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Mitigation Strategies for Beyond Design Basis Events

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Mitigation of Beyond-Design-Basis Events

Document: NRC-2014-0240-DRAFT-0015
Comment on FR Doc # 2015-28589

Submitter Information

Name: Jim Riley

General Comment

See attached file(s)

Attachments

02-09-16_NEI_Industry Comments on Draft Mitigating Beyond Design Basis Events Rulemaking Package

02-09-16_NEI_Industry Comments on Draft Mitigating Beyond Design Basis Events Rulemaking Package_Attachment 1

02-09-16_NEI_Industry Comments on Draft Mitigating Beyond Design Basis Events Rulemaking Package_Attachment 2

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NUCLEAR ENERGY INSTITUTE

February 9, 2016

Secretary, US Nuclear Regulatory Commission
Washington, DC 20555-0001
Attn: Rulemakings and Adjudications Staff

Subject: Industry Comments on Draft Mitigation of Beyond Design Basis Events Rulemaking Package (Docket ID NRC-2014-0240)

Project Number: 689

On behalf of the nuclear energy industry, the Nuclear Energy Institute (NEI) is providing comments on the NRC draft Mitigation of Beyond Design Basis Events Rulemaking Package (Docket ID NRC-2014-0240).

We appreciate the opportunity to comment on this draft rulemaking package which incorporates most of the important actions that the industry and the NRC have taken in response to the 2011 accident at the Fukushima Dai-ichi Nuclear Power Plant. NEI supports issuance of the proposed rule and is largely in agreement with the requirements it contains. We do have some suggestions on modified rule language, comments on some parts of the rulemaking package, and responses to the questions it contains; these details are included in the attachments to this letter. We would like to emphasize several of our comments as described below.

- Implementation Time: The proposed rule would require that each holder of an operating license comply with its provisions no later than 2 years following the effective date of the rule. This timeframe is not adequate. The degree to which the reevaluated seismic or flooding hazard(s) may impact the implementation of mitigating strategies varies widely across the operating reactor fleet, and the effort required to address them varies widely too. In addition, the various evaluations necessary to prepare for any necessary changes are in different stages of completion. As a result, the industry recommends that the proposed rule allow licensees to submit site specific schedules for achieving full compliance with the rule. Our response to the question on "Equipment Protection Implementation Deadline" in Section VI of the rulemaking package provides our proposed rule language to address this concern (Attachment 3).
- Application of Other Change Control Processes: Section 50.155(f) should explicitly and clearly address the application of "Other Change Control Processes" given that facility changes can impact multiple aspects of the plant having different applicable requirements, and be subject to different change control requirements. The rule and associated guidance should consistently differentiate between design basis conditions and beyond-design-basis conditions, i.e., clarify that existing change control

processes such as § 50.59, § 50.54(p), § 50.54(q) and fire protection change controls are not applied to beyond-design-basis requirements. Our response to the "Change Control" questions in Section VI of the rulemaking package propose changes to the rule to address this concern (Attachment 3).

- Methodology for Addressing the Reevaluated Hazards: The need for a licensee's strategies and guidelines to be capable of execution in the context of the reevaluated flooding and seismic hazards should be addressed in § 50.155(b)(1) rather than § 50.155(c)(2) for several reasons.

  1) We believe that the intent is to mitigate the effects of the reevaluated hazards in a manner similar to the strategies that have been developed by the industry for FLEX. The inclusion of the reevaluated hazards requirement into § 50.155(c)(2)(i) applies reasonable protection to all the equipment covered by the proposed rule (both plant equipment and FLEX equipment), however, reasonable protection should only apply to FLEX equipment.
  2) Including the reevaluated hazard requirement in § 50.155(c)(2)(i) only applies the reevaluated hazard requirement to equipment, it does not achieve the intended objective of applying the reevaluated flood and seismic hazards to mitigating strategies in general.

  Furthermore, in addressing mitigating strategies for the reevaluated hazards, section 50.155(b)(1) should allow further flexibility in the licensee's strategies and guidelines by:

  1) establishing an alternative means of compliance that does not include the surrogate conditions of an extended loss of all alternating current power and loss of normal access to the ultimate heat sink, and
  2) providing different success criteria for targeted or scenario-specific mitigating strategies (i.e., requiring core cooling and spent fuel pool cooling but not the containment capability to be maintained).

  Finally, the rule should also allow for utilization of risk insights or other approaches to demonstrate reasonable protection for mitigation of beyond design basis external events.

  Our response to the "Methodology for Addressing the Reevaluated Hazard" question in Section VI of the rulemaking package proposes changes to the rule to address these concerns (Attachment 3).

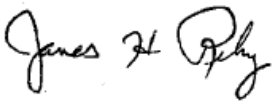
- Use of Adequate Protection: The proposed rule and regulatory analysis properly recognizes that the new requirement to monitor and assess multiple source terms constitutes a backfit, but rather than perform a systematic and documented analysis demonstrating that this new requirement will result in a cost-justified substantial increase in safety, the NRC has invoked backfit exception in 10 C.F.R. § 50.109(a)(4)(ii) for regulatory actions that are "necessary to ensure that the facility provides adequate protection to the health and safety of the public." The draft regulatory analysis fails to overcome the presumption that current regulations and orders currently ensure adequate protection because it identifies no significant safety issue that is going unaddressed. On top of the extensive required actions that licensees are already taking, the industry is voluntarily implementing multiple source term dose assessment capabilities to assist in the mitigation of remote, yet potentially serious

beyond-design-basis external events. Rather than place these actions in their proper context, the draft regulatory analysis offers generic statements about meeting existing emergency preparedness regulatory objectives. Accordingly, the NRC has not justified using the adequate protection exception and should not impose this new requirement absent an analysis demonstrating that it will result in a cost-justified substantial increase in safety. We provide additional information relative to this concern in response to Question 5 in Section XI of the rulemaking package (Attachment 3).

