/15/14

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(09-2014)

U. S. NUCLEAR REGULATORY COMMISSION

NCP TRACKING NUMBER

NON-CONCURRENCE PROCESS

NCP-2014-10

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT

ADAMS ACCESSION NO.

Relationship Between MS for DBE & Reeval. of Flooding

ML14238A616

NAME

Sunil Weerakkody

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Office of the Nuclear Reactor Regulation

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

See attached.

SIGNATURE



DATE

10-17-14

CONTEXT

Three of the staff members who non-concurred on the subject COMSECY (Mr. Jeffery Mitman, Dr. Fernando Ferrante, Mr. George Lapinsky) are in the Division of Risk Assessment of the Office of Nuclear Reactor Regulation. They have provided extensive support to various activities directly related to the Mitigating Systems Directorate (MSD) and the NTTF 2.1 External Flooding. They have also provided extensive support to assist the regions in dispositioning a large number of GREATER THAN GREEN inspection findings related to External Flooding.

Since the non-concurrence is approximately 40 pages long and discusses a large number of issues, I briefly communicated with each of the three staff members who report to me further understand the key concerns that prompted them to non-concur. Subsequently, since I am not cognizant of the needs that prompted the NRC to prepare the COMSECY, I consulted a manager in JLD to enhance my understanding about the technical as well as other equally important issues pertaining to the COMSECY.

Based on my current understanding of the subject non-concurrence and the draft COMSECY, I offer four observations and one suggestion for your consideration. In light of the mission of the PRA Operations and Human Factors Branch, I chose to offer one suggestion that would maximize the risk reduction achievable via the implementation of mitigation strategies as they pertain to issues brought up via this non-concurrence.

I want to also acknowledge the contribution that the staff members made by choosing to participate in this important discussion by offering their perspectives via the NCP.

General Observation

Based on my understanding of all circumstances (technical, policy, and other) surrounding MSD and NTTF 2.1 Flooding, I believe that the proposed COMSECY is an appropriate step towards dispositioning key safety issues relevant to External Flooding. In fact, the COMSECY represents a "course correction" that we should, conditional to Commission approval; in light of the NRC's commitment to its fundamental Principles of Good Regulation.

Risk-Informed Observations

1. Unreliable or missing flood barriers, degraded conduits that lacks internal barriers, degraded or missing flood seals and unreliable operator manual actions contributed to a majority of the Greater Than Green findings. Post Fukushima efforts such as the walk down resulted in identification and expeditious elimination of a large number these risk-outliers.

2. In spite of staff and licensee efforts to continue to identify and eliminate degraded conditions, as reflected by the recent events at St. Lucie (2014) and ANO (2013), in nuclear plants that have significant number of seals, barriers, and conduits, there is a credible probability that some degraded conditions would reveal themselves during actual floods. Therefore, mitigating capabilities (e.g., operator manual actions) that provide the defense-in-depth must be reliable.
3. In the event the Commission approves the strategies proposed in COMSECY, licensees are likely to rely more on operator manual actions (OMAs), a number of which will be implemented outside of the control room as opposed to engineered design features (e.g., robust barriers, berms, hardware that protect safety-related SSCs) to minimize risk attributed to external floods.
4. The non-concurrence appears to imply that the strategies proposed in the COMSECY lower the acceptance standard of OMAs to “feasible,” i.e. they do not have to meet the standard for “reliable” even though the acceptance standard for OMAs should be “Feasible and Reliable¹” for other similar events (e.g. fire²).

Risk-Informed Suggestion

In light of the above, I recommend that during the process of dispositioning the subject non-concurrence, we examine the accuracy of the implication mentioned in Item (4) above. If it is accurate, then, I suggest that cognizant staff and management adequately deliberate the acceptance standard for operator manual actions that the licensee may rely on to mitigate impacts of floods. I also suggest that in setting these standards and/or in developing implementing guidance, NRC staff uses qualitative or quantitative risk-insights to prompt licensees to focus resources on the subset of operator manual actions that are risk-significant³.

¹ NUREG-1852 provides a detailed distinction between “Feasible” vs “Feasible and Reliable” Operator Manual Actions.

² It is recognized that MSDs are applicable to beyond-design-basis accidents in comparison to fire protection (which are also not design basis) which is regulated by 10 CFR 50.48.

³ Commission Meeting SRM M140529 and the associated Commission Meeting on Human Reliability (5/28/2014) provides a recent communication between the staff and the Commission on the subject of Operator Manual Actions implemented outside of the Control Room.

NON-CONCURRENCE PROCESS

TITLE OF DOCUMENT Relationship Between Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation	ADAMS ACCESSION NO.
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SECTION B - TO BE COMPLETED BY NON-CONCURRING INDIVIDUAL'S SUPERVISOR

NAME Sean E. Peters

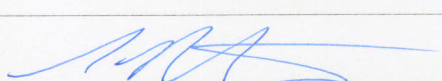
TITLE Branch Chief	PHONE NO. 301-251-7582
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ORGANIZATION
Human Factors and Reliability Branch, Division of Risk Analysis, Office of Nuclear Regulatory Research

COMMENTS FOR THE DOCUMENT SPONSOR TO CONSIDER

- I HAVE NO COMMENTS
- I HAVE THE FOLLOWING COMMENTS

I agree with the non-concurrence. Even in its revised version, the proposed SECY paper continues to propose the skipping of the assessment of the impacts of more severe flooding hazards on the plant. These assessments would allow the licensees and the NRC to determine whether protection, mitigation, or a mix of protection and mitigation is the appropriate response. Instead, the SECY paper allows the focus to shift towards assessing whether some aspects of the plant's mitigating strategies should be modified. It shifts the focus away from protecting safety-significant structures, systems, and components as a primary or even an optional means of defense against flooding and moves the conversation towards the consideration of FLEX issues. This approach was neither the intent of Congress nor the Commission when the staff originally undertook this rulemaking and, with its high reliance on FLEX capabilities, it does not ensure that plant sites are adequately protected against the re-evaluated flood risk.

SIGNATURE 	DATE 10/23/14
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SUBMIT THIS PAGE TO DOCUMENT SPONSOR

NON-CONCURRENCE PROCESS

NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT Relationship between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation	ADAMS ACCESSION NO. ML14238A616
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NAME William R. Ott

TITLE Branch Chief	TELEPHONE NUMBER 251-7407
-----------------------	------------------------------

ORGANIZATION Environmental Transport Branch, Division of Risk Analysis, Office of Nuclear Regulatory Research
--

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

I supervise Dr. Joseph Kanney who is one of those who prepared NCP-2014-010 (NCP) to document their views on the draft COMSECY titled "Relationship between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards."

also addresses participation in NCP-2014-010 by Jacob Philip, RES/DRA/ETB - see email dated 10/31/14
--

Comments/Evaluation:

1. I support each of the twelve concerns documented in NCP-2014-010.
2. The non-concurrence and proposed alternatives are presented logically and supported by sound reasoning and a thorough knowledge of the background of the various documents discussed and the implications of the proposed action.
3. I read the non-concurrence and COMSECY searching for some quantitative basis to support the confidence that is being placed in the use of mitigative features as the primary line of defense for public safety in the event of a very low probability extreme flood and the attendant disruption from impacts beyond the plant. I found none. There is actually little direct evidence in the COMSECY to support the actions that it recommends to the Commission. Instead, the non-concurrence pointed out repeatedly that the result of the COMSECY proposed path would be to limit the quantitative information that would be collected. I am convinced that the provision of mitigative capabilities is a good practice and may be invaluable in responding to lesser calamities or as a complement to site specific protective measures. However, in meeting the agency's safety mission, my judgement says that we need far more assurance that we both understand the hazard and can protect the public from the consequences of that hazard impacting one of our licensees.
4. I also support the alternative resolution proposed in the non-concurrence.

SIGNATURE <i>William R Ott</i>	DATE 10/29/14
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NON-CONCURRENCE PROCESS

NCP-2014-010

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT

Relationship Between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation

ADAMS ACCESSION NO.

ML14238A616

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NRO/DSRA/SPRA

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

I supervise Malcolm Patterson, Marie Pohida, and Suzanne Schroer (at the time of non-concurrence), who are among those who prepared NCP-2014-010 (NCP) to document their views on the draft COMSECY titled "Relationship Between Mitigation Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards."

I support the well-articulated concerns in NCP-2014-010. Since plant safety is the key issue when addressing lessons learned from the experiences at Fukushima, it is not clear that "mitigating strategies" referenced in EA-12-049 will provide an effective level of targeted flood protection as the "mitigation capability" resulting from the integrated assessment.

SIGNATURE



DATE

11/3/14

NON-CONCURRENCE PROCESS

NCP-2014-010

SECTION C - TO BE COMPLETED BY NCP COORDINATOR

TITLE OF SUBJECT DOCUMENT COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards	ADAMS ACCESSION NO. ML14238A616
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TITLE Special Advisor for Policy	TELEPHONE NUMBER (301) 415-7490
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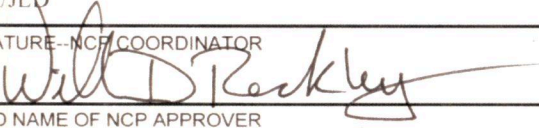
ORGANIZATION Office of Nuclear Reactor Regulation/Japan Lessons Learned Division

AGREED UPON SUMMARY OF ISSUES (use continuation pages or attach Word document) SEE ATTACHED
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EVALUATION OF NON-CONCURRENCE AND RATIONALE FOR DECISION (use continuation pages or attach Word document) SEE ATTACHED

TYPED NAME OF NCP COORDINATOR William D. Reckley	TITLE Special Advisor for Policy
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ORGANIZATION NRR/JLD

SIGNATURE--NCP COORDINATOR 	DATE 11/6/14
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TYPED NAME OF NCP APPROVER William M. Dean	TITLE Director
---	-------------------

ORGANIZATION Office of Nuclear Reactor Regulation
--

SIGNATURE--NCP APPROVER 	DATE 11/16/14
--	------------------

NON-CONCURRENCE PROCESS

NCP-2014-010

TITLE OF SUBJECT DOCUMENT

COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards

ADAMS ACCESSION NO.

ML14238A616

CONTINUATION OF SECTION

A B C

SEE ATTACHED

Non-Concurrence Process Documentation

NCP-2014-010; Section C (Document Sponsor)

Summary of Issues

The issues raised in the non-concurrence relate to the information being provided to the Commission, the recommendations in the COMSECY, and the related changes to the NRC staff's activities for flooding reevaluations. The authors of the non-concurrence summarize the general concern and twelve specific concerns as follows:¹

The fundamental concern with the COMSECY is that it proposes a change that bypasses current plans for a deliberate and systematic process for understanding the potential for flooding events to adversely affect nuclear power plants without sufficient regard for the importance of developing insights about flood risks. The COMSECY describes a significant departure from the current, approved process for implementing NTTF Recommendation 2.1. It likewise proposes a departure from associated guidance that was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. The events at Fukushima were caused by a flood event and U.S. operating experience further speaks to the importance of understanding plant response to flooding hazards. Despite this knowledge, the COMSECY describes a truncation of the process established to evaluate plant response to reevaluated flooding hazards that are more severe than the plant design basis. Moreover, it asserts that mitigating strategies (originally developed and evaluated as an additional defense-in-depth measure) generally provide an appropriate response and "first line of defense" against the reevaluated hazard. It precludes systematic evaluations that would support regulatory actions to strengthen plant protections against flooding risks, where justified. While mitigating strategies provide an important contribution to implementing the lessons learned from Fukushima, their existence does not negate the need to evaluate the total site-specific plant response to the reevaluated hazard. The proposed path forward creates a deficiency in knowledge because it precludes the systematic collection of information necessary to understand whether additional regulatory actions are needed. Moreover, the COMSECY lacks clarity and thus the intent and consequences of the proposed path forward are not well-defined in the paper. Finally, the COMSECY does not request a Commission vote on the proposed significant change in course for implementing Recommendation 2.1.

¹ NCP-2014-010 was initiated based on a version of the COMSECY distributed for division and office level concurrence on October 7, 2014. The October 7, 2014 version is referred to as the "original version" within this section of the non-concurrence package. The COMSECY has subsequently been revised to address concerns expressed in the non-concurrence and comments received from other staff, the Office of General Counsel, and NRC senior managers.

A COMSECY is a document in which the NRC staff requests guidance from the Commission, and includes a concurrence process and ultimately reflects the position of the document signer. Differing views among NRC employees are welcomed and can be reflected through various forms of communication, including the formal non-concurrence process. This response to the non-concurrence therefore refers to "the NRC staff or the staff" when referring to the views in the COMSECY or in other established agency positions. The terms "non-concurring staff" or "authors of the non-concurrence" are used to refer to the NRC employees expressing a differing view on the COMSECY.

