DISCUSSION PAPER

NRC STAFF PRELIMINARY PROCESS FOR TREATMENT OF REEVALUATED SEISMIC AND FLOODING HAZARD INFORMATION IN BACKFIT DETERMINATIONS

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This paper has been prepared and is being released to support a public discussion on the NRC staff's preliminary process for treatment of reevaluated seismic and flooding hazard information in backfit determinations. The staff's intention is to solicit stakeholder feedback on this document. This does not reflect a final staff decision on the process for treatment of reevaluated seismic and flooding hazard information in backfit determinations. The staff will adjust the process as appropriate based on stakeholder feedback.

This document describes the U.S. Nuclear Regulatory Commission (NRC) staff's preliminary process to address treatment of reevaluated seismic and flood hazard information in backfit determinations, and the expected interactions and additional insights needed from licensees to complete these activities. The process reflects the Commission's direction in the Affirmation Notice and Staff Requirements Memorandum (SRM) dated January 24, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19023A038), associated with SECY-16-0142, "Draft Final Rule – Mitigation of Beyond-Design-Basis Events [MBDBE] (RIN 3150-AJ49)," (ADAMS Accession No. ML16291A186).

Summary

By letter dated March 12, 2012 (ADAMS Accession No. ML12053A340), the NRC issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, under Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807). Enclosure 1 and 2 of the 50.54(f) letter requested that licensees reevaluate seismic and flooding hazards, respectively, for their sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses.

The 50.54(f) letter describes a two-phase process for providing and assessing this information. Phase 1 of the process is defined in the 50.54(f) letter as licensees reevaluating the seismic and flooding hazards at their sites using updated seismic and flooding hazard information and present-day regulatory guidance and methodologies, and, if necessary, to request they perform a risk evaluation. Phase 2 of the process is outlined by the 50.54(f) letter and by a letter dated September 21, 2016 (ADAMS Accession No. ML16237A103); and is defined as the NRC staff determining whether additional regulatory actions are necessary (e.g., update the design basis and structures, systems, and components important to safety) to provide additional protection against the updated hazards. The NRC's Phase 2 process will be implemented in accordance

with NRC Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection" (ADAMS Accession No. ML18073A203).

The process outlined in this document uses information provided in response to the 50.54(f) letter and describes how the staff intends to use this information for its Phase 2 decision-making. Highlights of this process include:

- Based on the reevaluated seismic hazard information that has been provided to date, other than information associated with seismic probabilistic risk assessments (SPRA) reports, additional regulatory actions are not warranted.

- Based on the reevaluated flood hazard information that has been provided to date, the staff has identified the need to engage licensees for 21 sites to determine if licensees intend to treat actions that were described in their flooding mitigation strategies assessments (MSA) and flooding focused evaluations (FE) as regulatory commitments. The understanding of the treatment of these actions is important for the staff's Phase 2 determination.

- The staff will continue its assessment of SPRA reports, flooding FEs, and flooding integrated assessments (IAs) and will use the results of these assessments in the Phase 2 process described in the 50.54(f) letter and by the letter dated September 21, 2016.

- Based on the staff's assessment found in the Enclosure to this document, the staff's preliminary process would suspend its review of flooding and seismic MSAs. The majority of these MSAs have been evaluated by the staff. For the MSA reviews that have not yet been completed, or have not yet been submitted, the staff will evaluate mitigation strategies, as appropriate, as part of its review of SPRA reports, flooding FEs, and flooding IAs.

- Letter(s)[1] will be issued related to the seismic and flooding reevaluations that document the staff's 50.54(f) backfit decisions in accordance with Phase 2 of the process and by the letter dated September 21, 2016. The letter(s) will bin sites according to the following four categories: Category 1 – no additional insights are needed; Category 2 – additional insights are needed before a backfit decision is made; Category 3 – corresponds to sites that have reevaluated seismic or flooding information that is currently being reviewed by the staff; and Category 4 – corresponds to sites that have had, or requested that, reevaluated hazard information submittals be deferred.

Background

The seismic and flooding reevaluated hazards information provided in response to the 50.54(f) letter and reviewed by the staff includes the following licensee submittals: 1) flooding hazard

[1] The staff is considering an initial letter that would bin sites. If a site is identified as a Category 1 site for both the seismic and flooding reevaluated hazard, the initial letter would complete the Phase 2 process for this site and no further letters associated with the reevaluated hazards would be issued for such a site. For all other Categories, a separate letter documenting the staff's Phase 2 decision would be provided.

reevaluation report and seismic hazard screening report, 2) flooding and seismic MSAs; 3) flooding FEs and IAs; 4) the expedited seismic evaluation program (ESEP); 5) spent-fuel pool (SFP) seismic integrity evaluations; 6) seismic high frequency confirmations; and 7) SPRA reports.

The staff's detailed assessment of the information that has been provided in response to the 50.54(f) letter is found in the Enclosure of this document. A key guidance document that was used by the staff to evaluate flooding and seismic MSAs was Appendix G, and H, respectively, of Nuclear Energy Institute (NEI) 12-06, Revision 4, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (ADAMS Accession No. ML16354B421). The NRC's endorsement of NEI 12-06, Revision 4, is described in Japan Lessons-Learned Division (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-01, Revision 2, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML17005A182).[2]

Section 6 of JLD-ISG-2012-01, Revision 2, provides guidance regarding the treatment of reevaluated seismic and flood hazard information in mitigation strategies developed in response to Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). The draft final MBDBE rule (SECY-16-0142) contained provisions that would have required mitigation strategies to address the reevaluated seismic and flood hazard information on a generic basis. However, these provisions were removed from the approved final MBDBE rule as the Commission determined that the generic MSA requirements did not meet the requirements of § 50.109, "Backfitting," and § 52.98, "Finality of combined licenses; information requests." Therefore, Section 6 of JLD-ISG-2012-01, Revision 2, is not consistent with the direction provided by the Commission in the SRM dated January 24, 2019. The SRM directs the staff to use the 50.54(f) process to ensure that the agency and its licensees will take the needed actions, if any, to ensure that each plant is able to withstand the effects of the reevaluated flooding and seismic hazards.