- Spent Fuel Pool Instrumentation (SFPI): The rule language, regulatory guides and related supporting information must keep the requirements for SFPI separate and distinct from the requirements for mitigating strategies. The requirement for SFPI was promulgated by NRC Order EA-12-051, while the requirement for mitigating strategies was promulgated by NRC Order EA-12-049. While the two Orders were in response to lessons-learned from the Fukushima accident, they are distinctly different in underlying purpose and character. EA-12-049 requires guidance and strategies to maintain core and spent fuel cooling and the containment function in the face of certain events, and requires the ability to take action under the circumstances specified in the Order. EA-12-051, requires the installation of reliable spent fuel pool instrumentation to provide decision makers with information about the amount of water in the spent fuel such that resources can be allocated. EA-12-051 does not require the ability to take action; it only provides information. The fact that industry Flex program implemented in response to EA-12-49 uses this information to indicate the need to add water to the pools does not change the underlying SFPI requirement and does not justify including SFPI as part of mitigating strategies as appears to have been done in the draft of proposed 10CFR50.155(c)(4). We provide suggested changes to the rule language to address this concern in our detailed comments (Attachment 1).

We look forward to engaging the Staff to discuss or clarify any of our comments. If you have questions or require additional information, please contact me at 202-739-8137; jhr@nei.org.

Sincerely,



James H. Riley

Attachments:

1. MBDBE Rulemaking Package Comment Table
2. Comment Table Text Changes
3. Responses to Questions in Sections VI and XI
4. NEI 13-06 Revision 1
5. NEI 13-06 Revision 1 / Revision 0 Comparison
6. NEI 14-01 Revision 1

7. NEI 14-01 Revision 1 / Revision 0 Comparison

c: Fukushima Points of Contact
Administrative Points of Contact

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Comment #	Tech Area	Document	Page	Text	Concern	Suggestion for Change
1	FLEX	DG-1301	1	The last sentence of the second paragraph states, "Additionally, this RG provides guidance in areas that are not covered in NEI 12-06, for meeting the regulations in 10 CFR 50.155."	Presumably this is referring to the guidance for performing a mitigating strategies assessment for the reevaluated seismic hazard.	Industry guidance has been added in Appendix H of NEI 12-06 so this sentence should be deleted.
2	General	DG-1301	2	"Related Guidance," states: "JLD-ISG-2012-01 is superseded and replaced by this RG." However the stated purpose of JLD-ISG-2012-01 is to provide an acceptable approach for compliance with EA-12-049, and the stated purpose of DG-1301 is to provide an acceptable approach for compliance with 10 CFR 50.155. It is not clear how DG-1301 can supersede JLD-ISG-2012-01 when JLD-ISG-2012-01 has a different purpose than DG-1301.	Clarification is needed regarding the following aspects of the transition from Orders EA-12-049 and EA-12-051 to 10 CFR 50.155: Some licensees have already achieved compliance with Orders EA-12-049 and EA-12-051 in accordance with JLD-ISG-2012-01 Rev. 0, and JLD-ISG-2012-03 Rev. 0, and their associated NEI guidance documents. It is recognized that 10 CFR 50.155 and	Describe the process for rescinding Orders EA-12-049 and EA-12-051 following the issuance of the final rule

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					the R.G.s associated with DG-1301, and DG-1317 may specify actions that are additional to, and/or different from, the actions required by the ISGs to achieve to compliance with the NRC Orders. It is also recognized that 10 CFR 50.155 and the associated R.G.s may specify actions that are less restrictive than the corresponding actions needed for compliance with the orders. It is not clear if and when compliance with Orders EA-12-049 and EA-12-051 will no longer be required following issuance of 10 CFR 50.155 and the associated R.G.s.	

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3	FLEX	DG-1301	4	The word "determine" in the second sentence of the first paragraph should be "determined."		
4	FLEX	DG-1301	4	The reference to Revision 1A of NEI 12-06 in the last sentence of the fourth paragraph should be removed.	The reference is referring to NEI 12-06 in general not to a specific revision.	Suggest rewording the sentence as follows: "The strategies and guidance described in NEI 12-06 expand on those developed…."
5	FLEX	DG-1301	5	Background , Last paragraph	In Revision 2 of NEI 12-06 the description of Phase 2 was changed to "Augment or transition from plant equipment to on-site FLEX equipment and consumables to maintain or restore key functions." The description of Phase 2 in the Background of the DG retains the previous language for Phase 2.	Modify the language to use the current terminology.

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6	FLEX	DG-1301	7	Staff Position a) Initial and boundary conditions do not accurately reflect a loss of all ac power condition. Staff Position 1.2 Contingencies for Loss of All Alternating Current Power	Staff Position a) and 1.2 are not needed since the rule addresses an extended loss of ac power as opposed to a loss of all ac power.	The language in § 50.155(b)(1) should be changed to eliminate the word "all" from extended loss of ac power in order maintain consistent terminology. Eliminate Staff Position a) and Section 1.2. The resolution of the same comment for JLD-ISG-2012-01, Rev. 1 is not necessary since the rule address mitigation of an extended loss of ac power as opposed to a loss of all ac power.
7	FLEX	DG-1301	7	Staff Position b) ….However, maintenance of the guidance and strategies requires that the estimate of capability be kept current to reflect plant conditions following facility changes such as modification or equipment outages.	It is not clear what is being clarified that is not already addressed by Section 11.8 Configuration Control of NEI 12-06. This section addresses assessing	The change made in response to this comment in JLD-ISG-2012-01, Rev. 1 is appropriate.

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					the impact of facility changes to ensure FLEX strategies are not adversely impacted. Additionally, the guidance addresses the unavailability of equipment. The industry does not believe this clarification is necessary, but rather, that it creates a lack of clarity in that it implies something in addition to Section 11.8 is needed.	
8	FLEX	DG-1301	8	Staff Position d).1 The use of Level C validation methods should be limited to those tasks, manual actions and decisions that do not have a time constraint for the strategy to be successful.	It does not appear that a clarification is needed as Level C validation is limited in the guidance to those tasks, manual actions and decisions that do not have a time constraint for the strategy to be	The change made in response to this comment in JLD-ISG-2012-01, Rev. 1 is appropriate.