The above leads to the following twelve specific concerns, which are further described in Section 2 of this document:

1. *It departs from the intent of NTTF Recommendation 2.1 (Section 2.1).*
2. *It departs from previous Commission and Congressional direction (Section 2.2).*
3. *It deviates from the implementation process currently established for reevaluating flooding hazards and plant response (Section 2.3).*
4. *It may create regulatory inconsistencies (Section 2.4).*
5. *It presumes a conclusion that adequate protection has been achieved and, in most cases, additional regulatory actions are either not expected or not warranted (Section 2.5).*
6. *It does not elicit sufficient information to support a staff conclusion regarding the need for additional regulatory action (Section 2.6).*
7. *It does not incorporate lessons learned from operating experience (Section 2.7).*
8. *It fails to distinguish between the intended purpose of the integrated assessment and activities for mitigating strategies and does not recognize the differences between guidance associated with the two activities (Section 2.8).*
9. *It does not adequately distinguish between consequential floods and the reevaluated flood hazard (Section 2.9).*
10. *It is vague in its description of “targeted mitigating strategies” (Section 2.10).*
11. *It is not responsive to external recommendations by regarded experts (Section 2.11).*
12. *It creates inconsistency regarding the manner in which different external hazards are treated by NRC under Recommendation 2.1 (Section 2.12).*

In addition, to the twelve specific concerns above, the authors of the non-concurrence also identified four general concerns:

1. *The COMSECY departs from an approved, systematic process that has been in place for several years.*
2. *The COMSECY does not recognize the importance of understanding total plant response to flooding hazards. The approach proposed in the COMSECY is not consistent with operating experience and evidence that flooding hazards are in some cases larger and more likely than was believed when plants were licensed.*
3. *The COMSECY proposes to eliminate the systematic evaluation that is necessary to determine if additional regulatory actions are needed to protect a given plant from flooding hazards.*
4. *The COMSECY does not call for input and direction from the Commission on significant policy decisions that would change the path forward for implementing NTTF Recommendation 2.1 and complying with previous Commission and Congressional direction.*

The general concern and twelve specific items are addressed below:

General Concern Summary and Actions Taken

The fundamental concern with the COMSECY is that it proposes a change that bypasses current plans for a deliberate and systematic process for understanding the potential for flooding events to adversely affect nuclear power plants without sufficient regard for the importance of developing insights about flood risks. The COMSECY describes a significant departure from the current, approved process for implementing NTTF Recommendation 2.1. It likewise proposes a departure from associated guidance that was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. The events at Fukushima were caused by a flood event and U.S. operating experience further speaks to the importance of understanding plant response to flooding hazards. Despite this knowledge, the COMSECY describes a truncation of the process established to evaluate plant response to reevaluated flooding hazards that are more severe than the plant design basis. Moreover, it asserts that mitigating strategies (originally developed and evaluated as an additional defense-in-depth measure) generally provide an appropriate response and “first line of defense” against the reevaluated hazard. It precludes systematic evaluations that would support regulatory actions to strengthen plant protections against flooding risks, where justified. While mitigating strategies provide an important contribution to implementing the lessons learned from Fukushima, their existence does not negate the need to evaluate the total site-specific plant response to the reevaluated hazard. The proposed path forward creates a deficiency in knowledge because it precludes the systematic collection of information necessary to understand whether additional regulatory actions are needed. Moreover, the COMSECY lacks clarity and thus the intent and consequences of the proposed path forward are not well-defined in the paper. Finally, the COMSECY does not request a Commission vote on the proposed significant change in course for implementing Recommendation 2.1

Background

Order EA-12-049 was issued on March 12, 2012, and directed power reactor licensees to develop, implement, and maintain guidance and strategies (“mitigation strategies”) to maintain or restore core cooling, containment and SFP cooling capabilities following a beyond-design-basis external event. The NRC staff plans to incorporate these requirements into NRC regulations through the mitigation of beyond-design basis events (MBDBE) rulemaking. The NRC also issued letters on March 12, 2012, to power reactor licensees pursuant to 10 CFR § 50.54(f), which requested licensees reevaluate the seismic and flooding hazards at their sites using updated hazard information and current regulatory guidance and methodologies. The reevaluations of seismic and flooding hazards are related to Recommendation 2.1 from the NRC’s Post-Fukushima Near-Term Task Force (NTTF) report. The COMSECY has been prepared to clarify the NRC staff’s plans to complete activities currently underway to address lessons learned from the Fukushima accident and describe how the mitigation strategies order, rulemaking, and reevaluated hazards relate to each other now that sufficient information exists to describe a more integrated process.

The NRC staff is proposing in the COMSECY for the Commission to affirm that licensees for operating nuclear power plants need to address the reevaluated flooding hazards from Recommendation 2.1 within their mitigating strategies for beyond design basis external events (Order EA-12-049 and related MBDBE rulemaking). The rationale for this approach is to ensure

that the reevaluated hazards will, at a minimum, be addressed by the requirements for improved mitigating strategies. This expectation was included in the regulatory basis published in support of the MBDBE rulemaking. The NRC staff documented this expectation within the regulatory basis document to address the concern that mitigating strategies were being developed to cover a variety of external hazards but not necessarily protection against the postulated flooding scenarios from the Recommendation 2.1 reevaluations. This discrepancy results from licensees needing simultaneously to implement Order EA-12-049 and reevaluate seismic and flooding hazards. The guidance for Order EA-12-049, therefore, allowed licensees to base their mitigating strategies on the most recent site flood analysis because the hazard reevaluations from Recommendation 2.1 were not available. The regulatory basis for the MBDBE rulemaking and the subject COMSECY reflect the view that the desired end state following completion of the hazard reevaluations and implementation of the MBDBE rulemaking is that licensees have mitigating strategies to address the scenarios identified from the Recommendation 2.1 assessments.

An underlying theme within the non-concurrence and related discussions involves the potential benefits of a broad-based (total plant) integrated assessment of the response of selected operating nuclear plants to various flooding scenarios. The selected plants are those where the estimated flooding hazards using present day information and guidance exceeds the design-basis-flood for the facility. The design basis flood defines the conditions against which safety related structures, systems, and components (SSCs) need to be protected. The non-concurrence states that such a systematic assessment can support NRC staff and licensees identifying and evaluating measures to enhance flood protection features, improve mitigating equipment and strategies, or develop a combination of protection- and mitigation-related actions. This line of inquiry could be characterized as seeking information to help determine the appropriate balancing of accident prevention and mitigation. The staff describes the actual decision-making related to an appropriate or justifiable regulatory action within the flooding reevaluations as an activity (Phase 2) that would follow completion of information gathering, including integrated assessments.

The alternative approaches described in the COMSECY and this non-concurrence can largely be described in terms of two different but related issues. The first is the relationship between the regulatory actions for mitigating strategies for beyond-design-basis external events and the reevaluation of flooding hazards (i.e., do the regulatory requirements for mitigating strategies address reevaluated flooding hazards?). This relationship is addressed specifically in the COMSECY and by the first two items for which the NRC staff is seeking affirmation from the Commission. The non-concurrence does not focus on this central point of the COMSECY but rather on the processes to be used by the NRC staff in gathering information on reevaluated flooding hazards and how this information will be used in considering possible regulatory actions. As reflected in the original version of the COMSECY, the NRC staff viewed this largely as a matter to be resolved by internal procedures and revisions to staff-issued guidance (e.g., interim staff guidance). As discussed later, the NRC staff has added a request in the COMSECY for the Commission to approve revising the Recommendation 2.1 flooding assessments (focusing on mitigating strategies) and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking. The COMSECY was also revised to make more clear that the NRC staff is proposing to revise the information gathering and assessments to reflect the recommended regulatory approach (i.e., a requirement for mitigating strategies to address reevaluated flooding hazards).

The NRC staff discussed several possible approaches during the development of the COMSECY – involving variations of the two issues mentioned above. The three primary alternatives considered are as follows:

- (1) Maintaining the requirements for mitigating strategies to address reevaluated hazards and consider various factors when deciding on a plant-specific or conditional basis whether to pursue more detailed flooding assessments as part of evaluating plant-specific backfits;
- (2) Maintaining the requirements for mitigating strategies to address reevaluated hazards and perform the currently planned integrated assessments to possibly identify additional protective or mitigative measures, and then assess whether those measures could be imposed as regulatory requirements (i.e., backfits) in addition to mitigating strategies; and
- (3) Removing the requirements for mitigating strategies to address reevaluated hazards and pursuing Recommendation 2.1 as the primary vehicle to assess and, where justified, impose requirements to address reevaluated flooding hazards as separate regulatory actions (possibly but not necessarily including requirements for mitigating strategies).

The COMSECY describes the first option as the approach favored by the NRC staff. The authors of the non-concurrence favor the second approach, emphasizing the importance of maintaining the integrated assessments as described in the 50.54(f) letter and JLD-ISG-2012-05. The actual guidance in JLD-ISG-2012-05 and the process usually described prior to the COMSECY for Phase 2 decision-making reflected the third approach.

Summary/Discussion

The authors of the non-concurrence correctly point out that the COMSECY proposes changes to the activities related to flooding reevaluations, mitigating strategies and the related MBDBE rulemaking. The NRC has made changes and adjustments within other Fukushima lessons-learned activities as the staff and nuclear industry have gained experience and knowledge in implementing imposed requirements and evaluating various issues. The authors of the non-concurrence state that the original version of the COMSECY did not appropriately identify and highlight the change to the Commission and did not request Commission approval of the described changes in approach.

Another underlying concern expressed in the non-concurrence relates to changes in the scope of integrated assessments included in the request for information and how that might impact subsequent decisions on possible regulatory actions. The general vision described in JLD-ISG-12-05 includes assessing various flooding mechanisms, the impact of the flooding conditions on the plant, and identifying possible measures to protect plant SSCs or mitigate the loss of plant SSCs. The hazard reevaluations and possible measures to address them would then be evaluated within the NRC's processes to determine what, if any, regulatory actions the NRC staff should pursue. The COMSECY describes a different process in that it recommends that the Commission affirm that licensees for operating nuclear power plants need to address the reevaluated flooding hazard within their mitigating strategies for beyond-design-basis external events.² Contrary to the statements in the non-concurrence, the NRC staff is proposing this approach to ensure that the lessons learned from Fukushima and other insights

² To “address the reevaluated flooding hazard,” the mitigating strategies need to provide key safety functions such as core cooling given an extended loss of alternating current (ac) power that might be caused by a beyond-design-basis external event. The mitigating strategies equipment and

related to flooding hazards are addressed by a specific regulatory requirement for safety improvements. With a minimum regulatory requirement addressing reevaluated flooding hazards established for all plants, the assessment of the information can become more focused, with expected improvements in efficiency and timeliness. The flooding reevaluations and focused assessments will ensure mitigating strategies provide the capability to address the range of beyond-design-basis flooding hazards from various mechanisms and conditions.

The COMSECY also describes how additional assessments might be undertaken if the NRC staff determined that regulatory actions beyond improving mitigating strategies might be warranted to address plant or scenario-specific issues. The NRC staff expects that such assessments would not be needed for all plants and the staff would document the basis for additional assessments and consideration of plant-specific actions (beyond the requirements for mitigating strategies to address the reevaluated flooding hazard). The authors of the non-concurrence advocate pursuing the total plant integrated assessments described in JLD-ISG-12-05 for all affected plants and then using those assessments to determine if additional regulatory actions should be considered. Assuming the Commission affirms the positions described in the COMSECY, the staff would initiate internal and external discussions about changes to the internal plans, revisions to staff-issued guidance, and integration of the flooding reevaluations and mitigating strategies activities. The original version of the COMSECY did not seek specific Commission approval of this integration but instead considered it a natural result of the requested Commission affirmation related to the scope of mitigating strategies. If the Commission decides not to affirm the positions in the COMSECY, the NRC staff will revert back to the flooding reevaluations and integrated assessments described in JLD-ISG-12-05 and drop plans to include requirements in the proposed MBDBE rulemaking for mitigating strategies to address reevaluated external hazards.

The NRC staff and management assessed the overall program for addressing the lessons learned from the Fukushima accident and considered a variety of concerns and possible outcomes in developing the recommendations provided in the COMSECY. The discussions and deliberations can be summarized in terms of tradeoffs between what are often competing elements of a project (e.g., developing proposed regulatory actions). These elements or factors include: (1) Scope or safety improvements sought from the project, (2) Cost or resources needed for the project, (3) Duration or schedule for the project, and (4) Project risk (failing to address first 3 elements).