Process

The Enclosure to this document provides a preliminary process that outlines the staff's use of information from the reevaluated flooding hazard information submittals in the Phase 2 50.54(f) process, as further described in the September 21, 2016, letter. The staff's backfit determination associated with the reevaluated flooding hazard information is dependent on the staff confirming the status of licensee's commitments found in flooding MSAs, and flooding FE/IAs. The staff considers the confirmation of commitments necessary because in some cases licensees did not identify plant changes described in these documents as commitments because the licensee believed that some changes would be codified as requirements as part of the MBDBE rule. As described in Section 4.0 of the Enclosure to this document, the staff has reviewed the reevaluated seismic hazard information that has been provided to date and has preliminarily determined that based on inherent structural capacity that have been demonstrated, only SPRA report reviews could lead to the staff identifying a need for modifying,

[2] Appendices G and H were first introduced in Revision 2 of NEI 12-06, endorsed by revision 1 of the ISG.

suspending or revoking a license in accordance with Phase 2 50.54(f) process.

Conclusion

Based on the staff's assessment provided in the Enclosure, the staff's preliminary process would be to issue letter(s) related to the seismic and flooding reevaluations that document the staff's 50.54(f) backfit decisions in accordance with Phase 2 of the process outlined in the 50.54(f) and September 21, 2016, letters. The letter(s) will bin sites according to the following four categories: Category 1 – no additional information is needed; Category 2 – additional insights are needed before a backfit decision is made; Category 3 – corresponds to sites that have reevaluated seismic or flooding information that is being reviewed by the staff; and Category 4 – corresponds to sites that have had, or requested that, reevaluated hazard information submittals be deferred.

Enclosure:
Process for Treatment of Reevaluated Seismic
and Flooding Hazard Information in Backfit Determinations

Process for Treatment of Reevaluated Seismic and Flooding Hazard Information in Backfit Determinations

Contents

Enclosure

1.0 Introduction and Summary

This document describes the U.S. Nuclear Regulatory Commission (NRC) staff's preliminary process to address treatment of reevaluated seismic and flood hazard information in backfit determinations, and the expected interactions and additional insights needed from licensees to complete these activities. The process reflects the Commission's direction in the Affirmation Notice and Staff Requirements Memorandum (SRM) dated January 24, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19023A038), associated with SECY-16-0142, "Draft Final Rule – Mitigation of Beyond-Design-Basis Events [MBDBE] (RIN 3150-AJ49)," (ADAMS Accession No. ML16291A186).

By letter dated March 12, 2012 (ADAMS Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, under Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807). Enclosure 1 and 2 of the 50.54(f) letter requested that licensees reevaluate seismic and flood hazards, respectively, for their sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses.

The 50.54(f) letter describes a two-phase process for providing and assessing this information. Phase 1 of the process is defined in the 50.54(f) letter as licensees reevaluating the seismic and flooding hazards at their sites using updated seismic and flooding hazard information and present-day regulatory guidance and methodologies, and, if necessary, to request they perform a risk evaluation. Phase 2 of the process is outlined by the 50.54(f) letter and by letter dated September 21, 2016 (ADAMS Accession No. ML16237A103); and is defined as the NRC staff determining whether additional regulatory actions are necessary (e.g., update the design basis and structures, systems, and components important to safety) to provide additional protection against the updated hazards. The NRC's Phase 2 process will be implemented in accordance with NRC Management Directive (MD) 8.4, "Management of Facility-Specific Backfitting and Information Collection" (ADAMS Accession No. ML18073A203).

The process outlined in this document uses information provided in response to the 50.54(f) letter and describes how the staff intends to use this information for its Phase 2 decision-making. Highlights of this process include:

- Based on the reevaluated seismic hazard information that has been provided to date, other than information associated with seismic probabilistic risk assessments (SPRA) reports, additional regulatory actions are not warranted.

- Based on the reevaluated flood hazard information that has been provided to date, the staff has identified the need to engage licensees for 21 sites to determine if licensees intend to treat actions that were described in their flooding mitigation strategies assessments (MSA) and flooding focused evaluations (FE) as regulatory commitments. The understanding of the treatment of these actions is important for the staff's Phase 2 determination.

- The staff will continue its assessment of SPRA reports, flooding FEs, and flooding integrated assessments (IAs) and will use the results of these assessments in the Phase 2 process described in the 50.54(f) letter and by the letter dated September 21, 2016.

- Based on the staff's assessment found in this Enclosure, the staff's preliminary process would be to suspend its review of flooding and seismic MSAs. The majority of these MSAs have been evaluated by the staff. For the MSA reviews that have not yet been completed, or have not yet been submitted, the staff will evaluate mitigation strategies, as appropriate, as part of its review of SPRA reports, flooding FEs, and flooding IAs.

- Letter(s)[1] will be issued related to the seismic and flooding reevaluations that document the staff's 50.54(f) backfit decisions in accordance with Phase 2 of the process and by the letter dated September 21, 2016. The letter(s) will bin sites according to the following four categories: Category 1 – no additional insights are needed; Category 2 – additional insights are needed before a backfit decision is made; Category 3 – corresponds to sites that have reevaluated seismic or flooding information that is currently being reviewed by the staff; and Category 4 – corresponds to sites that have had, or requested that, reevaluated hazard information submittals be deferred.

2.0 Background

The seismic and flooding reevaluated hazards information provided in response to the 50.54(f) letter and reviewed by the staff includes the following licensee submittals: 1) flooding hazard reevaluation report and seismic hazard screening report, 2) flooding and seismic MSAs; 3) flooding FEs and IAs; 4) the expedited seismic evaluation program (ESEP); 5) spent-fuel pool (SFP) seismic integrity evaluations; 6) seismic high frequency (HF) confirmations; and 7) SPRA reports.

The staff's detailed assessment of the reevaluated seismic and flood hazard information that has been provided in response to the 50.54(f) letter is found in Sections 4 and 5 of this Enclosure, respectively. A key guidance document that was used by the staff to evaluate flooding and seismic MSAs was Appendix G, and H, respectively, of Nuclear Energy Institute (NEI) 12-06, Revision 4, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide"

[1] The staff is considering an initial letter that would bin sites. If a site is identified as a Category 1 site for both the seismic and flooding reevaluated hazard, the initial letter would complete the Phase 2 process for this site and no further letters associated with the reevaluated hazards would be issued for such a site. For all other Categories, a separate letter documenting the staff's Phase 2 decision would be provided.