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					successful. Clarification has been added to the description of Level C validation in Section E.5.1.2 of Appendix E to NEI 12-06.	
9	FLEX	DG-1301	8	Staff Position d).2 Level B vs Level A validation	Footnote 17 on page 97 of NEI 12-06, Revision 1A erroneously establishes the basis of using a Level B validation for time-sensitive actions started between 6 and 24 hours solely on the availability of additional personnel. This is not the case and, as such, the footnote has been deleted. Validation is performed based on the nature of the task to determine if it can be performed within the time constraint	The change made in response to this comment in JLD-ISG-2012-01, Rev. 1 is appropriate.

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					with reasonable confidence. If the validation did not provide reasonable confidence, then applying additional resources to the task is one option that can be considered to establish reasonable confidence if additional personnel would effectively improve task performance. With this change, the industry does not believe the clarification is needed.	
10	FLEX	DG-1301	8	Staff Position d).2 Integrated Reviews	The last sentence of the staff position provides a clarification that would imply the guidance in Appendix E for performing the integrated review is	The change made in response to this comment in JLD-ISG-2012-01, Rev. 1 is appropriate.

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					not sufficient. The guidance as written does address adjusting procedures and revalidating tasks if there is not reasonable confidence that the task, manual action or decision can be completed within the time constraint. The industry does not see the need for clarification and the clarification only creates a lack of clarity as it implies that something in addition to the guidance is needed but does not provide clarifying guidance.	
11	General	DG-1301	8	Staff position d. "…required human actions. NEI 12006, Rev. 1A, Appendix E neither proposes nor is endorsed as a method to assess whether	Typographical error.	Should be NEI 12-06.

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				required human actions are reliable."		
12	FLEX	DG-1301	9	Sections 1.1.1.1, 1.1.1.2 and 1.1.1.3	The language in these sections refers to installed and portable equipment.	The language in these sections should refer to "plant equipment" and "FLEX equipment" vs installed equipment and portable equipment, respectively.
13	FLEX	DG-1301	11	Section 3 first sentence	In accordance with the changes proposed to § 50.155(c) and § 50.155(b)(1) in Attachment 3.in response to the question on Methodology for Addressing Reevaluated Hazards, the word "reasonably" should be deleted from the first sentence.	
14	FLEX	DG-1301	13	Programmatic Controls for Unavailability, Staff Position: Section 11.5.3 of NEI 12-06,	Unavailability is addressed in Section 11.5.4 not 11.5.3.	

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				Revision 1A…..		
15	FLEX	DG-1301	13	Equipment Maintenance, Section 4 first sentence	In accordance with Attachment 3 Question on Equipment Requirements, the word "adequate" should be eliminated.	
16	FLEX	DG-1301	13	Treatment of Reevaluated Hazards , Section 6 first sentence	In accordance with the changes proposed to § 50.155(c) and § 50.155(b)(1) in Attachment 3 in response to the question on Methodology for Addressing Reevaluated Hazards, the first paragraph of Section 6 should be revised accordingly.	
17	FLEX	DG-1301	14	Section 6.1	NEI 12-06 revision 2 was endorsed by JLD-ISG-2012-01 revision 1 which has now been issued with a	The Regulatory Guide and ISG will need to reflect the a revision to NEI 12-06 when Path 5 is

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					pending effective date. The industry intends to further revise NEI 12-06 to address a Path 5 for plants performing seismic PRAs and intends to submit revision 3 for endorsement. This will necessitate a further revision to NRC guidance.	incorporated.
18	FLEX	DG-1301	14	Section 6.1- The ISG provides the guidance for performing the mitigating strategy assessment for the reevaluated seismic hazard.	Revision 2 to NEI 12-06 includes Appendix H which provides guidance for performing the mitigating strategies assessments for the reevaluated seismic hazard. The guidance in Appendix H has been endorsed in ISG-JLD-2012-01 Rev. 1 and should similarly be endorsed in the Regulatory	The change made in response to this comment in JLD-ISG-2012-01, Rev. 1 is appropriate.

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					Guide, which would replace the guidance provided in Section 6.1.	
19	FLEX	DG-1301	15	Section 6.1.2.b Second sentence	The second sentence addresses the flooding mechanism when it should address seismic.	The change made in response to this comment in JLD-ISG-2012-01, Rev. 1 is appropriate.
20	FLEX	DG-1301	20	Sections 6.2.1, 6.2.2, and 6.2.3- Reference to § 50.155(c)(2)(i)	See the changes proposed to § 50.155(c) and § 50.155(b)(1) and in the response to "Methodology for Addressing Reevaluated Hazards" in Attachment 3, These paragraphs should be revised accordingly. Also in Section 6.2.1 in JLD-ISG-2012-01, Rev. 1 the wording "provide reasonable protection from" was used when it should	In Section 6.2.1 in JLD-ISG-2012-01, Rev. 1, the wording "provide reasonable protection from" should be replaced with "mitigate."

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					say "mitigate."	
21	FLEX	DG-1301	20	6.2.2 and 6.2.3 Staff Positions The staff positions state that strategy developed must provide "a capability to mitigate the BDBEE by mitigating or preventing an ELAP that would occur as a result of the BDBEE through exhaustion of fuel for operating emergency power sources…"	For the AMS and THMS an ELAP does not need to be considered to occur unless it is caused by the reevaluated hazard. The staff position appears to be requiring the mitigation or prevention of an ELAP condition even though it is not necessarily assumed to occur.	The language in the same sections in JLD-ISG-2012-01, Rev 1 would resolve this comment.
22	General	DG-1301	2	JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," Rev. 0 Also, Reference 4 on page 23 still cites rev 0 of JLD-ISG-2012-01	JLD-ISG-2012-01, Rev 1 is published. These citations should be updated when the ISG revision is issued.	