One of the major concerns of the authors of the non-concurrence is the proposed change to the scope or approach to the request for information related to flooding reevaluations (Stage 2 of Phase 1 of the flooding reevaluation activity). However, the COMSECY is addressing a higher level issue involving the longer term or expected “end state” of the NRC’s overall regulatory response to the Fukushima accident. Although the scope of integrated assessments within the flooding reevaluations has been an important part of that program, the NRC staff and management needed to consider all of the above elements and the impacts on the agency, the regulated community, and other stakeholders within the context of ensuring nuclear power plants pose no undue risk to the public health and safety.

The general concern expressed in the non-concurrence reflects the perspective of those involved in the request for information on flooding reevaluations. As mentioned in the COMSECY and the non-concurrence, some of the issues result directly from the need for

actions would also need to be protected against those beyond-design-basis events identified during the reevaluation of flooding hazards (see Figure 2.1 in Enclosure 2 to the COMSECY).

licensees to implement plant changes for mitigating strategies to address beyond-design-basis external events while simultaneously reevaluating seismic and flooding events using more recent information and analysis methodologies. This in turn led to developing mitigating strategies for Order EA-12-049 based on the most recent site flood analysis available, which in some cases might be the current design-basis flood described in a plant's final safety analysis report (FSAR). Some of the existing staff-level documents and discussions associated with mitigating strategies and flooding reevaluations reflect this interim measure in that they refer to mitigating strategies only addressing flooding hazards to the magnitude of the design-basis flood. Some possible paths forward included an assumption that these interim configurations would satisfy the subsequent MBDBE rulemaking. The guidance for flooding reevaluations generally assumed the two activities (mitigating strategies and flooding reevaluations) were separate in terms of the associated regulatory actions, with Phase 2 of the flooding reevaluations determining what, if any, requirements would be imposed to address the reevaluated flooding hazards.

A possible outcome of treating flooding reevaluations as a separate activity is that the mitigating strategies developed to address a variety of external hazards would not address flooding events similar to those identified from the reevaluations. A separate justification and regulatory action would then be needed under Phase 2 of the flooding reevaluation to address the revised hazard, either by improving flooding protection or mitigation measures (including but not necessarily limited to the strategies covered by the MBDBE rulemaking). However, the regulatory basis for the MBDBE rulemaking described how the desired end state following completion of the hazard reevaluations and implementation of the MBDBE rule is that, at a minimum, licensees have mitigating strategies to address the scenarios identified from the Recommendation 2.1 assessments. The NRC staff is requesting that the Commission affirm that approach for the reasons provided in the COMSECY and expanded upon in this section of the non-concurrence package. The deliberations leading to the recommendations in the COMSECY reflect the above project elements or tradeoffs and a management decision based on the best overall outcome. For example,

- The COMSECY reflects the established view (as reflected in the regulatory basis document published for the MBDBE rulemaking) that a regulatory requirement should exist for plants to address the flooding reevaluations. The regulatory requirement currently being developed where this concern would be incorporated is the MBDBE rulemaking. The non-concurrence focuses upon the current information gathering phase of the flooding reevaluations as described in JLD-ISG-12-050. However, pursuing a separate regulatory action for the reevaluated flooding hazard would increase costs, extend schedules, and increase overall project risk because it is uncertain if or when the NRC would impose any additional requirements. To the degree that the concerns of the non-concurrence apply to imposing requirements beyond mitigating strategies, the differences between the described approaches are that the COMSECY describes a staff evaluation that would initiate further assessments (i.e., conditional based on staff judgment) while the authors of the non-concurrence propose assessments for all affected plants as currently described in JLD-ISG-12-050.
- NRC and industry are facing resource challenges related to the implementation of new requirements and performance of additional studies in response to the Fukushima accident. The relationship between the external hazard re-evaluations and the development of mitigating strategies for such events has become clearer as both activities have been developed over time, and the planned integration of the activities will support a more efficient and effective resolution of the issues.

- The ongoing information gathering activities related to flooding reevaluations have experienced delays, and the staff foresees more delays as licensees decide to use new approaches to address some flooding mechanisms, such as intense precipitation events. The industry may choose to pursue such approaches for responding to the request for information because of uncertainties about the regulatory “end state” under Phase 2 of Recommendation 2.1 activities. Establishing regulatory clarity and stability at this time may accelerate resolution of reevaluated flooding hazards to support implementation of NRC Order EA-12-049 and the related MBDBE rulemaking.
- The approach described in the COMSECY provides real and timely safety improvements by requiring – at a minimum – that mitigating strategies include capabilities to address reevaluated flooding hazards. There is some uncertainty associated with this approach given the associated rulemaking is still under development – but the likelihood of achieving this outcome is high provided the Commission affirms the positions identified in the COMSECY. The NRC staff acknowledges the logic of the general process in the non-concurrence – collect information, assess information, and then make a regulatory decision. In such a model, more information and insights about flooding or other risk contributors are useful in helping with the decision-making process. In this case, the integrated assessment might be viewed as an analytical tool comparable to probabilistic risk assessments used in evaluating other potential regulatory actions. However, experience has shown that such approaches are often long-term projects, and the outcomes are highly uncertain in terms of achieving a change in NRC requirements. For example, the initial estimated schedule for the NRC’s Probabilistic Flood Hazard Assessment Research Plan (PFHARP), which is being developed to help resolve some of these issues, extends into 2019. Incorporating insights from the PFHARP into the regulatory decisions for the flooding hazard reevaluations would be some years after that, most likely well into the 2020s. A thorough evaluation of possible approaches needs to consider the possible costs of information gathering efforts; not only in terms of resources and schedule but also in potentially leading to a less effective regulatory response to lessons learned from the Fukushima accident.

In summary, the NRC staff and management acknowledge the concerns expressed by the authors of the non-concurrence in terms of the changes to the planned flooding reevaluations as described in JLD-ISG-12-05. However, the evaluation and development of the COMSECY needed to consider other factors – not mentioned in the non-concurrence – to determine the best overall approach in terms of optimizing safety improvements, costs, schedules, and project risks.

Action

The authors of the non-concurrence correctly point out that the recommendations in the COMSECY include changes to the current activities related to flooding reevaluations, mitigating strategies, and the related MBDBE rulemaking. The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and request Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

The presentation of the information in the COMSECY and its enclosures is a reasonable way to ensure the Commission has the needed information and is made aware of the issues related to the recommendations. The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of where the agency has consolidated activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency (e.g., COMSECY-13-002, "Consolidation of Japan Lessons Learned Near-Term Task Force Recommendations 4 and 7 Regulatory Activities"). The additional discussions and request for Commission approval of the integration of flooding reevaluations and mitigating strategies is an improvement to the COMSECY and provides the needed information to the Commission for their deliberations.

Specific Issue Summaries and Actions Taken

1. *NTTF Recommendation 2.1 is for the NRC to "[o]rder licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis and SSCs [structures systems and components] important to safety to protect against the updated hazards." Thus, at the core of Recommendation 2.1 is the reevaluation of flooding hazards and, if needed, updating a plant's design basis to ensure protection of SSCs important to safety. Recommendation 2.1 was implemented via the issuance of the 50.54(f) letter in March 2012, as described above. The reevaluation of flooding hazards is responsive to the first portion of Recommendation 2.1, while the integrated assessment provides the relevant information regarding plant response to support an NRC decision regarding the need to change the design or licensing basis of the plant to protect SSCs important to safety or to take other regulatory action.*

In light of the intent of Recommendation 2.1, four key issues emerge regarding the COMSECY:

1. *The COMSECY represents a significant departure from the intent of Recommendation 2.1.*
2. *The paper provides no technical or safety basis for departing from Recommendation 2.1.*
3. *The COMSECY does not clearly and explicitly state, for the benefit of external stakeholders and the Commission, that the proposed path will no longer meet the intent of Recommendation 2.1.*
4. *The COMSECY does not request a Commission vote on the proposed path forward despite the aforementioned departures.*

Summary/Discussion

As previously discussed, the NRC staff and management acknowledge in the COMSECY and in this response to the non-concurrence that now is an appropriate time to identify and implement changes to various activities within the agency's response to the Fukushima accident. The COMSECY has been prepared to clarify the NRC staff's plans to complete activities currently

underway and describe how the mitigation strategies order, rulemaking, and reevaluated hazards relate to each other now that sufficient information exists to describe a more integrated process. The NRC staff and management have requested the Commission affirm those changes viewed as potential policy issues to minimize potential confusion or future challenges to the recommended approaches. The NRC staff can address more detailed changes to the coordination of information gathering activities, ongoing regulatory actions, and future evaluations of possible regulatory actions through working with stakeholders and revising appropriate guidance documents.

The authors of the non-concurrence refer heavily to the NTTF report as part of the basis for this specific concern. The NTTF report is recognized as a major achievement and provided a good starting point for subsequent actions defined by the NRC's Japan Lessons Learned Steering Committee and the Commission. However, the agency made many changes to the actions recommended by the NTTF, and more appropriate references salient to the agency's post-Fukushima activities are the later Commission papers and related staff requirements memoranda. The evolving nature of the NRC's response to lessons learned from the Fukushima accident is reflected in the numerous status updates, policy papers, and Commission decisions prepared since the orders and requests for information were issued in March 2012. The staff views the COMSECY as part of the continuing evolution of the NRC's response and changes needed to address information and insights gained during the evaluation and implementation of the closely related activities.

Action

The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and specifically requests Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

As explained under the discussion of the general concern identified in this non-concurrence, the NRC staff needs to consider various factors and possible outcomes when establishing a course of action and making policy recommendations to the Commission. The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of consolidating activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency. The additional discussions and request for Commission approval of the changes from the original plans for flooding reevaluations and the integration with mitigating strategies is an improvement to the COMSECY and provides the Commission with information needed for their deliberations.

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2. *There has been clear Commission and Congressional direction regarding implementation of Recommendation 2.1. The COMSECY outlines a proposed path forward that significantly deviates from the current path for implementation of Recommendation 2.1. The following issues are observed:*

1. *The COMSECY does not clearly and explicitly describe the previous Commission and Congressional direction regarding the need to reevaluate flooding hazards, identify plant vulnerabilities under the new hazard, and (as needed) take further regulatory action in response to Recommendation 2.1.*
2. *The main body of the COMSECY does not clearly acknowledge that the proposed path forward for implementation of Recommendation 2.1 represents a significant deviation Section A from the previous Commission and Congressional direction regarding Recommendation 2.1.*
3. *The paper does not ask the Commission to vote on the change in direction that is proposed in the COMSECY.*

Summary/Discussion

The NRC staff includes recommendations in the COMSECY for the Commission to affirm the proposed relationship between mitigating strategies and flooding reevaluations. The original version of the COMSECY treated this relationship as a central issue and the matter needing Commission attention to enable the NRC staff to effectively establish regulatory requirements and revise various internal plans and staff-level guidance documents. The evolving nature of the NRC's response to lessons learned from the Fukushima accident is reflected in the numerous status updates, policy papers, and Commission decisions prepared since the orders and requests for information were issued in March 2012. The staff views the COMSECY as part of this continuous assessment and adjustment of activities as information and insights are gained from performing evaluations and implementing plant changes. The NRC staff considers the information provided, approaches developed, requested Commission decisions, and the resultant changes to staff-level guidance to be consistent with previous directions from the Commission and the language of Section 402 of the Consolidated Appropriations Act, 2012, (Public Law 112-074, dated December 23, 2011).³

The authors of the non-concurrence point out that related changes to the plans for reevaluated flooding hazards and the integration of parts of two Fukushima-related activities were not emphasized in the original version of the COMSECY and that the Commission was not asked to approve those changes. Assuming the Commission affirms the positions described in the COMSECY, the staff would initiate internal and external discussions about changes to the internal plans, revisions to staff-issued guidance, and integration of the flooding reevaluations and mitigating strategies activities. The original version of the COMSECY did not seek specific Commission approval of this integration but instead considered it a natural result of the requested Commission affirmation related to the scope of mitigating strategies. However, a

³ Section 402 of the Consolidated Appropriations Act, 2012, states:

The Nuclear Regulatory Commission shall require reactor licensees to reevaluate 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.

request for Commission approval of the integration of flooding assessments and decision-making into the development and implementation of requirements for mitigating strategies has been added to the memorandum.

Action

The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and request Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of consolidating activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency. The additional discussions and request for Commission approval of the changes from the original plans for flooding reevaluations and the integration with mitigating strategies is an improvement to the COMSECY and provides the needed information to the Commission for their deliberations.