(ADAMS Accession No. ML16354B421). The NRC's endorsement of NEI 12-06, Revision 4, is described in Japan Lessons-Learned Division (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-01, Revision 2, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML17005A182).[2]

Section 6 of JLD-ISG-2012-01, Revision 2, provides guidance regarding the treatment of reevaluated seismic and flood hazard information in mitigation strategies developed in response to Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). The draft final MBDBE rule (SECY-16-0142) contained provisions that would have required mitigation strategies to address the reevaluated seismic and flood hazard information on a generic basis. However, these provisions were removed from the approved final MBDBE rule as the Commission determined that the generic MSA requirements did not meet the requirements of § 50.109, "Backfitting," and § 52.98, "Finality of combined licenses; information requests." Therefore, Section 6 of JLD-ISG-2012-01, Revision 2, is not consistent with the direction provided by the Commission in the SRM dated January 24, 2019. The SRM directs the staff to use the 50.54(f) process to ensure that the agency and its licensees will take the needed actions, if any, to ensure that each plant is able to withstand the effects of the reevaluated flooding and seismic hazards.

3.0 Process

Figure 3.0-1 provides a flow chart for a preliminary process that outlines the staff's use of information from the flooding reevaluated hazard information submittals in the Phase 2 50.54(f) process, as further described in the September 21, 2016, letter. As described in Section 4.0 of this Enclosure, the staff has reviewed the reevaluated seismic hazard information that has been provided to date and has preliminarily determined that based on the inherent structural capacity that have been demonstrated, only SPRA report reviews could lead to the staff identifying a need for modifying, suspending or revoking a license in accordance with the Phase 2 50.54(f) process.

The process for reviewing the reevaluated flood hazard information begins with the staff confirming the status of licensee's commitments found in the flooding MSA and flooding FE/IA. The staff considers the confirmation of commitments necessary because:

- In the SRM to COMSECY-14-0037 (ADAMS Accession No. ML15089A236), the Commission directed the staff to develop a process (subsequently outlined in COMSECY-15-0019 (ADAMS Accession No. ML15153A104)) that fundamentally assumed that licensees are expected to protect mitigation strategies equipment from the reevaluated hazards developed in response to the 50.54(f) letter. The draft final MBDBE rule (SECY-16-0142) contained provisions that would have required mitigation strategies to address the reevaluated seismic and flood hazard information on a generic basis. However, these provisions were removed from the approved final MBDBE rule as the Commission determined that the generic MSA requirements did not meet the

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requirements of § 50.109, “Backfitting,” and § 52.98, “Finality of combined licenses; information requests.”

- Licensees may not have identified plant changes in the submittals as Regulatory Commitments (per NEI 99-04) given the anticipated regulatory treatment called out in the draft final MBDBE rule.

- In COMSECY-15-0019, “Closure Plan for the Reevaluation of Flooding Hazards for Operating Nuclear Power Plants” (ADAMS Accession No. ML15153A104) the staff noted that where additional measures are necessary to reasonably demonstrate that a site can protect against the reevaluated flooding mechanism, a licensee may make regulatory commitments to implement procedural or hardware changes that will allow the site to screen out of a flooding IA.

The flow chart provides various options for the staff’s backfit determination based on the status of flooding licensee’s commitments. In accordance with the Commission direction provided in the SRM for SECY-99-063, “The Use by Industry of Voluntary Initiatives in the Regulatory Process,” dated May 27, 1999 (ADAMS Accession No. ML003752062), the staff will not rely on commitments in lieu of regulatory actions where a question of adequate protection of public health and safety exists. The staff subsequently provided to the Commission SECY-13-0132, "U.S. Nuclear Regulatory Commission Staff Recommendation for the Disposition of Recommendation 1 of the Near Term Task Force Report." In SECY-13-0132, the staff proposed re-affirmation of the Commission's expectation that such initiatives may not be used in lieu of NRC regulatory action on adequate protection issues, but did not otherwise propose a restriction on the use of voluntary initiatives. In SRM-SECY-13-0132, the Commission did not object to the staff's proposal, thereby upholding the policy in SRM-SECY-99-063. The staff’s treatment of regulatory commitments is discussed in the September 21, 2016, Phase 2 decisionmaking process letter that notes that the staff may consider requiring the escalation of the regulatory treatment of an issue from one tier of the licensing basis (e.g., regulatory commitment) to another tier (e.g., regulatory requirement).

As described in Figure 3.0-1 the staff recognizes that a licensee may choose one of 4 options relative to flooding MSA and FE/IA commitments:

Option 1 - Continue to implement both mitigation strategies and protection of key safety functions (following the 50.54(f) process) against the reevaluated flooding hazard(s) in accordance with commitments noted in their flooding MSA, and FE/IA,

Option 2 - Choose to protect key safety functions against the reevaluated flooding hazard in accordance with commitments noted in their flooding FE/IA,

Option 3 - Choose to implement a flooding mitigation strategy for a reevaluated flooding hazard in accordance with commitments noted in their flooding MSA,

Option 4 – Choose not to implement regulatory commitments to address the reevaluated flooding hazard

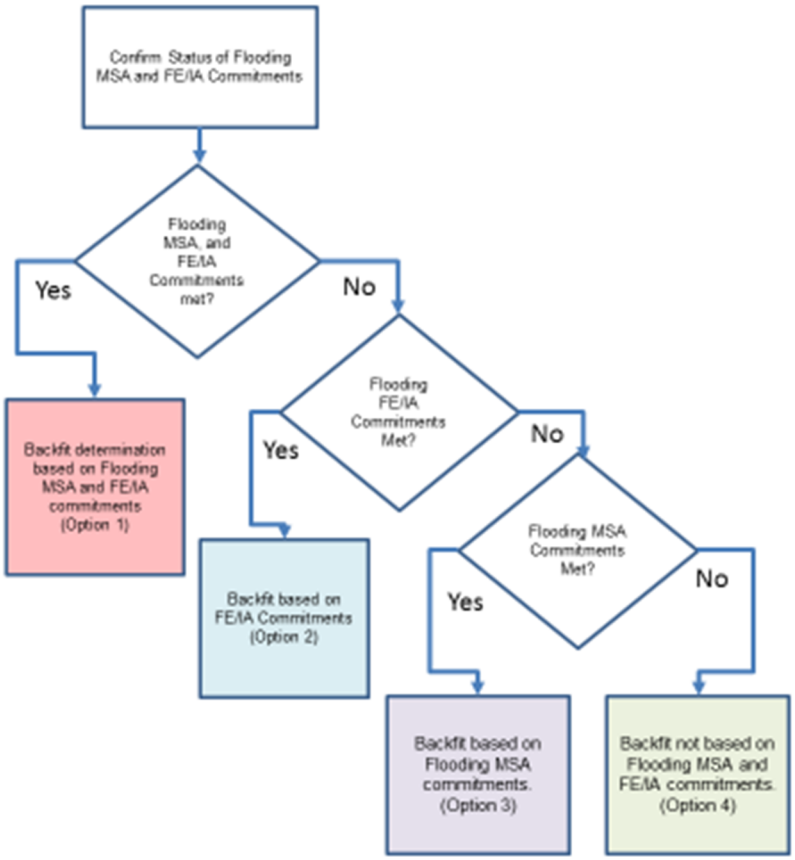

Figure 3.0-1 Treatment of Flooding MSAs and FE/IAs

The staff plans to issue a letter related to the seismic and flooding reevaluations that documents the staff's 50.54(f) backfit decisions, in accordance with Phase 2 of the process associated with the 50.54(f) letter. This is the approach outlined in a September 1, 2015, letter (ADAMS Accession No. ML15174A257) associated with the reevaluated flood hazard, and a letter dated September 21, 2016 (ADAMS Accession No. ML16237A103), associated with regulatory decisionmaking for reevaluated flooding and seismic hazards. The new letter would bin sites using existing information.