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23	General	DG-1317	2	"Related Guidance," states: "JLD-ISG-2012-03 is superseded and replaced by this RG." However the stated purpose of JLD-ISG-2012-03 is to provide an acceptable approach for compliance with EA-12-051, and the stated purpose of DG-1317 is to provide an acceptable approach for compliance with 10 CFR 50.155. It is not clear how DG-1317 can supersede JLD-ISG-2012-03 when JLD-ISG-2012-03 has a different purpose than DG-1317. "Related Guidance," also states: "Draft regulatory guide (DG)-1301 (proposed RG 1.226), "Flexible Mitigation Strategies for Beyond-Design-Basis Events" (Ref. 7) is planned to supersede and replace JLD-ISG-2012-01." As noted in the first bulleted paragraph above, it is not clear how DG-1301 can supersede JLD-ISG-2012-01	Clarification is needed regarding the following aspects of the transition from Orders EA-12-049 and EA-12-051 to 10 CFR 50.155: Some licensees have already achieved compliance with Orders EA-12-049 and EA-12-051 in accordance with JLD-ISG-2012-01 Rev. 0, and JLD-ISG-2012-03 Rev. 0, and their associated NEI guidance documents. It is recognized that 10 CFR 50.155 and the R.G.s associated with DG-1301, and DG-1317 may specify actions that are additional to, and/or different from, the actions required by the JLDs to achieve to compliance with	Describe the process for rescinding Orders EA-12-049 and EA-12-051 following the issuance of the final rule

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				when JLD-ISG-2012-01 has a different purpose than DG-1301.	the NRC Orders. It is also recognized that 10 CFR 50.155 and the associated R.G.s may specify actions that are less restrictive than the corresponding actions needed for compliance with the orders. It is not clear if and when compliance with Orders EA-12-049 and EA-12-051 will no longer be required following issuance of 10 CFR 50.155 and the associated R.G.s.	
24	SFPI	DG-1317	3	The wide-range spent fuel pool level instrumentation required by Order EA-12-051	Confusion created by referring to order not rule	"The wide-range spent fuel pool level instrumentation required by 10CFR50.155(c)(40 (originally required by Order EA-12-051)…"
25	SFPI	DG-1317	4	These regulations require that licensees install reliable means		"These regulations require that licensees install

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				of remotely monitoring wide-range SFP levels to support effective prioritization of event mitigation and recovery		reliable means of remotely monitoring wide-range SFP levels to support the mitigation strategies required by 10CFR50.155(b)(1) and effective prioritization of event mitigation and recovery…"
26	SFPI	DG-1317	6	This exception is needed to strengthen the guidance in NEI 12-02, Rev. 1 by recommending that portable instrument channel components should be designed as hand-held devices or similar rugged components.	"designed as hand-held devices or similar rugged components." Needs further definition. The analogy with commercially available smartphones was used during several meetings with NRC staff in 2012 during development of NEI 12-02.	"This exception is needed to strengthen the guidance in NEI 12-02, Rev. 1 by recommending that portable instrument channel components should be designed as hand-held devices (*e.g.,* commercially available smartphones) or similar rugged components."
27	FLEX	FRN	70611	Section: Supplementary Information: Executive Summary, C. Costs and Benefits:	The changes being made to the mitigation strategies to address the	Suggest the following wording:

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				However, this regulatory analysis does not estimate the impacts that may occur as a result of licensees needing to make changes to mitigation strategies including potential plant modifications as a result of the need to address the seismic and flooding reevaluated hazards for reasonable protection of the FLEX equipment.	information from the reevaluated flooding and seismic hazards is not for the purpose of reasonably protecting the FLEX equipment but is for the purpose of ensuring that the reevaluated hazards can be mitigated. Furthermore, reasonably protecting the FLEX equipment is not the only acceptable method of addressing the hazard.	Although the draft regulatory analysis did not estimate the impacts that may occur as a result of licensees needing to make changes to mitigation strategies including potential plant modifications as a result of the need to address the seismic and flooding reevaluated hazards, the NRC requested information on this issue and these costs are now reflected in the final regulatory analysis.
28	FLEX SFPI	FRN	70615	Section IV.A.1: In making the requirements of Order EA-12-049 generically-applicable, this proposed rule would also consider the reevaluated hazard information developed in response to the March 12, 2012, NRC letter issued under § 50.54(f) as part of providing reasonable protection for	The changes being made to the mitigation strategies to address the information from the reevaluated flooding and seismic hazards is not for the purpose of reasonably protecting the FLEX	Suggest the following wording: In making the requirements of Order EA-12-049 generically-applicable, this rule would also require that licensees consider the reevaluated

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				mitigation strategies equipment against external flooding or seismic hazards.	equipment but is for the purpose of ensuring that the reevaluated hazards can be mitigated. Furthermore, reasonably protecting the FLEX equipment is not the only acceptable method of addressing the hazard.	hazard information developed in response to the March 12, 2012, NRC letter issued under § 50.54(f) in development of the mitigation strategies.
29	General	FRN	70617	The discussion on "SAMG Implementation" concludes with, "The Commission notes that the industry indicated it would strengthen its voluntary initiative for SAMGs in its letter dated May 11, 2015."	This section should be revised to state that the strengthened voluntary industry initiative was approved by the NEI NSIAC on October 15, 2015, and will be implemented per site-specific commitments. Refer to NEI letter, Pietrangelo to Johnson, dated October 26, 2015.	Add this information (or similar) to the "SAMG Implementation" section – "The NEI Nuclear Strategic Issues Advisory Committee (NSIAC) approved a strengthened voluntary initiative for SAMGs on October 15, 2015. This initiative requires timely updates of site-specific SAMGs based on revisions to Owners Group generic severe accident technical guidelines. In addition, SAMGs will be considered

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						within plant configuration management processes, integrated with other emergency response guideline sets and symptom-based EOPs, and validated. Each licensee has sent a letter to the NRC docketing site-specific commitments related to these actions."
30	Proc Integ	FRN	70617	Section IV.B Scope of Procedure and Guideline Integration 2. EDMGs The NRC proposes to expand the scope of the generic term "EDMGs" to include all of the strategies and guidelines used to implement § 50.54(hh)(2).	It is not clear what would be required by this expansion of the term "EDMGs". Per the rule language the EDMGs must address firefighting, operations to mitigate fuel damage, and actions to minimize radiological release.	The NRC should clarify that it is not expanding the requirements currently set forth in § 50.54(hh)(2).
31	Applicability	FRN	70620	Section IV.D Applicability However, the resulting rule was written to remove the EDMG requirements once the certifications of permanent	While explained well in the supplementary information, § 50.155(a)(3) can be clarified to address	In the final rule, § 50.155(a)(3) should be clarified as follows: (3)(i) After the NRC has docketed the certifications