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3. *The COMSECY describes a change from the implementation process for Recommendation 2.1. The following issues arise:*
- *The COMSECY does not, for the awareness of the Commission and external stakeholders, clearly and explicitly articulate that the COMSECY proposes a significant change to the current implementation process for Recommendation 2.1.*
 - *The COMSECY does not clearly articulate a sound basis, technical or otherwise, for the changes to the implementation process.*
 - *The COMSECY does not describe the consequences of the proposed changes to the implementation process (Sections 2.4 through 2.11 describe the consequences of changes to the process).*

Summary/Discussion

The authors of the non-concurrence correctly point out that the recommendations in the COMSECY include changes to the current activities related to flooding reevaluations, mitigating strategies, and the related MBDBE rulemaking. The COMSECY can be viewed as part of the ongoing program to address lessons learned from the Fukushima accident, which has included numerous changes and adjustments to address information or insights from implementing newly imposed requirements and evaluations undertaken by the NRC and others. The changes to the information gathering efforts mentioned by the authors of the non-concurrence result primarily from the decision, if affirmed by the Commission, to include requirements for licensees to address reevaluated flooding hazards within the mitigating strategies covered by the proposed MBDBE regulation. Inclusion of a requirement within the MBDBE rule for mitigation of the reevaluated flooding hazard necessarily leads to changes in the Phase 2 decisions on

regulatory actions for improved flood protection or mitigation. Changes to the decision-making process in turn lead to changes in the information collection and assessments being requested from licensees. These changes were mentioned in the original version COMSECY but not discussed in detail because it was considered to be an implementation detail within the NRC staff's purview once the Commission decides upon the other higher-level policy recommendations included in the paper.

This recurring theme within the non-concurrence to maintain the integrated assessments as described in JLD-ISG-12-05 is largely indicative of differences in perspective. The NRC staff acknowledges that changes to various activities will result from the COMSECY if the recommendations are affirmed by the Commission. Changes will be needed to staff-level guidance for mitigating strategies and flooding reevaluations as well as to the proposed regulations being prepared as part of the MBDBE rulemaking. Whereas the NRC staff does not discuss in detail the reduction in scope of flooding integrated assessments within the COMSECY, neither does the COMSECY include detailed discussions of potential issues with maintaining the current path in terms of resource challenges, schedule changes, and the possibility of missing opportunities to effectively address beyond-design-basis external events within regulatory requirements meant to address lessons learned from the Fukushima accident (see previous response to general concern). The focus of the COMSECY (original and subsequent revisions) is on the policy-level issues for which the staff is seeking Commission affirmation.

Action

The original version of the COMSECY did not emphasize the changes to the flooding reevaluations or request the Commission approve the integration of the flooding reevaluations and mitigating strategy activities. The COMSECY has been revised to better describe the changes and request Commission approval of revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking.

Conclusion

The NRC staff has revised the COMSECY to request that the Commission approve the integration of activities consistent with previous examples of consolidating activities to achieve the desired safety enhancements while improving regulatory effectiveness and efficiency. The additional discussions and request for Commission approval of the changes from the original plans for flooding reevaluations and the integration with mitigating strategies is an improvement to the COMSECY and provides the needed information to the Commission for their deliberations.

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4. *The proposed path forward may lead to several potential regulatory inconsistencies:*
- *The treatment of increased flooding hazards from dam failures may differ between (1) sites for which there is ongoing regulatory activity that may lead to changes in the protection of the plant or other backfits and (2) sites for which regulatory activity is not already ongoing.*

- *The treatment of new information about different flood mechanisms may differ. For example, NRC may treat new information about increased flooding hazards from dam failures (at some sites) differently than new information about increased flooding hazards from other mechanisms such as storm surge and local intense precipitation.*

Recent regulatory activity at Oconee Nuclear Station provides an illustration of regulatory actions related to dam failure that were initiated before the events at Fukushima. Actions were taken by NRC in response to new information about flooding hazards from dam failure and resulted in documented staff concerns regarding whether the plant was adequately protected. Staff concerns resulted in the initiation of activities to build protective features at the site. In contrast to treatment of new information regarding flooding hazards at Oconee, under the proposed path forward for Recommendation 2.1 described in the COMSECY, all new hazard information would be broadly classified as “beyond design basis,” without consideration of whether the design or licensing basis of the plant should be updated to protect SSCs important to safety. Instead, mitigating strategies would serve as the primary “defense” against the reevaluated hazard defined using present-day guidance and methods used to define the design basis of new reactors.

Experience with Oconee contributed, in part, to the proposal (and subsequent designation) of Generic Issue 204 related to flooding of nuclear power plants following upstream dam failure. The activities related to Generic Issue 204 as well as other site-specific regulatory activities were subsumed by the NTTF Recommendation 2.1 activities. However, the proposed path forward for NTTF Recommendation 2.1 will not provide information to support resolution of the issues subsumed by Recommendation 2.1 activities and thus they would require use of other processes to ensure resolution.

Finally, the COMSECY describes the systematic evaluation program (SEP) and invokes it as regulatory precedent. The description of the program and the resulting implications for Recommendation 2.1 is not clear and may be misleading.

Summary/Discussion

The COMSECY describes the recommended approach including a requirement that reevaluated flooding hazards at least be addressed by the mitigating strategies being developed and implemented in accordance with the proposed MBDDBE rulemaking. This approach provides a generic minimum or baseline that all licensees would need to address. In addition, the NRC staff may elect to request additional information from licensees and conduct further assessments to determine if the NRC should consider imposing additional requirements. Further information gathering, assessments and consideration of potential regulatory actions could be pursued unless proposed backfits are not likely to provide a substantial increase in overall protection, or the direct and indirect costs of implementation are not likely to be justified. The licensing histories and applicable regulatory requirements differ among operating plants and so the need to consider plant-specific decisions is appropriate. Proposed regulatory actions could be based upon the need to comply with established regulatory requirements (generic or plant specific), measures needed to provide reasonable assurance of adequate protection of public health and safety, or cost-justified enhancements that provide a substantial safety benefit. The NRC staff notes that the approach advocated in the non-concurrence relies on plant-specific decisions and regulatory actions. As previously discussed, the authors of the non-concurrence prefer the information gathering described in JLD-ISG-12-05 followed by plant-specific Phase 2 regulatory evaluations versus the conditional collection of information

described in the COMSECY. Ongoing activities within the operating experience program, generic issues program, reactor oversight process, enforcement program, and generic communications program will continue to play an important role in the NRC oversight of nuclear power plants under the approaches mentioned in the COMSECY and this non-concurrence. The NRC processes for addressing requests for information do not offer any clear advantage in terms of ensuring consistency in regulatory approach compared to the processes to establish and implement regulatory requirements such as Order EA-12-049 and the related MBDBE rule. Examples of specific regulatory issues such as the potential flooding of the Oconee Nuclear Station cited in the non-concurrence were identified and addressed using the processes and decision-making criteria described in the COMSECY.

The authors of the non-concurrence sometimes refer to the benefits of the approach described in JLD-ISG-12-05 (i.e., increasing the understanding of potential plant risks from flooding events) without reminding the reader that the current activity involves requesting information from licensees and related staff assessments to support future and largely undefined regulatory decisions. The requests for information and staff efforts will not resolve issues without a subsequent regulatory action at which time the staff would face many of the same limitations and obstacles identified as concerns in the non-concurrence (e.g., the lack of detail in performance-based rules). The brief mention of the systematic evaluation program (SEP) and individual plant examination of external events (IPEEE) within Enclosure 1 of the COMSECY are offered to provide historical background and some regulatory context to current information gathering activities. NRC regulations and processes remain largely the same now as they were when those evaluations were undertaken and the agency will face many of the same challenges in terms of proposing new requirements, managing budgets and schedules, and negotiating compromises with internal and external stakeholders. Discussions of maintaining the integrated assessments and other activities as they were contemplated in 2012 should acknowledge the risks of that approach getting bogged down in analytical discussions and ultimately leading to no regulatory actions. Some evidence of this currently exists as the staff is continuing its reviews of flooding hazard reevaluations submitted in March 2013 and some licensees are undertaking additional reevaluations for specific flooding scenarios. In such cases, the more detailed efforts to obtain and analyze information may have an actual adverse impact on the safety of operating nuclear power plants compared to taking a more timely regulatory action. The NRC staff has held some public meetings with the nuclear industry on the coordination of activities as described in the COMSECY, and it appears there is sufficient consensus to begin working on revisions to appropriate guidance documents.

Action/Conclusion

The NRC staff did not make specific changes to the COMSECY to address this concern. However, the authors of the non-concurrence raise a legitimate issue regarding the importance of achieving as much consistency as possible during the assessments and decision-making process. As discussed in the COMSECY, the NRC staff will use established guidance (e.g., management directives, office instructions) to ensure consistent and predictable actions are taken to gather information, perform evaluations, and, where appropriate, impose requirements. No additional changes or delays in providing the paper to the Commission are needed.

5. *As described in the previous sections, Phase 1 of the implementation process for NTTF Recommendation 2.1 is intended to gather sufficient information about (1) the reevaluated flooding hazard for a site, (2) the effects of the hazard on the site, and (3) the plant's proposed response to a hazard (e.g., protection, mitigation, or some combination). This information is gathered so that NRC can ensure that plants are adequately protected and make decisions regarding safety enhancements. It is important to note the typical reasons that flooding hazards have increased as a result of the NTTF Recommendation 2.1 flood hazard reevaluations. These reasons for increase include:*
1. *Hazard mechanisms were not previously considered (e.g., local intense precipitation events not considered when the plant was sited are evaluated as part of the NTTF Recommendation 2.1 hazard assessment)*
 2. *Reassessment of or new information regarding the credibility of hazards (e.g., dam failure events previously considered not credible based on an assessment of dam failure frequencies are reassessed as credible)*
 3. *New modeling and analysis tools lead to the understanding that flood height, associated effects, or flood event duration associated with the same events considered in the design basis for a site are more severe than previously estimated (e.g., estimation of higher flood levels resulting from same dam failure events already included within the design basis)*

The COMSECY proposes to truncate the current Recommendation 2.1 implementation process and focus on mitigating strategies (originally developed to provide additional defense in depth) as the first line of defense against the reevaluated flooding hazard. The COMSECY prejudices the outcomes of Phase 2 of the implementation process for NTTF Recommendation 2.1 and states that NRC does not expect to redefine the design basis for protection of safety-related SSCs. This may conflict with NRC's obligation to continually assess whether there is adequate protection of public health and safety.

Summary/Discussion

The concern expressed by the authors of the non-concurrence again reflects differences in perspective and presents reasonable arguments for sticking to the process defined in JLD-ISG-12-05. That approach reflects a straightforward logic of collecting information, assessing plant risks or vulnerabilities, and then determining what, if any, regulatory actions might be appropriate. It is worth noting that the 50.54(f) letter and related guidance does request licensees to provide information about interim actions taken or planned to address any higher flooding hazards relative to the design basis, prior to completion of the integrated assessment, if necessary. However, the non-concurrence does not discuss possible downsides with that overall approach in terms of resource challenges, schedule delays, and the possibility of missing opportunities to more effectively address beyond-design-basis external events within regulatory requirements. The importance of taking timely actions is especially important when dealing with operating reactors and the finite terms of their operating licenses. Delayed actions mean that real risks of operation are not addressed during the period of analysis except for possible licensee-initiated interim actions included in the responses to the 10 CFR 50.54(f) request for information. The potential benefits of delayed regulatory actions are diminished because they are in place for a shorter period of time (which in turn makes it more difficult to justify such an action in the future). The approach recommended in the COMSECY takes into account these various factors and while reducing the scope and possible benefits of the broader

integrated assessments favored by the authors of the non-concurrence, a requirement for mitigating strategies to address reevaluated flooding hazards does result in a more timely and predictable regulatory action (and related safety enhancement) that appropriately addresses lessons learned from the Fukushima accident. The COMSECY also states that the NRC staff will use information about the reevaluated flooding scenarios, plant design, and other available information to decide if further assessments and potential plant-specific backfit evaluations should be pursued (see response to Concern #9 regarding reasonable judgment to initiate additional assessments).

If the Commission affirms the NRC staff's recommended positions in the COMSECY, various staff-level guidance documents related to mitigating strategies and flooding reevaluations (including integrated assessments) will need to be revised. The NRC staff would immediately work with stakeholders to revise guidance and the planned MBDBE rulemaking to provide for the timely implementation of mitigation strategies with the capability to address the reevaluated flooding hazards. In addition, the COMSECY discusses how additional analysis should be undertaken if the NRC staff has technical concerns or reason to believe that plant-specific regulatory actions are warranted. The COMSECY reflects the views of the NRC staff and management that when these issues are looked at more holistically, the proposed approach will provide more timely and certain safety enhancements while still maintaining an ability to pursue additional assessments and plant-specific actions, if warranted.