The binning would be based on existing and proposed plant capabilities, as reflected in the licensee submittals and staff assessments associated with the reevaluated seismic and flood hazards. As appropriate, the staff would credit changes licensees have planned or implemented at the site if a clear regulatory path, such as commitments, are adequately documented and managed. Existing plant capabilities and changes the staff will consider in its backfit determinations include, but are not limited to:

- Physical modifications to the plant that have been planned or implemented that would address a reevaluated seismic or flood hazard.

- Site topography and expected conditions of the plant prior to a reevaluated flood event.

- Changes to procedures to predeploy FLEX equipment based on warning time such that FLEX implementation is not impeded by a flood event.

- Changes to procedures to ensure relay chatter due to a seismic event do not adversely impact a plant's capability to shutdown, or its ability to ensure adequate core cooling, containment integrity or SFP cooling.

The NRC staff considers that licensee commitments described in a licensee evaluation (i.e., MSA, FE. IA, or SPRA) and credited in NRC staff assessments meet the definition of regulatory commitments as described in Section 4.2 of NEI 99-04, "Guidelines for Managing NRC Commitment Changes," Revision 0, dated July 1999 (ADAMS Accession No. ML003680088). As described in NEI 99-04 Section 4.2, if the original commitment has yet to be implemented, the licensee can proceed with the change, but the NRC should be notified of the change as soon as practicable after the change is approved by licensee management, but before any committed completion date. Notification should be accomplished by supplementing the docketed correspondence containing the original commitment. If the original commitment has been implemented, the licensee can revise the commitment and the NRC should be notified in a summary report.[3] If licensees choose not to implement commitments described in the flooding MSA, flooding FE/IA or SPRA report, the staff will assess the effect of not implementing the commitments using the Phase 2 decision-making process.

The staff notes that the flooding backfit analysis could result in the staff needing to develop risk assessments based on a more frequent flood for an unbounded mechanism (e.g., on the order of 1E-4/year frequency).

The staff will bin sites based on one of the following four categories.

- Category 1: Corresponds to sites where no additional information is needed. This category includes sites that have all the seismic or flood hazard mechanisms bounded by the current design basis, or sites where the licensee has demonstrated that existing seismic capacity or effective flood protection will address the unbounded reevaluated hazards.

  Licensees in this category have no commitments in the reevaluated hazard submittals provided in response to the 50.54(f) letter, or the licensee has already implemented changes to address the reevaluated hazard. Additional sites falling in this category may include sites that have made modifications described in the MSA (or other) submittals that have either been implemented at the site or are minor in nature.[4]

[3] Changes to these modifications could result in additional or supplementary backfit analysis of seismic or flooding hazards.

[4] To the extent MSA modification or actions are credited in the backfit analysis and documented in the NRC staff assessment the staff would expect licensees to treat such modifications as regulatory commitments per NEI 99-04, Revision 0.

- Category 2: Corresponds to sites where additional insights are needed before a backfit determination is made. This category includes sites where the licensee has demonstrated that existing seismic capacity or effective flood protection will be addressed with more than minor modifications to the site, sites that rely on commitments made in the MSA, or the NRC does not have all the information needed to make a Phase 2 determination for such a site.

- Category 3: Corresponds to sites where one (or more) seismic or flooding submittals are still under review and the NRC has not yet made a conclusion on the adequacy of the review. This category also includes sites that have not yet submitted SPRA reports or flooding FEs or IAs. Therefore, the staff's review is ongoing and will account for the recent Commission direction and be documented in the appropriate staff assessment.

- Category 4: Corresponds to sites that have requested, or are in the process of, requesting a deferral of completion of flooding work related to the 50.54(f) process based on plant closure. The staff considers that each site's corresponding deferral letter adequately addresses each site's plan to address the hazards up to the period of plant closure. If a site in this Category remains in operation longer than previously communicated, the staff will revisit its deferral letter decision.

The staff's preliminary process would address the closure of 50.54(f) activities in each of the first three categories using a combination of letter(s) that would address the changes, if any, to their existing evaluations as a result of the revision to the proposed MBDBE rulemaking. Category 4 (deferred sites) will follow the existing process as described in the site's corresponding deferral letter, and either provide a submittal that the 50.54(f) activities are no longer necessary based on the conditions of the plant (e.g., fuel being permanently removed from the reactor vessel in accordance with 10 CFR 50.82(a)(1)(ii), and SFP capabilities) or provide the remaining information should they decide to remain in operation past the planned shutdown date. At such a point, the staff would evaluate those sites based on the process described in this document.

4.0 Seismic Reevaluated Hazards

The NRC staff has revisited previously completed reevaluated seismic hazard staff assessments, particularly those where licensee actions were identified to ensure that key safety functions (core cooling, containment, and SFP cooling) are maintained to determine the need for further regulatory actions. The seismic reevaluations in response to the March 12, 2012, 50.54(f) letter include interim actions associated with the ESEP, SFP integrity evaluations, HF confirmations, MSAs, and SPRA reports. With the exception of the SFP integrity evaluations, these activities could propose actions to ensure that key safety functions are maintained. For sites where no SPRA reports are expected, activities identified during the ESEPs, HF confirmations, and MSAs have been revisited to support the previous Phase 2 determination. For sites where SPRA reports will be, or have been, performed, the SPRA report will support the Phase 2 determination.

The only seismic MSA staff reviews that have not been completed are associated with sites that have provided or will provide an SPRA report. As described in further detail in the seismic MSA section below, the staff believes that future seismic MSA submittals are not warranted, given the recent Commission decision. Instead, appropriate backfit decisions can be made based on the

information that licensees provide in their SPRA reports. If additional information relative to mitigation strategies capabilities associated with a seismic event are needed to support a staff backfit decision, the staff will pursue obtaining such information on an individual plant basis as part of its SPRA report reviews.