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				cessation of operations and removal of fuel from the reactor vessel were submitted rather than upon removal of fuel from the SFP. The NRC proposes to correct this error from the 2009 final rule in this proposed rule as explained in the "EDMGs" portion of this section.	the applicability of plants undergoing decommissioning. The proposed changes to paragraph (3)(i) eliminates unnecessary language and clarifies that § 50.155 applies until all irradiated fuel has been removed from the spent fuel pool(s). Paragraphs (3)(i)(A) and (B) are added to clarify when the requirements of § 50.155(b)-(e) associated with maintaining and restoring secondary containment capabilities would be applicable to plants undergoing decommissioning. The Supplementary	of permanent cessation of operations and permanent removal of fuel from the reactor vessel described in § 50.82(a)(1) or § 52.110(a) of this chapter, the licensee shall comply with the following provisions until all irradiated fuel has been permanently removed from the spent fuel pool(s): (A) If the reactor design employs secondary containment as a fission product barrier for the spent fuel pool source term, then the licensee shall comply with the requirements of § 50.155(b) through (e) associated with maintaining or restoring secondary containment capabilities, and spent fuel pool cooling capabilities, except that such licensees need not comply with §

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					Information published with the proposed rule states: "This proposed rule would require secondary containment for reactor designs that employ this feature as a fission product barrier for the spent fuel pool source term." See pg. 70,619, Col. II. Thus, use secondary containment as a fission product barrier for the spent fuel pool source term was used to define when the proposed requirements associated with maintaining and restoring secondary containment capabilities would be applicable to plants undergoing	50.155(c)(4); or (B) If the reactor design does not employ secondary containment as a fission product barrier for the spent fuel pool source term, then the licensee shall comply with the requirements of § 50.155(b) through (e) associated with spent fuel pool cooling capabilities, except that such licensees need not comply with § 50.155(c)(4). (ii) Holders of operating licenses or combined licenses for which the NRC has docketed the certifications described in § 50.82(a)(1) or § 52.110(a) of this chapter need not meet the requirements of this section except for paragraph (b)(2) of this section once the decay heat of the fuel in the

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					decommissioning. Paragraph (3)(iv) was added to clarify that the requirements of § 50.155 do not apply once the certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel have been docketed and all irradiated fuel is permanently removed from the spent fuel pool(s). Under no circumstances would §50.155(c)4 remain in effect once all spent fuel in the pool was removed from the reactor vessel five or more years earlier.	spent fuel pool can be removed solely by heating and boiling of water within the spent fuel pool and the boil-off period provides sufficient time for the licensee to obtain off-site resources to sustain the spent fuel pool cooling function indefinitely, as demonstrated by an analysis performed and retained by the licensee. (iii) Dominion Nuclear Connecticut, Inc. (Millstone Power Station Unit 1) is not subject to the requirements of this section. (iv) Holders of operating licenses or combined licenses for which the NRC has docketed the certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel described in § 50.82(a)(1)

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						or § 52.110(a) are not subject to the requirements of this section once all irradiated fuel has been permanently removed from the spent fuel pool(s). (4) §50.155(c)(4) is not applicable if the spent fuel pool contains no fuel used in a reactor vessel for power generation within the past five years or the conditions in §50.155(a)(3)(i),(ii),(iii),(iv) are met, whichever comes sooner.
32	General	FRN	70621	First paragraph, fifth sentence - "For example, functional integration of the strategies, guidelines and procedures would ensure that transition points are explicitly identified and conflicts between strategies are eliminated to the extent practical."	Revise this sentence to better clarify the expectations for procedure and guideline integration. Given the unbounded nature of BDB event sequences, there should be some reasonable limit on the expected work	"For example, functional integration of the strategies, guidelines and procedures would ensure that transition points are explicitly identified and readily apparent conflicts between strategies are eliminated to the extent practicable."

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					directed at eliminating "conflicts." Replace "practical" with "practicable" to better characterize the scope of effort (i.e., feasible, or able to be done or put into practice successfully).	
33	FLEX	FRN	70622	Section IV.D Integrated Response Capability "Specifically, this damage state was implemented through the assumption of the ELAP to the onsite emergency ac buses, but did allow for ac power from the inverters to be assumed available in order to establish event sequence and the associated times for when mitigation actions would be assumed to be required. To address the Order EA-12-049 requirement for an actual loss of all ac power, including ac power from the batteries	The wording of this section and others can easily lead to the conclusion that the mitigating strategies implemented by the industry did not properly consider a loss of all ac power in that the assumptions and initial conditions allowed for the availability of ac power from batteries through inverters. Even though the paragraph in question expressly states there	Revise the statements to clarify the explanation. Suggested wording: "~~Nevertheless, in~~ In this proposed rule the NRC is requiring that the strategies and guidelines be capable of implementation during an ELAP with contingencies to address actions during a loss of all ac power." The language in § 50.155(b)(1) should be changed to eliminate the word "all" from extended loss of ac power in order

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				(through inverters), contingencies are included in the mitigation strategies to enable actions to be taken under those circumstances…..Nevertheless, in this proposed rule the NRC is requiring that the strategies and guidelines be capable of implementation during a loss of all ac power." The paragraph on page 70623 in this same section that starts with "the principal regulatory objective of § 50.63 was….." also states that an ELAP is a loss of all ac power (including ac from inverters) which similarly is not consistent with the approved and implemented definition of an ELAP.	is no intent to either relax or impose new requirements, the overall message of the paragraph is that a loss of all ac power includes the loss of ac power from batteries through inverters. This is inconsistent with the definition of ELAP from the NRC-endorsed industry guidance in NEI 12-06 which defines an ELAP as a loss of off-site power, emergency diesel generators and any alternate ac source but not the loss of ac power from buses fed by station batteries through inverters. To even infer anything different from this definition will create the potential for improper	maintain consistent terminology.