Enclosure 1 to the COMSECY includes a discussion of the terminology associated with licensing basis information, including design basis and design-basis events. As mentioned in the non-concurrence, the enclosure includes a statement that the NRC staff does not expect to revise the design-basis flood against which safety related equipment would need to be protected, but does not definitively rule out that plant-specific information could warrant such a rare regulatory action. As described in the paper, the last several decades of regulatory history and the fact that more economical measures can be taken to provide similar controls on plant risks is the basis for the statement. The discussion in the COMSECY is based upon available guidance in Regulatory Guide 1.186, "Guidance and Examples for Identifying 10 CFR 50.2 Design Basis." The NRC staff included this topic within the COMSECY because the continued discussions about the hypothetical redefining of design-basis floods may be among the reasons a number of licensees are currently refining analyses of flooding scenarios, which leads to delays in the gathering of information and evaluating possible regulatory actions. Approaches based on established NRC processes for identifying and establishing design-basis information (e.g., Regulatory Guide 1.186) are consistent with the direction given in Commission and Congressional documents cited in the non-concurrence. The NRC staff has held some public meetings with the nuclear industry on the coordination of activities as described in the COMSECY, and it appears there is sufficient consensus to begin working on revisions to appropriate guidance documents.

Action

The NRC staff did not make significant changes to the COMSECY to address this concern. An example and additional figure were added to Enclosure 1 to help explain the proposed approach and how it would affect licensing basis information, including the design basis for specific SSCs.

Conclusion

Beyond the actions taken to further explain how the recommended approach affects licensing basis information (i.e., figure and example), no additional changes or delays in providing the paper to the Commission are needed.

6. *The proposed path forward described in the COMSECY truncates the Recommendation 2.1 implementation process by reducing the scope and rigor of the integrated assessment, or eliminating the integrated assessment altogether. As a result, important insights about plant response will not be gathered at sites for which the reevaluated hazard is more severe than the design basis. Information about the increase in hazard alone is not sufficient to determine whether additional regulatory actions should be pursued. Therefore, the proposed path forward described in the COMSECY will not provide sufficient information to support staff decisions regarding whether to take additional regulatory action (beyond providing functional requirements and reference bounds for Order EA-12-049 mitigating strategies) to ensure adequate protection of public health and safety or as cost-justified substantial safety enhancements.*

Summary/Discussion

Similar to previous concerns expressed in the non-concurrence, this item relates to changes in the scope of integrated assessments included in the request for information and how that might impact subsequent decisions on possible regulatory actions. The general vision described in JLD-ISG-12-05 includes assessing various flooding mechanisms, the impact of the flooding conditions on the plant, and identifying possible measures to protect plant SSCs or mitigate the loss of plant SSCs. The hazard reevaluations and possible measures to address them would then be evaluated within the NRC's processes to determine what, if any, regulatory actions should be pursued. The COMSECY describes a different process in that it recommends that the Commission affirm that licensees for operating nuclear power plants need to address the reevaluated flooding hazard within their mitigating strategies for beyond-design-basis external events. The assessments of mitigating strategies equipment and actions would ensure protection against various flooding mechanisms and conditions identified from the flooding reevaluations. Mitigating strategies would therefore need to address scenarios that could range from slightly above the design-basis flood to significantly above the design-basis flood and depending on the site, scenarios involving different warning times, debris loads, event durations, and other factors identified by the hazard reevaluations. With a specific regulatory requirement addressing reevaluated flooding hazards established for all plants, the assessment of the information can become more focused, with expected improvements in efficiency and timeliness and therefore, meaningful safety enhancements established more promptly. The COMSECY also describes how the NRC staff may undertake additional assessments if they determine that regulatory actions beyond improving mitigating strategies might be warranted to address plant or scenario-specific issues. The NRC staff – including the decision-makers on matters related to operating reactors – finds the recommended approach provides appropriate regulatory controls and flexibilities to address plant-specific safety issues (see response to Concern #9 regarding reasonable judgment to initiate additional assessments). Assuming the Commission affirms the positions described in the COMSECY, the staff can initiate internal and external discussions about changes to the internal plans and revisions to staff-issued guidance. If the Commission decides not to affirm the positions in the COMSECY, the NRC staff will revert back to the flooding reevaluations and integrated assessments described in JLD-ISG-12-05 and drop

plans to include requirements in the MBDBE rulemaking for mitigating strategies to address reevaluated external hazards.

Action/Conclusion

Beyond the actions described in response to other concerns (e.g., describing integration of some parts of Recommendation 2.1 into mitigating strategies and requesting Commission approval of that integration), no changes were made to the COMSECY to address this specific concern.

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7. *Operating experience has demonstrated the potential hazards posed to nuclear power plants by flood events as well as the importance of ensuring plants can appropriately protect against flooding events. NRC operating experience in this area stretches back decades. Several examples of this past experience include the impact of Hurricane Andrew on Turkey Point (Ref. [19]), deficient flood panels at Prairie Island (Ref. [20]), and flooding of Cooper Nuclear Station (Ref. [21]). In addition there have been a number of recent events involving flooding of sites or structures, as well as recent “greater than green” findings under the reactor oversight process and recent non-cited violations and licensee event reports. This operating experience has brought to the forefront the importance of carefully evaluating flood protection. Recent flooding events have involved (1) failed or missing seals that resulted in the inundation of areas containing safety-related equipment, (2) the effect of rising water levels on instrumentation and information availability during a hurricane event, and (3) storm surge and debris effects. Recent findings under the reactor oversight process have involved missing seals, inadequate procedures, and infeasible manual actions. Although there can be some solace taken in the fact that some of these events have been discovered under the reactor oversight process, it is important to note that the purpose of the reactor oversight process is to inspect, measure, and assess plant performance, not to systematically evaluate plant response to new information regarding increased hazards. All of these insights arising from operating experience would be addressed as part of the integrated assessment. However, the proposed path forward described in the COMSECY would significantly reduce or eliminate the assessment of plant response that is performed under Recommendation 2.1 activities.*

Summary/Discussion

To the degree that the staff needs to consider operating experience within the flooding reevaluations and integrated assessments associated with the request for information under Recommendation 2.1, the staff will likewise consider operating experience within the licensing reviews, audits and inspections associated with licensees’ actions to comply with the regulatory requirements for mitigating strategies. The NRC processes for addressing such information in responses to the 50.54(f) do not offer an advantage compared to the processes to establish and implement regulatory requirements such as Order EA-12-049 and the related MBDBE rule. The recommended approach should result in a more focused assessment of the implications of operating experience and other technical issues since the generic regulatory action (MBDBE rulemaking) would require licensees to ensure mitigating strategies are protected against the reevaluated flooding hazards. However, NRC activities related to gathering and analyzing

information about operating experience and problems with protection against design-basis floods would continue within the current programs. Those NRC programs associated with operating experience, generic issues, reactor inspection and oversight, enforcement, and generic communications will continue to play an important role in the agency's oversight of nuclear power plants both under the approach recommended in the COMSECY and the approach favored by the authors of the non-concurrence.

Action/Conclusion

The NRC staff did not make specific changes to the COMSECY to address this concern. The authors of the non-concurrence highlight the importance of operating experience and incorporating insights into NRC programs. The NRC staff will continue to use established guidance (e.g., management directives, office instructions) and use existing programs (e.g., operating experience, inspections, generic communications) to ensure licensees address identified issues with flood protection and mitigation. No additional changes or delays in providing the paper to the Commission are needed.

8. *The integrated assessment interim staff guidance (Ref. [2]) describes the set of evaluations and documentation necessary to support licensees' assessments of their proposed strategies for evaluating the total plant response to any increased flooding hazards identified as a result of the hazard reevaluation using present-day guidance and methods applicable to defining the design basis for new reactors. The interim staff guidance (ISG) was developed by an inter-disciplinary staff team, in collaboration with industry, during an open process of public interactions that included an opportunity for formal public comment. In recognition that operating reactors are already sited and cannot be redesigned, the ISG allows licensees to credit (with appropriate justification) both protection and mitigation capabilities. Figure 1 provides a conceptual illustration of the integrated assessment process described in the ISG. Although the ISG allows licensing to credit mitigation (including FLEX or alternate strategies), the "level of review" described in the integrated assessment interim staff guidance requires a more detailed and rigorous evaluation than that required for the evaluation of mitigating strategies under Order EA-12-049. This is appropriate in light of the differences in intended goals of the integrated assessment and mitigating strategies evaluations (intended to provide broad capabilities for defense in depth). The COMSECY does not recognize these differences nor reflect the necessity of using the process described in the integrated assessment to develop the information required for staff to determine, with adequate technical justification, that a licensee's proposed approach to responding to the reevaluated hazard (whether using protection or mitigation) will be effective.*

Summary/Discussion

The authors of the non-concurrence refer to the benefits of the approach described in JLD-ISG-12-05 (i.e., increasing the understanding of potential plant risks from flooding events) without acknowledging that the current activity involves requesting information from licensees and conducting related staff assessments to support possible but uncertain regulatory actions in the future (See discussion under issue 4). Statements such as "*the ISG allows licensees to credit (with appropriate justification) both protection and mitigation capabilities*" and "*the "level of*

review” described in the integrated assessment interim staff guidance requires a more detailed and rigorous evaluation than that required for the evaluation of mitigating strategies under Order EA-12-049” does not reflect the actual regulatory hierarchy and treatment of requests for information versus compliance with NRC requirements. The non-concurrence cites the guidance and assumes the information collection and assessments will occur as envisioned when the staff issued the guidance in 2012. The NRC staff simply notes that the agency’s history with similar activities is that things rarely go so smoothly. The non-concurrence does not mention, for example, more recent discussions with the industry regarding difficulties in responding to the requests for information and related implications related to budgets, schedules, and actual information that licensees might provide. In addition, the requests for information and assessments described in JLD-ISG-12-05 do not resolve issues without a subsequent regulatory action, at which time the staff would face many of the same limitations and obstacles that the authors cite as shortcomings in the regulatory requirements already imposed in response to lessons learned from the Fukushima accident. The NRC staff has held some public meetings with the nuclear industry on the coordination of activities as described in the COMSECY, and it appears there is sufficient consensus to begin working on revisions to appropriate guidance documents.

The referenced figure (Figure 1) and related descriptions from JLD-ISG-12-05 do not reflect the approach described in the regulatory basis for the MBDBE rulemaking or the COMSECY. The recommended approach includes imposing a regulatory requirement through the MBDBE rulemaking to ensure mitigating strategies for beyond-design-basis external events address the reevaluated flooding hazards identified from Recommendation 2.1. The inclusion of a requirement within the MBDBE rule for mitigation of the reevaluated flooding hazard necessarily leads to changes in the Phase 2 decisions on regulatory actions for improved flood protection or mitigation. Changes to the decision-making process (based on the “results” box in the figure) in turn leads to changes in the information collection and assessments needed to support such decisions. In the context of the figure, the approach in JLD-ISG-12-05 currently calls for the flooding reevaluations to support an integrated assessment (total plant) which considers possible actions to improve flood protection and/or mitigation. The results from this integrated assessment are input to Phase 2 decision-making, including the need to address requirements for evaluating plant-specific backfits. However, the NRC staff is including a recommendation in the COMSECY for the Commission to affirm that regulatory requirements for mitigating strategies need to address the flooding scenarios from the reevaluations. The result of this recommended approach is more certain and timely implementation of safety enhancements to address reevaluated flooding hazards.

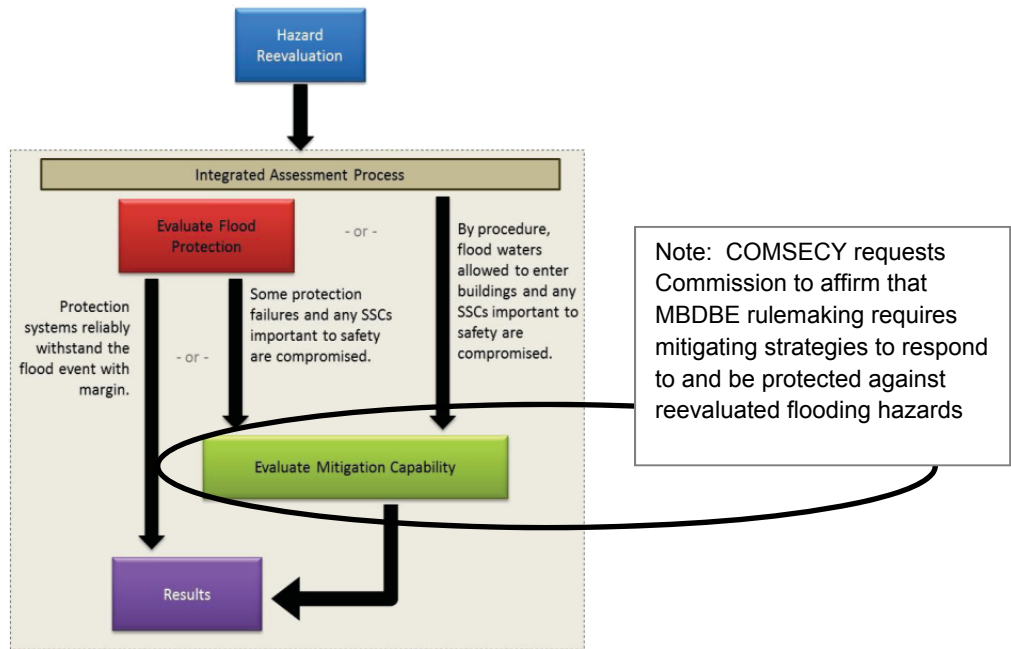


Figure 1

Action/Conclusion

Beyond the actions described in response to other concerns (e.g., revising the discussion of Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking), no changes were made to the COMSECY to address this specific concern.