Appendix A summarizes all operating reactor sites and their corresponding categorization associated with the reevaluated seismic hazard submittals. In general, 47 sites fall into Category 1 (i.e., no further information is needed to support the staff's backfit determination), 0 sites fall under Category 2 (i.e., the staff needs additional insights to support the staff's backfit determination), 12 sites fall under Category 3 because of ongoing SPRA report reviews, and 2 sites are considered to be under Category 4 because of their deferred status.

4.1 Expedited Seismic Evaluation Process

By letter dated April 12, 2013 (ADAMS Accession No. ML13102A142), the Electric Power Research Institute (EPRI) staff submitted EPRI Report 3002000704 "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force (NTTF) Recommendation 2.1: Seismic" (ADAMS Accession No. ML13102A142). The Augmented Approach proposed that licensees would use the ESEP to address the interim actions as requested by Information Item (6) in the 50.54(f) letter. The ESEP is a simplified seismic capacity evaluation with a focused scope of certain key installed Mitigating Strategies equipment that is used for core cooling and containment functions to cope with scenarios that involve a loss of all ac power and loss of access to the ultimate heat sink to withstand the review level ground motion (RLGM), which is up to two times the safe shutdown earthquake (SSE). By letter dated May 7, 2013 (ADAMS Accession No. ML13106A331), the NRC staff endorsed the guidance.

The staff's reviews assessed whether the intent of the guidance was implemented. All sites have received an ESEP staff assessment that concludes that licensees have demonstrated adequate implementation of the augmented approach. Part of the staff's assessment included a checklist item VII, "Modifications to Plant Equipment." This section of the staff's assessment addressed whether licensees identified actions to resolve modifications to achieve high confidence of low probability of failure (HCLPF) values that bound the RLGM. Some sites identified actions and/or plant modifications needed to reach those HCLPF values, and all actions and modifications have been completed. The staff believes such actions and/or modifications can be credited in its Phase 2 determination.

4.2 Seismic Spent Fuel Pool Evaluations

By letter dated January 31, 2017 (ADAMS Accession No. ML17031A171), NEI submitted the EPRI Report No. 3002009564 entitled, "Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation" (SFP Evaluation Guidance Report) (ADAMS Accession No. ML16055A017). The SFP Evaluation Guidance Report provides criteria for evaluating the seismic adequacy of an SFP to the reevaluated ground motion response spectrum (GMRS) hazard levels. This report supplements the guidance in EPRI Report 1025287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID)" (ADAMS Accession No. ML12333A170). The NRC endorsed the SFP Evaluation Guidance Report by letter dated February 28, 2017 (ADAMS

Accession No. ML17034A408), as an acceptable method for licensees to use when responding to Item (9) in Enclosure 1 of the 50.54(f) letter.

The staff's guidance was developed to support completion of SFP evaluation for sites with reevaluated seismic hazard exceedance in the 1-10 Hertz (Hz) frequency range (i.e., the frequency range of structural significance). The staff's evaluations of the 38 sites with exceedances in this frequency range were prioritized based on whether the reevaluated GMRS peak spectral accelerations were above or below 0.8 g. These 38 operating reactor sites have received a staff SFP structural evaluation that conclude that licensees have demonstrated an adequate margin to preclude a potential drain-down of the SFP as a result of the reevaluated seismic hazard occurring at their respective sites. The staff has confirmed that conclusions reached in these assessments are not affected by the Commission's Affirmation Notice and SRM on the MBDBE rule. The staff notes that, as part of the seismic MSAs, additional assessments have been performed to address the impact of the reevaluated seismic hazard on the SFP mitigation strategies. The assessment of the impacts of the Commission's direction relative to the MBDBE rule on these evaluations is found in Section 4.4 of this Enclosure.

4.3 Seismic High Frequency Confirmations

By letter dated July 30, 2015 (ADAMS Accession No. ML15223A095), NEI submitted EPRI Report 3002004396, "High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation" (hereafter referred to as the HF guidance) (ADAMS Accession No.ML15223A095). The HF guidance proposes methods for applying HF seismic testing results to support plant-specific analyses of potential HF effects. Specific guidance is given for plants performing a limited-scope HF confirmation to address the information requested in Item 4 in Enclosure 1 of the 50.54(f) letter.

The limited-scope HF confirmation is a simplified seismic capacity evaluation focusing on the potential impacts of HF motion on key plant functions following a seismic event. By letter dated September 17, 2015 (ADAMS Accession No. ML15218A569), the NRC staff endorsed the HF guidance. Licensees with a reevaluated seismic hazard exceeding the SSE above 10 Hz and not performing an SPRA submitted a HF confirmation report in accordance with the schedule in the NRC letter dated October 27, 2015 (ADAMS Accession No. ML15194A015).

Part of the staff's assessment included a checklist item VII, "Resolution Options and High Frequency Report Requirements (EPRI 3002004396 Sections 4.6 and 4.7)." This section of the staff's assessment addressed whether licensees identified actions to resolve any relays not meeting the component capacity screening criteria. A number of sites identified actions needed to resolve relays not meeting the screening criteria. The staff believes such actions can be credited in its Phase 2 determination such that additional actions are not needed. Therefore, such sites fall within the Category 1 bin described above. In addition, as described above, if licensees make changes to actions to resolve relays not meeting the component capacity screening criteria, the staff expects licensees to notify the NRC in accordance with NEI 99-04, in which case the staff may revisit the conclusion that additional regulatory actions are not warranted.

4.4 Mitigation Strategies Assessments and Seismic Probabilistic Risk Assessments

Guidance document NEI 12-06, Appendix H, Revision 4, contains 5 paths as shown in Figure 4.4-1 below.