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					interpretation of the required capabilities by future inspectors. The last sentence of the paragraph clearly implies that the rule is requiring something different than what was implemented under the Order. The mitigating strategies do provide contingencies for the loss of ac power from inverters but those contingencies are not the same as assuming a loss of ac power from inverters at the start of the event.	
34	Editorial	FRN	70623	Section IV.D Integrated Response Capability The paragraph that starts with "The proposed mitigation strategies requirements are	The apostrophe after containment should be a comma.	

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				both performance-based and functionally-based." has a sentence in it that says, "Maintaining or restoring three key safety functions (core cooling, containment' and spent fuel pool cooling)….		
35	FLEX	FRN	70623	Section IV.D Integrated Response Capability The paragraph that starts with "The mitigation strategies and guidelines implemented under NRC Order EA-12-049…." concludes with, "The NRC considers the development of timelines for the proposed mitigating strategies using the maximum heat load for either the reactor core or the spent fuel pool to be appropriate. While establishing the capability to mitigate the maximum heat load for both simultaneously would be compliant with the proposed requirement, it would not be necessary."	The paragraph implies that the timelines for strategy deployment for spent fuel pool cooling and core cooling both must assume the maximum heat load simultaneously. This is not what the guidance requires. The timeline for the spent fuel pool strategy is not required to use the maximum heat load in the spent fuel pool for the at power condition. NEI 12-06 in Section 3.2.2.14 states, "The sizing of	The NRC should clarify that the timeline for the spent fuel pool strategies for the at-power case may assume a heat load that is less than the full core offload heat load.

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					FLEX equipment used to cool the SFP should be based on the maximum design basis heat load for the site. For the purposes of determining the <u>response time</u> for the SFP strategies when fuel is in the reactor vessel, the rate of inventory loss of the SFP should be calculated based on the worst case conditions for SFP heat load assuming the plant is at power." (Emphasis added) The timeline for the spent fuel pool strategies for the at-power case may assume a heat load that is less than the full core offload heat	

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					load.	
36	EP	FRN	70625	Under "Staffing"	The FRN does not include a reference to ML13065A048, *Summary of February 19, 2013, Public Meeting to Discuss Framework of Phase 1 Staffing Submittals Related to Issues Associated with Near-Term Task Force Recommendation 9.3*, and the associated information regarding considerations for a BDB event staffing analysis that utilizes security personnel. This information was the basis for creating the NEI White Paper, *Generic Basis for Responses to Staffing Assessment Questions Related to Use of Security Personnel During a*	Add a reference to ML13065A048.

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					BDB Event Response, included in the comment below (see "EP Text Change 1" in Attachment 2).	
37	EP	FRN	70625	Under "Staffing" - see attached "EP Text Change 1" in Attachment 2	In reference to EROs, the term "expanded" is used incorrectly; should revise to align with usage in NEI 12-01 which is the source document (i.e., the term applies only to EROs at multi-unit sites). The description of the staffing analyses performed to respond to the 50.54(f) letter is not entirely accurate; revise language to better reflect analysis purpose and methodology. There is no reference to the NEI white paper on use of security	See attached "EP Text Change 1" in Attachment 2

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					personnel in a staffing analysis; one should be included.	
38	General	FRN	70625	"4. Licensees identify and resolve conflicts between the strategies, guidelines and procedures."	Revise this sentence to better clarify the expectations for procedure and guideline integration. Given the unbounded nature of BDB event sequences, there should be some reasonable limit on the expected work directed at identifying and resolving "conflicts." Replace "practical" with "practicable" to better characterize the scope of effort (i.e., feasible, or able to be done or put into practice successfully).	"4. Licensees identify and resolve readily apparent conflicts between the strategies, guidelines and procedures to the extent practicable."
39	General	FRN	70625	"5. Licensees identify competing considerations when using the strategies,	Revise this sentence to better clarify the expectations for	"5. Licensees identify readily apparent competing considerations when using

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				guidelines and procedures and eliminate or address them in guidance."	procedure and guideline integration. Given the unbounded nature of BDB event sequences, there should be some reasonable limit on the expected work directed at addressing "competing considerations."	the strategies, guidelines and procedures and eliminate or address them in guidance."
40	FLEX	FRN	70627	Section IV.D Equipment The paragraph that starts with, "The underlying proposed requirements…." includes a sentence that says "This proposed rule would require reasonable protection for the equipment relied on for the mitigation strategies to a hazard level as severe as that originally determined for the facility under GDC-2 or the applicable PDC unless the reevaluated hazards stemming from the March 12, 2012, NRC	The equipment being addressed in this paragraph is plant equipment, as opposed to FLEX equipment, and it should be so specified. In accordance with the NRC endorsed implementing guidance, reasonable protection only applies to FLEX equipment. For plant equipment to be	Suggest rewording the sentence as follows: This proposed rule would require plant equipment relied on for the mitigation strategies to meet the current design basis for a hazard level as severe as that originally determined for the facility under GDC-2 or the applicable PDC unless the reevaluated hazards stemming from the March 12, 2012, NRC letter issue under § 50.54(f), as

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				letter issue under § 50.54(f), as assessed by the NRC show that increased protection is necessary."	considered for use in a mitigating strategy it must meet the current plant design basis for the applicable external hazard(s) or the reevaluated seismic and flooding hazards. The paragraph should use this terminology for plant equipment.	assessed by the NRC show that a greater hazard is necessary.
41	FLEX	FRN	70627	Section IV.D Equipment The two paragraphs referring to COMSECY-14-0037.	These two paragraphs do not correctly capture the sequence of events in the development of the mitigation strategies. These paragraphs imply that NEI 12-06 always reflected the intent to update the mitigating strategies based on the reevaluated hazards. The mitigation strategies were developed	To correctly reflect how the reevaluated flooding and seismic hazards came to be included in the rulemaking, this section should be revised to remove statements suggesting that NEI 12-06 contained a requirement to reasonably protect equipment from the reevaluated hazards.