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9. *The draft COMSECY does not appropriately address the importance of understanding the capability of flood protection, cliff-edge effects, and whether there is a premature reliance on mitigating strategies for smaller and more frequent flooding events.*

Summary/Discussion

The authors of the non-concurrence provide a figure (Figure 2) to help describe the concept of cliff-edge effects and the possible implications of a range of flooding scenarios from various mechanisms (e.g., precipitation, dam failures). However, to reflect the approach described in the COMSECY, the figure would need to be revised to reflect that the requirements for mitigating strategies to include capabilities to address the reevaluated flooding hazards (Figure 3).

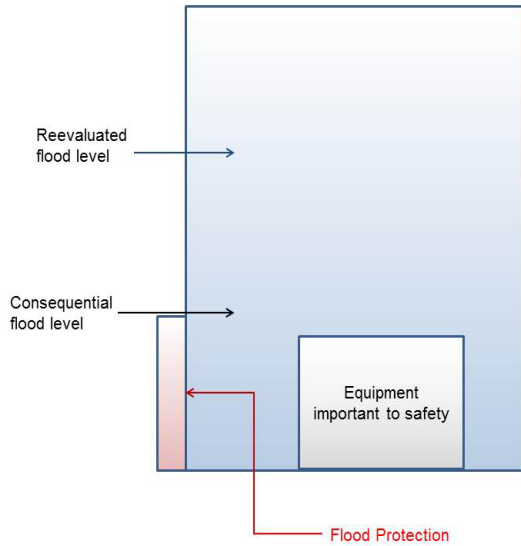


Figure 2
(re-created from NCP-2014-10)

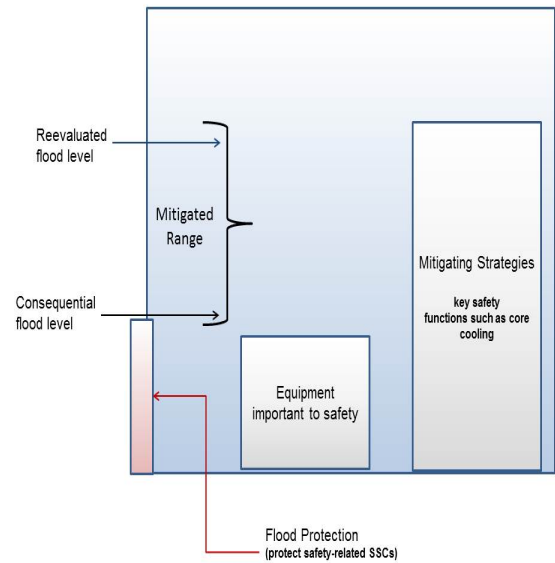


Figure 3

The NRC staff acknowledges that a variety of flooding scenarios exist and result in a range of possible conditions. These include floods protected against by existing flood protection measures to those up to the maximum reevaluated flood level. As previously discussed, the approach described in JLD-ISG-12-05 involves assessing the range of events but would require a separate regulatory action be taken to provide actual safety improvements. The approach recommended in the COMSECY involves including a regulatory requirement in the MBDBE rulemaking ensuring at a minimum that mitigating strategies address the various scenarios from reevaluating flooding hazards. The assessments of mitigating strategies equipment and actions would ensure protection against various flooding mechanisms and conditions identified from the flooding reevaluations. Mitigating strategies would therefore need to address scenarios that could range from slightly above the design-basis flood to significantly above the design-basis flood and depending on the site, scenarios involving different warning times, debris loads, and event durations. The range of conditions from the existing flood protection up to the reevaluated flood level is addressed by the mitigating strategies (mitigated range in Figure 3). Plant-specific questions, if pursued, would be whether the range of events covered by mitigating strategies – using the acceptance criteria of providing key safety functions (e.g., preventing core damage) is reasonable or if a case could be made for increasing the flooding protection for all safety-related SSCs or some subset of equipment that is important to safety (e.g., normal electrical supplies). The evaluation of additional measures in accordance with established rules and procedures would consider factors such as:

- frequency of events within the mitigated range,
- likelihood of such events progressing to core damage, and
- success of possible protective actions (e.g., evacuations)

The same factors and process would be used to evaluate the results from the integrated assessments described in JLD-ISG-12-05 to determine if the NRC should consider additional flood protection or mitigation measures. In the approach where the MBDBE rule includes a requirement for mitigating strategies to address the reevaluated flooding hazards, the

recommendations in the COMSECY and those included in the non-concurrence would very likely result in the same regulatory outcome. Both approaches ultimately need to conform to the NRC's backfit regulation which ties information gathering and consideration of plant modifications to the likelihood that such actions will provide a substantial increase in overall protection, and the direct and indirect costs of implementation being justified. The distinction largely comes down to whether (1) NRC staff judgment using available information (e.g., from flooding reevaluations, mitigating strategies reviews and inspections, operating experience) is used to initiate further assessments, or (2) the process itself directs licensees to perform the integrated assessments as described in JLD-ISG-12-05 (recognizing the guidance includes the use of graded approaches and possible alternatives that would be based largely on expert judgment). In the approach where the MBDBE rule does not include a requirement for mitigating strategies to address the reevaluated flooding hazards, there is a real possibility (and perhaps a high likelihood) that the approach advocated in the non-concurrence would result in no regulatory requirements to address flood levels within the mitigated range shown in Figure 3. This possibility was a large factor in the NRC staff preparing the COMSECY and requesting Commission affirmation of the recommended positions described in the paper so that we are assured of meaningful results that will enhance safety for beyond-design-basis flooding events.

Actions/Conclusion

Beyond the actions described in response to other concerns (e.g., revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking), no changes were made to the COMSECY to address this specific concern.

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10. *The COMSECY provides a vague description of strategies that licensees may employ under floods that "might result in significant damage to the nuclear power plant." The description provided in the COMSECY is not sufficiently explicit to inform the Commission and external stakeholders regarding the types of strategies that may be employed.*

Summary/Discussion

The NRC staff has had some discussions with the nuclear industry on efforts to expedite resolution of Recommendation 2.1 flooding activities and integrate flooding-related Phase 2 decisions and assessments into mitigating strategies. The industry described a possible approach that would ensure that the mitigating strategies implemented to satisfy Order EA-12-049 or new alternate strategies (termed targeted hazard mitigating strategy in a recent industry presentation) would be established to address the reevaluated flood hazards. From the industry's standpoint, the focus on mitigating strategies may be a cost-effective approach that optimizes ongoing post-Fukushima safety upgrades to the U.S. power reactor fleet. The planned approach reduces the level of information to be submitted by licensees, and the integrated assessments will focus on mitigating strategies instead of more varied enhancements that could be developed to protect against a range of flooding conditions. However, the NRC staff finds that the integration of the activities can provide the desired outcome in terms of meaningful and assured safety improvements. The recommended approach also provides benefits in terms of establishing regulatory clarity and stability, reducing demands on schedules and resources, and ensuring more timely responses to the lessons learned from the Fukushima accident.

The targeted strategy would be, by its nature, plant and scenario specific. Licensees would identify such targeted hazard mitigating strategies within the programs developed and implemented to satisfy regulatory requirements defined in the proposed MBDBE rulemaking. These would be subject to NRC reviews and inspections to provide the desired level of confidence that the targeted hazard mitigating strategies include the needed capabilities for cooling of fuel assemblies in reactor cores or spent fuel pools. The NRC staff is amenable to the concept of targeted hazard mitigating strategies given it is consistent with existing NRC regulations, staff-level guidance for mitigating strategies, and the expected level of protection to be required by the MBDBE rulemaking. The COMSECY mentions some of the possible actions identified in the non-concurrence (e.g., allowing flood waters to enter plant structures). The staff requested the Commission affirm this position because it is important for some licensees developing and implementing their mitigating strategies. The NRC staff revised the language slightly to address other stakeholder comments – and now highlight that the actions under these targeted strategies may include “unconventional measures.”

Actions/Conclusion

Beyond the actions described in response to other concerns (e.g., revising the Recommendation 2.1 flooding assessments and integrating the Phase 2 decision-making into the development and implementation of mitigating strategies in accordance with Order EA-12-0049 and the related MBDBE rulemaking), no changes were made to the COMSECY to address this specific concern. The plant- and scenario-specific targeted hazard mitigating strategies (including any unconventional measures) will be described in documents submitted by licensees in accordance with the reporting requirements in Order EA-12-049 and the pending MBDBE rulemaking.

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11. *As described in Sections 2.1 and 2.2, the proposed path forward for Recommendation 2.1 described in the COMSECY is no longer meeting the intent of Recommendation 2.1 and is not consistent with previous Commission and Congressional direction. Moreover, the proposed path forward (1) does not comport with the NRC’s response to a recent report from the United States Government Accountability Office and (2) is not responsive to one of the key observations from a recent National Academies of Sciences report.*

Summary/Discussion

The NRC staff does not consider the requested Commission action or the resultant changes to staff-level guidance to contradict previous directions from the Commission or the language of Section 402 of the Consolidated Appropriations Act, 2012, (Public Law 112-074, dated December 23, 2011). The integration of the flooding reevaluations and mitigating strategies, if affirmed by the Commission, will result in changes to staff-level plans and guidance for various activities. The net result of the changes will, however, increase the efficiency and effectiveness of the NRC actions being taken to address the lessons learned from the Fukushima accident. In response to the non-concurrence, the NRC staff is requesting that the Commission approve the recommended integration of the subject activities similar to how the Commission has addressed previous requests by the staff to consolidate Fukushima-related items.

The NRC routinely provides information on the status of its activities to the GAO, Congress, and other organizations. The information related to flooding reevaluations in the referenced GAO report does not include detailed discussions of how we are conducting our related activities and program changes to address the recommendations in the COMSECY do not conflict with the overall message or NRC response. In any case, such reports are not intended to prevent the NRC from subsequently making appropriate changes to its regulatory programs.

In regard to the National Academy of Sciences (NAS) report, the NRC staff is currently preparing a response to the findings and recommendations in the report. However, Finding 3.1 in that report states:

FINDING 3.1: The overarching lesson learned from the Fukushima Daiichi accident is that nuclear plant licensees and their regulators must actively seek out and act on new information about hazards that have the potential to affect the safety of nuclear plants. Specifically,

1. Licensees and their regulators must continually seek out new scientific information about nuclear plant hazards and methodologies for estimating their magnitudes, frequencies, and potential impacts.
2. Nuclear plant risk assessments must incorporate these new information and methodologies as they become available.
3. Plant operators and regulators must take *timely* actions to implement countermeasures when such new information results in substantial changes to risk profiles at nuclear plants.

A problem cited by the NAS was the inclination of both licensees and regulator to “call for more studies.” So while the authors of the non-concurrence are correct to promote the seeking out of new information and insights, the benefits of such efforts are diminished when the information collection efforts delay timely regulatory actions. As noted in the NAS report, the accident at Fukushima might have been prevented if certain countermeasures had been pursued, including “Installing additional backup equipment at higher elevations on the plant site” (e.g., mitigating strategies). The NRC staff considered a variety of factors when developing the recommendations in the COMSECY in an effort to appropriately balance the desired safety improvements from regulatory actions and the related costs and schedules of the NRC efforts to address lessons learned from Fukushima, The recommendations in the COMSECY reflect the NRC staff’s conclusion that the best overall results involve an appropriate compromise between information gathering and analysis and actual, timely regulatory actions to achieve safety improvements. The NRC staff request in the COMSECY that the Commission affirm that mitigating strategies should address reevaluated flooding hazards. This approach provides the most timely action to address the new hazard estimates.