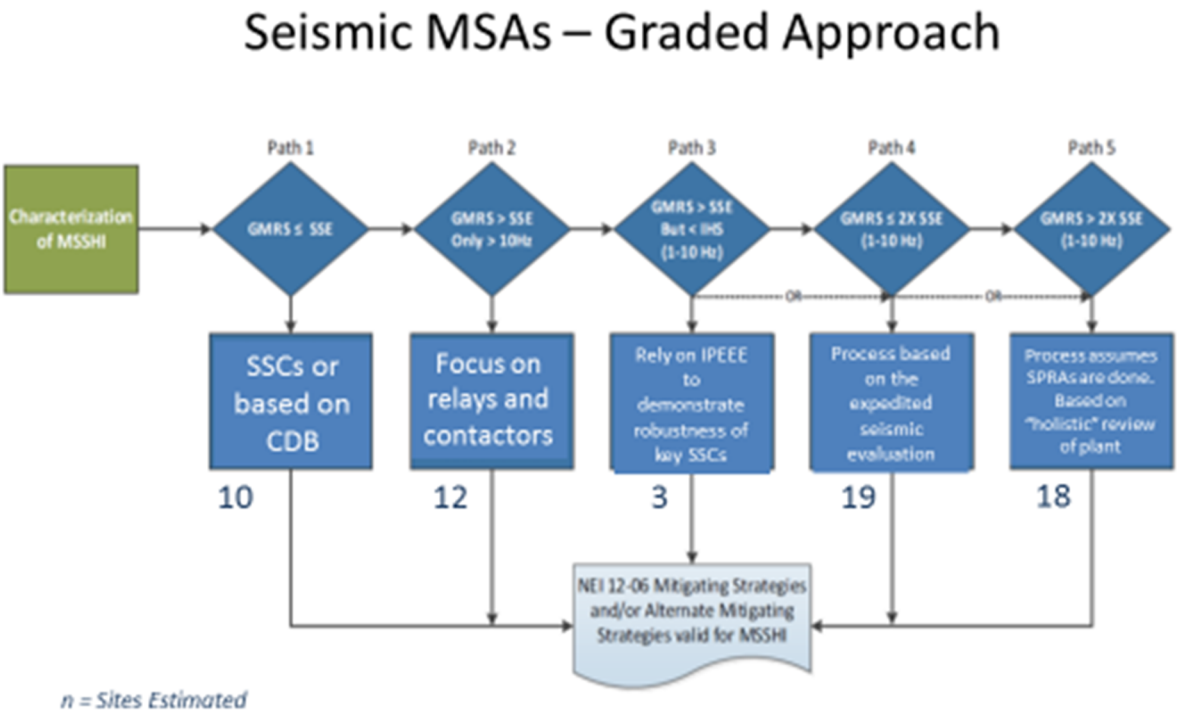

Figure 4.4-1

Licensees have submitted their MSAs and the staff assessments have been completed for Paths 1 through 4 that are shown in Figure 4.4-1. The staff concluded that structures, systems, and components (SSCs) relied upon for mitigation strategies have seismic capacity to levels equal to or higher than the reevaluated GMRS, safe shutdown of the plant can be accomplished, and any consequences can be appropriately mitigated under the reevaluated seismic hazard conditions.

Based on the staff's assessment of the seismic Path 1 through 4 MSAs, the staff has determined that such submittals fall within the Category 1 bin described above. In some cases, licensee operator manual actions (such as operator actions needed to address relay chatter) are credited in staff assessments associated with the MSAs. The staff believes such actions can be credited in its Phase 2 determination such that additional information is not needed. Only two licensees identified actions needed to implement the mitigation strategies under the reevaluated seismic hazard conditions. If licensees make changes to actions credited in the MSA staff assessments, the staff expects to be informed in accordance with the process outlined in NEI 99-04

For sites following Path 5 of NEI 12-06, Appendix H, Revision 4, licensees have submitted or are scheduled to submit SPRA reports that include evaluations of HF effects on the plant. The SPRA report review process will identify if additional regulatory actions are necessary to ensure adequate protection or are cost-justified substantial safety improvements in accordance with the

NRC's backfit process. Most SPRAs model FLEX equipment; however, seismic MSAs addressed SFP cooling because SFPs or SFP cooling are not modeled in SPRAs. As described above, operating reactor sites have either screened out for a SFP structural evaluation or have received a staff SFP structural evaluation that concluded that licensees have demonstrated an adequate margin to preclude a potential drain-down of the SFP as a result of the reevaluated seismic hazard occurring at their respective sites. The staff believes that the SFP structural assessments combined with the inherent large amount of time to recover SFP cooling or alternatively supply a makeup water supply to the SFP before fuel is uncovered renders the need for the seismic SFP cooling MSA information unnecessary.

Furthermore, because of the SPRA report reviews, the staff believes that additional information provided in the seismic MSA reports that address core cooling and containment integrity is not necessary at this time in order to make a backfit determination. If the staff needs additional information regarding the mitigation strategies capabilities that support core cooling or containment integrity, the staff will pursue obtaining such information on an individual plant basis as part of the SPRA report reviews. Therefore, the staff is recommending that continuing reviews of the seismic MSAs is not warranted. Appendix A of this document provides the results of the staff's binning of reevaluated seismic hazard submittals that have been provided to the staff.

4.5 Seismic Reevaluated Hazard Conclusion

The different activities completed in response to the 50.54(f) letter for reevaluated seismic hazards have produced safety improvements in multiple nuclear facilities. Sites that have completed their seismic MSA have enhanced their understanding of the inherent structural capacity of plant SSCs needed for implementing the mitigation strategies. The staff intends that information gathered in all of these activities, including proposed licensee actions, is considered to inform the Phase 2 determination. For sites that are still under review (SPRA sites), the SPRA report will be used to inform the Phase 2 determination.

5.0 Flooding Reevaluated Hazards

For flooding reevaluations, the staff has assessed all sites using existing information provided in the flooding submittals (flood hazard reports, MSAs, FEs, and IAs) and has binned them into 4 categories. Appendix A summarizes all sites and their corresponding categorization.

5.1 Flooding Mitigation Strategies Assessments

Figure 5.1-1 provides a breakdown of the flooding reevaluated hazard assessments that were performed in accordance with NEI 12-06, Appendix G. In accordance with Appendix G, MSAs were evaluated following one of five different paths. The staff has reviewed licensee's submittals and the associated staff assessments. Appendix A of this document provides the outcome of the staff's review as to whether the licensee included modifications to FLEX to maintain functional capabilities, or an alternate mitigation strategy, or a targeted hazard mitigation strategy. The staff identified 15 sites that fall in this category.