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					based on the design basis hazards that had been documented at the time of Order EA-12-049. The first paragraph says that as a result of COMSECY-14-0037 Order EA-12-049 included a requirement to reasonably protect equipment from the reevaluated hazards. and that these "principles" are reflected in NEI 12-06. The use of the term "most recent flood analysis" in NEI 12-06 did not mean what is implied in these two paragraphs. It meant to select the most recent design basis flood analysis	

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					applicable to the site in question and use that for developing the strategies. It was not referring to the ongoing activities under NTTF 2.1 because otherwise the licensees could not have complied with the Order in the time required. It is agreed that the COMSECY did direct addressing the reevaluated flood and seismic hazards through a mitigating strategies approach. That is, in fact, what is being done through the inclusion of Appendices G and H into NEI 12-06.	
42	Training	FRN	70628	Section IV.D Training The last sentence of the second paragraph in this	This statement is made at the end of the discussion	See attached "Training Text Change 1" in Attachment 2

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				section states, "Licensees would be required to use the SAT process for newly identified training requirements supporting the effective use of the strategies and guidelines that would be required by this proposed rule."	regarding other training programs that do not use the SAT process. The NRC concludes that such programs do not need to be revised to use the SAT process. However, the sentence in question would imply that new training requirements that would be implemented under such programs would need to be developed using the SAT process. The penultimate sentence in this paragraph would then only grandfather existing elements of these programs as not needing to use the SAT process. Since this training will in large part have been completed prior to	

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					the rule becoming effective, the rule should not impose a new requirement (i.e., for newly identified training to use the SAT process) retroactively.	
43	Training	FRN	70628	Under "Training" - see attached "Training Text Change 1" in Attachment 2	The Training description should be revised to better reflect how licensees would implement the new training requirement. A licensee would first need to assess all job tasks necessary to perform mitigating strategies in order to identify training gaps or future modifications. These gaps or modifications would then be addressed in the	See attached "Training Text Change 1" in Attachment 2

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					appropriate training program – a SAT-based program or, for common elements, a non-SAT program currently acceptable for meeting regulatory required training. Also, this section should address expectations for initial training that was delivered prior to the effective date of the rule training requirements.	
44	EP	FRN	70629	Under "Onsite and offsite communications capability"	There is no reference to the licensee communications assessments that were performed in response to the § 50.54(f) request for information of March 12, 2012. These assessments provided the bases for changes implemented by	This section of the FRN should recognize the communications assessments (similar to what was done with staffing) and that implementation of NRC-reviewed proposed changes are sufficient to meet the intent of the proposed requirement in 10 CFR 50, Appendix E,

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					licensees to add communications capabilities for events that result in extended loss of ac power onsite, or potential destruction of offsite communications infrastructure. Each facility's assessment was the subject of a Safety Assessment performed by the NRC staff; the Safety Assessments typically concluded that the assessment for communications was reasonable, and the interim measures, analyzed existing systems, and proposed enhancements would help to ensure that communications are maintained.	Section VII.

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45	EP	FRN	70629	Under "Staffing assessment" - see attached "EP Text Change 2" in Attachment 2	As used here, "EDMGs" are improperly conflated with the staffing assessment conducted under the March 12, 2012 request for information that was developed to align with the requirements included in Order EA-12-049, and the proposed new staffing assessment requirement in 10 CFR 50, Appendix E, Section VII. The reference to EDMGs should be deleted from this paragraph.	See attached "EP Text Change 2" in Attachment 2
46	FLEX	FRN	70632	V. Section-by-Section Analysis Proposed §50.155(b), "Integrated Response Capability" Paragraph starting with, "The proposed § 50.155(b)(1)	Reasonable protection only applies to FLEX equipment and not to plant equipment. This section is referring to both sets of	Suggest rewording the sentence as follows: "This provision also results in the need to have mitigation equipment withstand the effects of

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				would limit the requirements for mitigation strategies to…" The last sentence refers to equipment being reasonably protected.	equipment; therefore, reasonable protection is the incorrect terminology.	external natural phenomena as discussed in later portions of this notice."
47	General	FRN	70632	V. Section-by-Section Analysis Proposed §50.155(b), "Integrated Response Capability"	First column, third paragraph: The citation at the end of the paragraph is incorrect.	The citation at the end of the paragraph should be to § 50.155(f) not § 50.155(g).
48	EP	FRN	70633	Under "Proposed § 50.155(b), 'Integrated response capability'" - see attached "EP Text Change 3" in Attachment 2	Revise wording to clarify the application of § 50.155 (b)(1) and (b)(2) requirements, i.e., (b)(1) applies to all "on-site units" consistent with Order EA-12-049 and, for the current 50.54(hh)(2) requirement, the "affected unit" consistent with industry implementation of	See attached "EP Text Change 3" in Attachment 2

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					NRC-endorsed guidance in NEI 06-12.	
49	FLEX	FRN	70633	V. Section-by-Section Analysis Proposed § 50.155(c), Equipment Requirements	The guidance for implementation of mitigation strategies uses two concepts for ensuring equipment is available to perform its mitigation function(s). For plant equipment the guidance provides that the equipment must meet the current design basis (including the reevaluated flooding and seismic hazards if they are greater). For FLEX equipment the concept of reasonable protection is applied to provide reasonable assurance that the FLEX equipment will be available to perform its function.	Rather than state that all equipment needs to be "reasonably protected," the final rule should reflect the approach allowed by guidance, which ensures that the equipment is available to perform its specified function. For example, § 50.155(c)(2) should be worded "(2) The equipment relied on for the mitigation strategies required by paragraph (b)(1) of this section must withstand the effects of natural phenomena applicable to the facility (including the reevaluated seismic and flooding hazards)." Or in place of "withstand" the phrase "remain available" could be

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					The rulemaking proposes to combine these two concepts under the term reasonable protection. This will create confusion and, in some cases, creates a conflict between the rule and the guidance. For example, the section-by-section analysis states that § 50.155(c)(2) sets the hazard level for reasonable protection at the design basis or the reevaluated flood or seismic hazard whichever is greater. But the analysis also recognizes that the guidance allows ASCE 7-10 to be used for reasonable protection. These two are in conflict.	used. The phrase at the end of this section "that are equivalent to the design basis of the facility" cannot be used as it is contrary to the guidance for reasonable protection of FLEX equipment in NEI 12-06. This language would also allow § 50.155(c)(2)(i) to be eliminated. (See the comments in Attachment 3 under the question Methodology for Addressing Reevaluated Hazards)