Actions

The COMSECY has been revised to include a short discussion of the NRC staff’s consideration of safety results, costs, schedules, and uncertainties in developing the recommendations. No changes were made to address this concern specifically by adding discussions of the GAO or NAS reports.

Conclusion

Beyond including a short discussion of balancing factors to develop the recommendations, no changes or delays in providing the paper to the Commission are needed

12. *Approximately parallel implementation processes are being used for seismic and flooding hazards under Recommendation 2.1. There are, of course, necessary adaptations to the processes to account to differences in the state of practice between the two hazards. The COMSECY proposes significant changes to the implementation process for flooding. It does not describe whether similar changes will be implemented for other external hazards. It remains unclear why, in light of recent operating experience, flooding hazards would be treated differently (and potentially less rigorously) than other external hazards.*

Summary/Discussion

The NRC staff recognizes that there are both similarities and differences between the ongoing evaluations of seismic and flooding hazards. The COMSECY acknowledges the need to also assess the implications that implementing the approach described in the memorandum for flooding reevaluations has on other hazard reevaluations and related NRC activities. For example, the regulatory basis for the MBDBE rulemaking mentions the “expedited approach” being developed and implemented to address increased seismic hazards and its potential relevance to the rule. The NRC had incorporated risk insights and performance-based approaches into regulations and guidance for addressing seismic hazards before the Fukushima accident. The availability of such risk-informed approaches for addressing seismic hazards is a notable difference between seismic- and flooding-related activities. The staff has recently developed a Probabilistic Flood Hazard Assessment Research Plan (PFHARP), which is being developed to help resolve some of the issues mentioned in the COMSECY and in responses to concerns in this non-concurrence. The initial schedule for the PFHARP extends into 2019. If the Commission affirms the approach recommended in the COMSECY, the staff will immediately begin discussions internally and with external stakeholders on the applicability to and implications for seismic and other hazards. The NRC staff has already discussed the issue during meetings with the industry’s Fukushima Steering Committee and the Advisory Committee for Reactor Safeguards. Information on future discussions will be provided to the Commission in routine status reports and briefings. If policy issues are identified, the staff will raise them to the Commission for consideration and resolution.

Actions/Conclusion

The COMSECY acknowledges that the NRC staff will have follow-up actions if the Commission provides the recommended affirmations related to the plans for mitigating strategies to address reevaluated flooding hazards. An assessment of the implications for seismic and other hazards is among the activities identified in the COMSECY. No changes or delays in providing the paper to the Commission are needed.

Proposed Approaches

The approach proposed by the authors of this non-concurrence recognizes that licensees may propose a variety of approaches to respond to the reevaluated flooding hazards. The list below describes the three high-level approaches licensees may choose as well as the proposed mechanisms for evaluation such the above three objectives are met:

1. *Use of flood protection: Licensees may propose to implement new flood protection (e.g., temporary flood protection measures such as portable berms or flood gates) to protect safety-related equipment under the reevaluated flooding hazard or may be able to justify the continued capability of existing protection under the reevaluated hazard (e.g., existing flood protection may be demonstrated to be capable of withstanding the larger hydrostatic and hydrodynamic loads associated with the reevaluated hazard). In such cases, the existing or proposed flood protection would be evaluated under the integrated assessment. The integrated assessment would not assess mitigation capability, if the flood protection is shown to be reliable with margin under the reevaluated hazard. However, in accordance with the proposed path forward on the pending mitigation of beyond design basis events (MBDBE) rulemaking, any necessary changes to mitigating strategies would be separately evaluated using NEI 12-06 (Ref. [23]), which (as described previously) provides a generally non-mechanistic assessment of strategies that is intended to ensure mitigating strategies provide additional defense in depth. This would ensure plants are appropriately protected for the reevaluated hazard (as demonstrated via the integrated assessment) and that mitigating strategies continue to provide additional defense in depth under the reevaluated flooding hazard (as demonstrated using the guidance in NEI 12-06).*
2. *Use of mitigation: A licensee may propose to rely on mitigation as the primary means to address the reevaluated hazard rather than use of protection. To avoid the potential for assessments of mitigating strategies using two different guidance documents (i.e., in accordance with NEI 12-06, as well as under the integrated assessment using JLD-ISG-2012-05), it is proposed that NRC prescribe the use of the flood-specific integrated assessment methodology rather than the more general NEI 12-06 guidance. This ensures that the strategies are assessed using a mechanistic and scenario-specific evaluation that is commensurate with the use of mitigating strategies as the primary means by which a licensee will respond to the specific plant conditions defined by the reevaluated flooding hazard (Section 2.8.2 provides additional information regarding differences between the guidance documents). Additionally, this would ensure sufficient information and insights (e.g., identification of whether mitigation is relied upon for less severe, more frequent events than those defined by the deterministic reevaluated hazard) are gathered to support a regulatory decision related to backfit in light of the reevaluated hazard, if necessary. In this case, assessment of mitigating strategies for flood events using NEI-12-06 would not be necessary in light of the integrated assessment that was performed under Recommendation 2.1.*
3. *Use of a combination of protection and mitigation: Licensees may propose to use protection for smaller, more frequent flooding events and transition to a mitigation-based approach for larger events. In this case, the integrated assessment guidance describes the appropriate, flood-specific evaluation process to address this “combination approach.”*

Summary/Discussion

Previous discussions related to both the general and specific concerns expressed by the authors of the non-concurrence (in particular Concern 7) apply to the above-proposed approaches. The evaluation and development of the COMSECY needed to consider other

factors – not mentioned in the non-concurrence – to determine the best overall approach in terms of the safety improvements, costs, schedules, and project risks. Importantly, the approaches described above do not reflect the general intent of the recommendations in the COMSECY for improving the coordination of activities between mitigating strategies and flooding reevaluations. The NRC staff has requested Commission affirmation of requiring mitigating strategies to address reevaluated flooding hazards. This results in a more effective and efficient approach to ensure that plants have capabilities to address potential flooding events above the current design-basis floods. However, another intended outcome of the approach was improved coordination and integration of activities related to lessons learned from the Fukushima accident. Assuming the Commission affirms the approaches recommended in the COMSECY, the staff will use the resultant need to revise plans and guidance documents for mitigating strategies and flooding reevaluations as an opportunity to improve the coordination and integration of these activities.

Actions/Conclusions

No changes or delays in providing the paper to the Commission are needed beyond those previously discussed under the general and specific concerns raised in the non-concurrence.

Enclosure 4

COMSECY: Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards

Non-Concurrence NCP-2014-011

NON-CONCURRENCE PROCESS COVER PAGE

The U.S. Nuclear Regulatory Commission (NRC) strives to establish and maintain an environment that encourages all employees to promptly raise concerns and differing views without fear of reprisal and to promote methods for raising concerns that will enhance a strong safety culture and support the agency's mission.

Employees are expected to discuss their views and concerns with their immediate supervisors on a regular, ongoing basis. If informal discussions do not resolve concerns, employees have various mechanisms for expressing and having their concerns and differing views heard and considered by management.

Management Directive, MD 10.158, "NRC Non-Concurrence Process," describes the Non-Concurrence Process (NCP), <http://nrcweb.nrc.gov:8600/policy/directives/catalog/md10.158.pdf>.

The NCP allows employees to document their differing views and concerns early in the decision-making process, have them responded to (if requested), and attach them to proposed documents moving through the management approval chain to support the decision-making process.

NRC Form 757, "Non-Concurrence Process" is used to document the process.

Section A of the form includes the personal opinions, views, and concerns of a non-concurring NRC employee.

Section B of the form includes the personal opinions and views of the non-concurring employee's immediate supervisor.

Section C of the form includes the agency's evaluation of the concerns and the agency's final position and outcome.

NOTE: Content in Sections A and B reflects personal opinions and views and does not represent official factual representation of the issues, nor official rationale for the agency decision. Section C includes the agency's official position on the facts, issues, and rationale for the final decision.

At the end of the process, the non-concurring employee(s):

- Concurred
 - Continued to non-concur
 - Agreed with some of the changes to the subject document, but continued to non-concur
 - Requested that the process be discontinued
-
- The non-concurring employee(s) requested that the record be non-public.
 - The non-concurring employee(s) requested that the record be public.



NON-CONCURRENCE PROCESS

2014-011

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT Integration of Mitigating Strategies for Beyond-Design-Basis External Events and Reevaluation of Flooding	ADAMS ACCESSION NO. ML 14238A616
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DOCUMENT SIGNER Mark A Satorius	SIGNER TELEPHONE NO. 415-1700
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TITLE Executive Director for Operations	ORGANIZATION OEDO
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NAME OF NON-CONCURRING EMPLOYEE(S) Scott Flanders, Gary M Holahan, Glenn M Tracy	TELEPHONE NUMBER 415-1897
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TITLE Director DSEA/NRO; Deputy Director NRO and Director NRO	ORGANIZATION NRO
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DOCUMENT AUTHOR
 DOCUMENT CONTRIBUTOR
 DOCUMENT REVIEWER
 ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR
Michael R Johnson

TITLE Deputy Executive Director for Reactor and Preparedness Prgms	ORGANIZATION OEDO
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I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C.
 I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY.

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM:
 PUBLIC
 NON-PUBLIC

REASONS FOR NON-CONCURRENCE AND PROPOSED ALTERNATIVES (use continuation pages or attach Word document)

The Commission paper at issue proposes to revise the current approach to addressing the post-Fukushima Daichi accident flooding Recommendations 2.1 and 4.2. Although the proposed changes appear to be within the Commission's authority and would, no doubt, lead to reduced resource expenditures for both the staff and industry, the question remains whether such changes constitute good safety and regulatory policy decisions.

As stated in the staff's Near-Term Task Force (NTTF) report, the collection of recommendations was intended to strengthen the NRC's defense-in-depth philosophy by enhancing each level of defense-in-depth where potential weaknesses were identified, namely:

- Recommendation 2 acknowledges that our understanding of the consequences from design-basis flood events has improved and calls for enhanced protection from design-basis floods and seismic events, where warranted.
- Recommendation 4 calls for enhanced mitigation, for both design-basis and beyond design-basis events.
- Recommendation 8 calls for enhanced severe accident mitigation capability, and
- Recommendation 9 calls for enhanced emergency preparedness.

These recommendations constitute a rational set of enhancements, strengthening defense-in-depth, with each recommendation having a specific nexus to the Fukushima Daichi accident. The Commission supported these recommendations, in whole or in part, through various mechanisms: Orders, rule-makings, or information demands.

The fundamental changes being proposed in the COMSECY are: 1) to limit staff and industry efforts on flooding to a confirmation that mitigation strategies can cope with the reevaluated flooding hazard; and 2) to eliminate the systematic re-consideration of any other external flooding protection. There are several consequences associated with such an action:

- First, the post-Fukushima recommendations would no longer constitute a full set of potential enhancements consistent with the Commission's defense-in-depth safety philosophy;

SIGNATURE 	DATE 11/10/14
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- Second, a systematic evaluation of the total plant response to flooding, addressing both protection and mitigation would be curtailed. This would constitute a lost opportunity to identify potential plant vulnerabilities and to implement practical measures to protect key safety-related equipment from not only the reevaluated flood events, but also from less severe but more-likely flooding events that also exceed the current plant protections; and

- Third, a non-safety-related system or collection of systems, intended for beyond design-basis events (i.e. systems without quality controls or quality assurance requirements, without redundancy requirements, without Technical Specification controls, without an assessment of system reliability, and without Maintenance Rule controls), would be used to compensate for potential weaknesses in or even non-compliances with flooding design-basis protection requirements.

We support the paper's approach on one specific issue; namely, reaffirming the issue of flooding protection for mitigation equipment (i.e. using the 2.1 re-evaluated flooding levels in the 4.2 mitigation strategy), thereby adding to defense-in-depth, as intended by the Commission.

We cannot support the full "integration" of Recommendations 2.1 and 4.2 because of the adverse impact on the re-consideration of flooding protection, as intended under Recommendation 2.1. Protection of the normal, design-basis safety equipment used for decay heat removal (e.g. the first line of defense including: diesel generators, electrical distribution equipment, motor-driven auxiliary feedwater, service water and other support systems) is too important to not be given a thorough and systematic re-evaluation. Simply stated, we do not believe that mitigation is an appropriate substitute for protection. Both mitigation and protection are essential, but separate, elements of the Commission's defense-in-depth safety philosophy and should be treated as such.

NON-CONCURRENCE PROCESS

NCP-2014-011

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT

COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards

ADAMS ACCESSION NO.