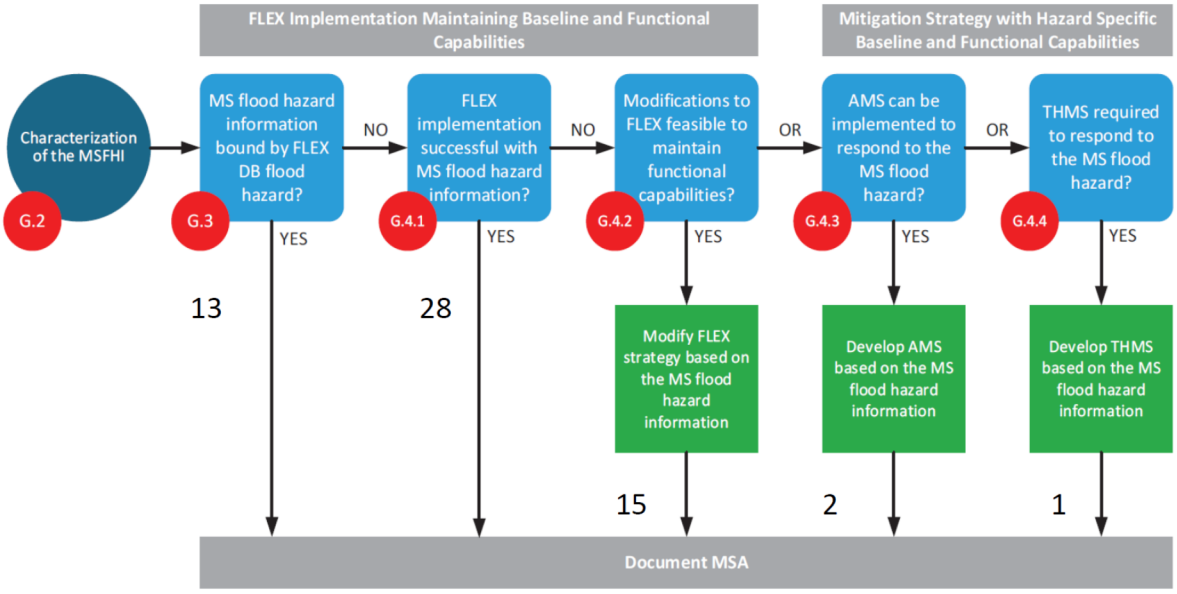

Figure 5.1-1 Flooding Mitigating Strategies Assessment Flow Chart

The staff's Phase 2 backfit determination will be based on the information provided by the licensee based on the option the licensee chooses.

The staff will consider information provided in the flooding MSAs that have been reviewed by the staff as part of the Phase 2 process for the 50.54(f) letter response. In the SRM to COMSECY 14-0037, "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards," dated March 30, 2015 (ADAMS Accession No. ML15089A236), the Commission provided the following direction:

> "In developing the Phase 2 acceptance criteria and guidance, the staff should:
>
> a. Add clarity on how Phase 2 decisions about whether further regulatory actions are necessary will be made within the current regulatory process, including the Backfit Rule.
>
> b. Allow flexibility in the way in which licensees address vulnerabilities identified through the integrated assessment process that relied on hazards developed using guidance for new plants. That flexibility should include the opportunity for licensees to demonstrate that vulnerabilities identified may be less risk significant when more realistic assumptions are applied in the analyses.
>
> c. Take into account the fact that the licensees are protecting mitigating strategies equipment from the reevaluated flood hazard developed in accordance with the 50.54(f) letter and the associated guidance.
>
> d. Consider an appropriate balance between protection and mitigation based on the principle of defense-in-depth."

Therefore, the staff intends to consider information from the MSAs as part of the Phase 2 process in the following manner:

- The MSAs outline the preservation of the defense-in-depth feature, on a voluntary basis, of ensuring that mitigation strategies will be adequately protected against the reevaluated flooding hazard conditions, if implemented as described.

- For the MSA reviews that have been completed to date, most of the licensees were either able to demonstrate that the mitigation strategies implementation was not affected by the reevaluated hazard or that only minor modifications (which in most cases have been already implemented) needed to be made to their mitigation strategies such that they could be implemented under the reevaluated hazard conditions.

- The staff will use qualitative and quantitative arguments, based on licensee's analysis (including commitments) found in the flooding MSAs, and will consider such statements as part of the Phase 2 backfit analysis.

5.2 Flooding Focused Evaluations/Integrated Assessments

Figure 5.2-1 provides a breakdown of the flooding reevaluated hazard assessments that were performed in accordance with NEI 16-05, "External Flooding Assessment Guidelines" (ADAMS Accession No. ML16165A178), which has been endorsed by the NRC in JLD-ISG-2016-01 (ADAMS Accession No. ML16162A301). In accordance with NEI 16-05, sites that had an unbounded flooding mechanism are evaluated following one of five different paths. The staff notes that for six sites the reevaluated flooding mechanisms were bounded by the current design basis. Therefore, NEI 16-05 does not apply to these six sites and they are not included in the figure. The figure also does not include 2 sites that have requested deferral of the required dates. The breakdown of sites provided in Figure 5.2-1 is based on an assumption that 6 sites will provide an integrated assessment.

The staff has reviewed licensee's submittals and the associated staff assessments. Appendix A of this document reflects the appropriate bin for each site based on statements made in a licensee's flooding focused evaluation or integrated assessment.

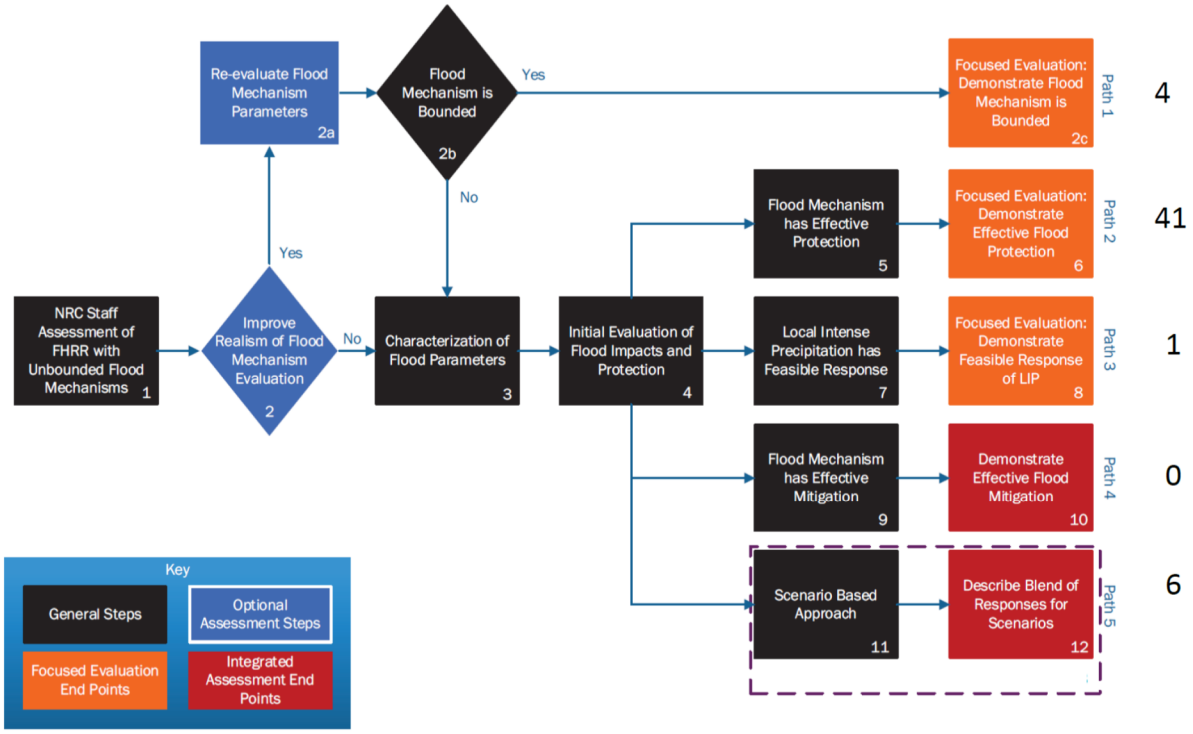

Figure 5.2-1 NEI 16-05 Flooding Impact Assessment Process Flowchart

5.3 Flood Reevaluated Hazard Conclusion

For the reevaluated flooding hazard information, as described in Appendix A of this document the staff has determined that: 26 sites fall under Category 1 (i.e., no further information is needed to support the staff's backfit determination), 21 sites fall under Category 2 (i.e., the staff needs additional insights to support the staff's backfit determination), 9 sites fall under Category 3 because of ongoing reviews, and 5 sites are considered to be under Category 4 because of their deferred status.

6.0 Conclusion

Based on the staff's assessment provided in this Enclosure, the staff intends to issue letter(s) related to the seismic and flooding reevaluations that document the staff's 50.54(f) backfit decisions in accordance with Phase 2 of the process outlined in the 50.54(f) letter. The letter(s) will bin sites according to the following four categories: Category 1 – no additional information is needed; Category 2 – additional insights are needed before a backfit decision is made; Category 3 – corresponds to sites that have reevaluated seismic or flooding information that is being reviewed by the staff; and Category 4 – corresponds to sites that have had, or requested that, reevaluated hazard information submittals be deferred.

Appendix A – Status of Reevaluated Flooding and Seismic Hazard Reviews

Site	*Reevaluated Flooding Hazard*					*Reevaluated Seismic Hazard*			
	MSA Contains Commitments (Y/N)	*No Additional Insights Needed Based on FE/IA*	*Additional Insights Needed Based on FE/IA*	*Ongoing Review*	*Deferred*	*No Additional Insights Needed*	*Additional Insights Needed*	*Ongoing Review*	*Deferred*
Arkansas Nuclear	Y	X				X			
Beaver Valley	Y	X				X			
Braidwood	N	X				X			
Browns Ferry				X				X	
Brunswick	Y		X			X			
Byron	N	X				X			
Callaway	N	X						X	
Calvert Cliffs	N	X				X			
Catawba	Y		X			X			
Clinton	N	X				X			
Columbia	N	X						X	
Comanche Peak	N		X			X			
Cooper				X		X			
Davis-Besse					X	X			
DC Cook	Y		X					X	
Diablo Canyon	Y	X				X			
Dresden				X				X	
Duane Arnold	N	X				X			
Farley	Y	X				X			
Fermi	N	X				X			
FitzPatrick	N	X				X			
Ginna	N	X				X			
Grand Gulf	Y		X			X			
Harris	N	X				X			
Hatch	N	X				X			

Flooding Cat 1

Flooding Cat 2

Site	Reevaluated Flooding Hazard					Reevaluated Seismic Hazard			
	MSA Contains Commitments (Y/N)	*No Additional Insights Needed Based on FE/IA*	*Additional Insights Needed Based on FE/IA*	*Ongoing Review*	*Deferred*	*No Additional Insights Needed*	*Additional Insights Needed*	*Ongoing Review*	*Deferred*
Hope Creek	Y		X			X			
Indian Point					X				X
LaSalle	N	X				X			
Limerick	N	X				X			
McGuire	N		X			X			
Millstone				X		X			
Monticello	N	X				X			
Nine Mile Point 1*	N		X			X			
Nine Mile Point 2*	N		X			X			
North Anna	Y		X					X	
Oconee	N	X						X	
Oyster Creek					X	X			
Palisades	N	X						X	
Palo Verde	N	X				X			
Peach Bottom	N	X						X	
Perry					X	X			
Pilgrim					X				X
Point Beach	N		X			X			
Prairie Island	N	X				X			
Quad Cities				X		X			
River Bend	Y	X				X			
Robinson				X				X	
Salem	N	X				X			
Seabrook	Y		X			X			
Sequoyah				X				X	
St. Lucie	Y		X			X			

Flooding Cat 1

Flooding Cat 2

Site	Reevaluated Flooding Hazard					Reevaluated Seismic Hazard			
	MSA Contains Commitments (Y/N)	*No Additional Insights Needed Based on FE/IA*	*Additional Insights Needed Based on FE/IA*	*Ongoing Review*	*Deferred*	*No Additional Insights Needed*	*Additional Insights Needed*	*Ongoing Review*	*Deferred*
South Texas	N	X				X			
Summer	N	X						X	
Surry				X		X			
Susquehanna	N	X				X			
TMI	N	X				X			
Turkey Point	Y		X			X			
Vogtle	Y		X			X			
Waterford	N		X			X			
Watts Bar				X		X			
Wolf Creek	N	X				X			
Total*	**15**	**31**	**16**	**9 (Cat – 3)**	**5 (Cat - 4)**	**47 (Cat - 1)**	**0 (Cat -2)**	**12 (Cat -3)**	**2 (Cat - 4)**
Total Flooding no additional insights needed	***26 (Cat -1)***								
Total Sites with flooding MSA commitments and additional actions based on FE/IA*	***21 (Cat -2)***								

* Nine Mile Point Nuclear Station, Units 1 and 2 treated individually because separate seismic hazard reviews were done for this site.
** Category 1, 2, 3, and 4 are described in the Enclosure to the document. If the flooding MSA indicates that the flooding MSA does not contain commitments, and the flooding FE/IA indicates no additional information is needed then the reevaluated flood hazard for the site is considered "Category 1."

Flooding Cat 1 | Flooding Cat 2