ML14238A616

NAME

n/a

TITLE

n/a

TELEPHONE NUMBER

ORGANIZATION

n/a

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

Section B not requested/provided
for NCP-2014-011

SIGNATURE

n/a

DATE

n/a

NON-CONCURRENCE PROCESS

NCP-2014-011

SECTION C - TO BE COMPLETED BY NCP COORDINATOR

TITLE OF SUBJECT DOCUMENT COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards	ADAMS ACCESSION NO. ML14238A616
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NAME William D. Reckley

TITLE Special Advisor for Policy	TELEPHONE NUMBER (301) 415-7490
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ORGANIZATION Office of Nuclear Reactor Regulation/Japan Lessons Learned Division

AGREED UPON SUMMARY OF ISSUES (use continuation pages or attach Word document) See Attached
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EVALUATION OF NON-CONCURRENCE AND RATIONALE FOR DECISION (use continuation pages or attach Word document) See Attached

TYPED NAME OF NCP COORDINATOR William D. Reckley	TITLE Special Advisor for Policy
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ORGANIZATION NRR/JLD

SIGNATURE--NCP COORDINATOR 	DATE 11/14/14
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TYPED NAME OF NCP APPROVER William M. Dean	TITLE Director
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ORGANIZATION Office of Nuclear Reactor Regulation
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SIGNATURE--NCP APPROVER 	DATE 11/16/14
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NON-CONCURRENCE PROCESS

NCP-2014-011

TITLE OF SUBJECT DOCUMENT

COMSECY: Integration of Mitigating Strategies and the Reevaluation of Flooding Hazards

ADAMS ACCESSION NO.

ML14238A616

CONTINUATION OF SECTION

A

B

C

See attached

Non-Concurrence Process Documentation

NCP-2014-011; Section C (Document Sponsor)

Summary of Issues

The authors of the non-concurrence provided the following description of concerns and preferred alternatives to the plans outlined in the subject COMSECY:

The Commission paper at issue proposes to revise the current approach to addressing the post-Fukushima Daiichi accident flooding Recommendations 2.1 and 4.2. Although the proposed changes appear to be within the Commission's authority and would, no doubt, lead to reduced resource expenditures for both the staff and industry, the question remains whether such changes constitute good safety and regulatory policy decisions.

As stated in the staff's Near-Term Task Force (NTTF) report, the collection of recommendations was intended to strengthen the NRC's defense-in-depth philosophy by enhancing each level of defense-in-depth where potential weaknesses were identified, namely:

- *Recommendation 2 acknowledges that our understanding of the consequences from design-basis flood events has improved and calls for enhanced protection from design-basis floods and seismic events, where warranted.*
- *Recommendation 4 calls for enhanced mitigation, for both design-basis and beyond design-basis events.*
- *Recommendation 8 calls for enhanced severe accident mitigation capability, and*
- *Recommendation 9 calls for enhanced emergency preparedness.*

These recommendations constitute a rational set of enhancements, strengthening defense-in-depth, with each recommendation having a specific nexus to the Fukushima Daiichi accident. The Commission supported these recommendations, in whole or in part, through various mechanisms: Orders, rule-makings, or information demands.

The fundamental changes being proposed in the COMSECY are: 1) to limit staff and industry efforts on flooding to a confirmation that mitigation strategies can cope with the reevaluated flooding hazard; and 2) to eliminate the systematic re-consideration of any other external flooding protection. There are several consequences associated with such an action:

- *First, the post-Fukushima recommendations would no longer constitute a full set of potential enhancements consistent with the Commission's defense-in-depth safety philosophy;*
- *Second, a systematic evaluation of the total plant response to flooding, addressing both protection and mitigation would be curtailed. This would constitute a lost opportunity to identify potential plant vulnerabilities and to*

implement practical measures to protect key safety-related equipment from not only the reevaluated flood events, but also from less severe but more-likely flooding events that also exceed the current plant protections; and

- Third, a non-safety-related system or collection of systems, intended for beyond design-basis events (i.e. systems without quality controls or quality assurance requirements, without redundancy requirements, without Technical Specification controls, without an assessment of system reliability, and without Maintenance Rule controls), would be used to compensate for potential weaknesses in or even non-compliances with flooding design-basis protection requirements.

We support the paper's approach on one specific issue; namely, reaffirming the issue of flooding protection for mitigation equipment (i.e. using the 2.1 re-evaluated flooding levels in the 4.2 mitigation strategy), thereby adding to defense-in-depth, as intended by the Commission.

We cannot support the full "integration" of Recommendations 2.1 and 4.2 because of the adverse impact on the re-consideration of flooding protection, as intended under Recommendation 2.1. Protection of the normal, design-basis safety equipment used for decay heat removal (e.g. the first line of defense including: diesel generators, electrical distribution equipment, motor-driven auxiliary feedwater, service water and other support systems) is too important to not be given a thorough and systematic re-evaluation. Simply stated, we do not believe that mitigation is an appropriate substitute for protection. Both mitigation and protection are essential, but separate, elements of the Commission's defense-in-depth safety philosophy and should be treated as such.

Summary/Discussion

The COMSECY describes an approach involving two basic uses of information related to the reevaluated flooding hazards. The first is to ensure that mitigating strategies being developed and implemented in accordance with Order EA-12-049 and the followup mitigation of beyond design basis events (MBDBE) rulemaking can address the reevaluated hazard. This approach ensures that licensees are required to implement mitigating strategies to address the range of postulated flooding events from the flooding-related hazard reevaluations. The COMSECY requests that the Commission affirm this requirement is needed to provide reasonable assurance of adequate protection of public health and safety. A Commission decision to affirm the position recommended by the staff would increase confidence that this specific regulatory requirement would be imposed and implemented. The authors of the non-concurrence state they favor establishing the requirement for mitigating strategies as recommended in the COMSECY.

The COMSECY also discusses how the staff may consider the need for flooding protection or mitigation beyond that provided by mitigating strategies. NRC staff decisions to evaluate further actions would be based on insights from the flooding reevaluations, previous plant inspections, overall integrated plans for mitigating strategies, and other available information as part of an assessment of each plant's capabilities to address reevaluated flooding hazards. The non-concurrence, therefore, overstates the degree to which the COMSECY proposes to "eliminate the systematic reconsideration of any other external flooding protection." The COMSECY does, however, propose that the staff makes an informed decision on the amount of plant-level

analyses requested from licensees and subsequently reviewed by the NRC staff. Further information gathering, assessments and consideration of potential regulatory actions could be pursued unless proposed backfits are not likely to provide a substantial increase in overall protection, or the direct and indirect costs of implementation are not likely to be justified. The imposition of requirements for licensees to have mitigating strategies to address the reevaluated flooding hazard will reduce the likelihood of additional flood protection providing a substantial increase in overall protection. The COMSECY describes an appropriate approach considering various factors to determine if further assessment by the staff is warranted. The staff would undertake further assessments as part of the established processes to initiate and evaluate potential plant specific backfits. The statement in the non-concurrence implying that the NRC staff is not approaching these decisions in a serious or thorough manner is not an accurate description of the plan or the manner in which the staff routinely approaches its responsibilities to fulfill the mission of the agency.

The COMSECY describes the staff's plans to provide real and timely safety improvements by requiring that mitigating strategies include capabilities to address reevaluated flooding hazards. While giving support to that approach, the non-concurrence does not mention the inter-relationships between the ongoing activities and how current and anticipated additional delays in the flooding hazard reevaluations jeopardize the ability to make timely and meaningful safety improvements. The experience of the staff with information collection activities undertaken without well-defined regulatory decision-making criteria is that they often become long-term research projects, and the outcomes are highly uncertain in terms of achieving a change in NRC requirements. In the case of flooding reevaluations, the Probabilistic Flood Hazard Assessment Research Plan (PFHARP) describes the large uncertainties and difficulties expected in using the integrated assessments within established regulatory processes. These uncertainties in analytical approaches and subsequent NRC decision-making are evident in current delays in licensees responding and NRC staff reviewing the first stage of information being provided on flooding reevaluations. As noted in 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," the NRC staff's goal is to complete Phase 1 and collect sufficient information to make a regulatory decision for most plants within 5 years. This goal does not seem achievable without making the adjustments proposed in the COMSECY. The approach described in the COMSECY defines a clear use for the information on flooding reevaluations - a test for mitigating strategies - and therefore allows licensees and NRC staff to make more informed decisions regarding the balancing of analyzing flooding hazards and instituting timely safety enhancements. The NRC staff has discussed these inter-relationships with the industry during several public meetings. The Nuclear Energy Institute documented in a letter dated November 4, 2014, their view that integration of the activities would better support moving forward on resolving the lessons learned from the Fukushima accident. A thorough evaluation of possible approaches needs to consider the possible costs of substantial information gathering efforts; not only in terms of resources and schedule but also in potentially leading to a less effective regulatory response.

The non-concurrence uses a defense-in-depth rationale for proposing further information collection and presumably as a future justification for requiring plant-specific modifications. While the near-term task force report discussed such an approach, the Commission did not adopt these changes to NRC rules, policy or guidance documents. In fact, the Commission specifically directed in the staff requirements memorandum for SECY-13-0132, "U.S. Nuclear Regulatory Commission Staff Recommendation for the Disposition of Recommendation 1 of the Near-Term Task Force Report," that the staff explore clarifying expectations for defense in depth outside the scope of NRC's post-Fukushima actions. The staff will therefore continue to

consider plant-specific backfits using established guidance (e.g., MD 8.4, “Management of Facility-Specific Backfitting and Information Collection”) which assesses overall protection without being prescriptive in terms of how to address prevention, protection, and mitigation. It is worth noting that even existing guidance (JLD-ISG-12-05) and future plans (PFHARP) prepared for flooding reevaluations provide for crediting mitigation as an alternative to improving flood protection features and do not seem to go as far as the statements in the non-concurrence that imply the need to provide both protection and mitigation against the reevaluated flooding hazards. The proposal in the non-concurrence reflects a rational and understandable approach to defense in depth and is generally consistent with design standards published by the International Atomic Energy Agency (IAEA) and some other regulatory bodies for siting and designing new nuclear power plants. The approach is, however, inconsistent with the NRC’s policies and procedures for addressing safety concerns for operating nuclear power plants. As discussed in the COMSECY, the NRC has adopted risk-informed and performance-based approaches to addressing operating reactor issues over the past several decades. The NRC staff will reassess the approach described in the COMSECY if the Commission decides not to affirm the recommendations or if the Commission decides to use this opportunity to instruct the staff to deviate from established rules and related guidance regarding resolution of safety concerns for operating nuclear power plants.

The non-concurrence also does not accurately reflect the expected requirements for the mitigating strategies in terms of programmatic controls. The description of mitigating strategies as not being safety-related equipment could likewise apply to fire protection, station blackout, equipment for loss of large areas due to fire or explosions, and any number of other risk-significant regulatory actions taken by the NRC following the initial design and construction of operating nuclear power plants. The existing guidance for Order EA-12-049 as well as the expected requirements in the MBDBE rule and associated guidance address programmatic controls for quality assurance, testing, maintenance, procedures, and other measures to ensure mitigating strategies provide reliable protection against beyond-design-basis events. In addition, much of the physical equipment relied upon for mitigating strategies consists of existing structures, systems and components (SSCs) classified as safety-related. These SSCs, such as turbine-driven auxiliary feedwater pumps and direct current (dc) power systems, are governed by technical specifications, quality assurance requirements, and the maintenance rule in addition to the requirements imposed by the Order and pending rulemaking. The non-concurrence would seem to not only challenge the staff’s plans for mitigating strategies but also call into question the last several decades of NRC’s use of risk-informed and performance-based approaches to address safety issues for operating plants. The implied confidence in traditional approaches for flood protection articulated in the non-concurrence would also seem to contradict the statements in the PFHARP regarding the need for research into the feasibility and reliability of flood protection features. As a general matter, it would seem advisable to await the results of the research project before drawing conclusions on particular remedies or decision-making criteria for possible regulatory requirements beyond the approach described in the COMSECY. The COMSECY explains the staff’s plans to define a requirement for licensees to address the reevaluated flooding hazards using mitigating strategies and also deciding in a systematic approach for each plant whether additional information should be sought to support evaluating potential plant-specific backfits.

Action/Conclusion

The COMSECY was changed to address comments and reflect interactions with the authors of the non-concurrence prior to the filing of NCP-2014-011 (e.g., describing the proposed approach as “integration of Recommendation 2.1 assessments and decision-making into mitigating strategies” and clarifying the discussions on considering plant-specific backfits). Additional changes were made following the filing of NCP-2014-011 to further explain some of the concerns prompting the NRC staff to prepare the COMSECY. These changes include additional discussions on the possible adverse impact on achieving timely and meaningful safety improvements caused by delays in the resolution of flooding hazard reevaluations. No further changes or delays in providing the paper to the Commission are needed