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					Hazard protection requirements for SFPI are limited to the NRC endorsed guidance NEI 12-02, Rev 1, which cites the hazard protection requirements in NEI 12-06 *Rev 0 {emphasis added}.* SFPI would be subject to a new requirement for evaluation against the re-evaluated hazards (the intent of proposed §50.155(c)(2)(i) – which is lost in this proposed change). As indicated above, this does not necessarily mean that the SFPI equipment must be altered in any way to account for the re-evaluated hazards. Other	

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					actions might be available to provide the needed information contemplated by the original Order EA-12-051 or to support FLEX operations. With regard to support for FLEX operations, SFPI shall be treated no differently than any other existing plant instruments providing information for FLEX operations.	
50	EP	FRN	70634	First paragraph, first sentence - "Proposed § 50.155(e) would require that each licensee and applicant specified in § 50.155(a) conduct drills and exercises for personnel that would perform activities in accordance with the strategies and guidelines identified in §	Recommend changing second "and" to "or" to align this sentence with the rest of the description contained in this section, and the proposed rule wording in 10 CFR 50.155(e).	"Proposed § 50.155(e) would require that each licensee and applicant specified in § 50.155(a) conduct drills or exercises for personnel that would perform activities in accordance with the strategies and guidelines identified in § 50.155(b)(1)

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				50.155(b)(1) and (2)."		and (2)."
51	EP	FRN	70634	First paragraph, third sentence – "'Integrated' is used to describe the licensee's or applicant's approach to using all tools, spaces, qualified personnel and resources during a performance enhancing experience to the furthest extent practical given a set of initiating conditions and within the bounds of a drill or exercise scenario."	The term "integrated" is not used in proposed 10 CFR 50.155(e), so it is unclear how it can be introduced here in the Section-by-Section Analysis to describe a drill or exercise. The sentence should be reworded such that it is stating the expected attributes (scope) of a drill or exercise demonstrating the integrated use of strategies or guidelines in § 50.155(b)(1) and (2). Revised wording is suggested to improve clarity of expected drill/exercise scope, and "practical" with "practicable" to better	"These drills or exercises should demonstrate usage of the procedures, guidelines, staffing and supporting organizational structure during a performance enhancing experience to the extent practicable given a set of initiating conditions and within the bounds of a drill or exercise scenario."

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					characterize the scope of effort (i.e., feasible, or able to be done or put into practice successfully). Note - the concept of "integrated," as it pertains to capabilities, procedures and guidelines demonstrated in a drill or exercise, is correctly addressed in the second and fourth sentences of this paragraph.	

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52	EP	FRN	70634	Second paragraph, first sentence - "This proposed rule uses the words 'drill' and 'exercise' as they are defined in NUREG-0654/FEMA-REP-1, Revision 1,[9] meaning an evaluated performance-enhancing experience that reasonably simulates the interactions between appropriate centers, work groups, strike teams, or individuals that would be expected to occur during the event."	Recommend changing "appropriate centers, work groups, strike teams, or individuals" to "the appropriate emergency facilities, teams and support groups" to align with standard industry terminology (e.g., in emergency plans and NEI 99-02). This will improve understanding of rule expectations.	"This proposed rule uses the words 'drill' and 'exercise' as they are defined in NUREG-0654/FEMA-REP-1, Revision 1,[9] meaning an evaluated performance-enhancing experience that reasonably simulates the interactions between the appropriate emergency facilities, teams and support groups that would be expected to occur during the event."
53	EP	FRN	70635	First paragraph, second sentence - "This would require that the drills and exercises performed to demonstrate this capability include transitions from other procedures and guidelines, as applicable, and the use of communications equipment that would be required by proposed 10 CFR part 50, appendix E, section	Recommend changing first "and" to "or" to align this sentence with the rest of the description contained in this section, and the proposed rule wording in 10 CFR 50.155(e).	"This would require that the drills or exercises performed to demonstrate this capability include transitions from other procedures and guidelines, as applicable, and the use of communications equipment that would be required by proposed 10 CFR part 50, appendix E,

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				VII."		section VII."
54	New Plants	FRN	70644	"… ELAP concurrent with either a loss of normal access to the ultimate heat sink (LUHS) or, for nuclear power plants with passive reactor designs, a loss of normal access to the normal heat sink…."	10 CFR 50.155(b)(1) does not address the possibility that some new plant designs may use an ultimate or normal heat sink.	In order to avoid having to make a rule change when additional new plant designs progress, the language in section 155(b)(1) regarding heat sinks should be revised to accommodate new designs as they become available.
55	EDMGs	FRN	70644	The rule language in § 50.155(b)(2).	The requirement in § 50.155(b)(1) addresses strategies and guidelines that must be capable of being implemented site-wide. § 50.155(b)(2) does not specify that it is only intended to apply to the affected unit.	To avoid backfit concerns regarding a potential unanalyzed expansion of what is now required by § 50.54(hh)(2), it is recommended that § 50.155(b)(2) be reworded as follows: (2) *Extensive Damage Mitigation Guidelines (EDMGs).* Strategies and guidelines to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of

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						the plant due to explosions or fire. These strategies and guidelines must be capable of being implemented in the affected unit and must address the following areas:
56	SFPI	FRN	70645	§50.155(c) "(4) The equipment relied on for the mitigation strategies in paragraph (b)(1) of this section must include reliable means to remotely monitor wide-range spent fuel pool levels to support effective prioritization of event mitigation and recovery actions."	Sweeps up SFPI into the requirements for mitigating strategies. Order EA-12-051 was separate and distinct from the mitigating strategies order with different purposes and characteristics. The strategies referred in §50.155(b)(1) do not attach to SFPI, which is only intended to provide information for prioritization of actions. The proposed rule language could lead to inadvertent application of	"(4) The mitigation strategies required in paragraph (b)(1) must be supported by spent fuel pool level information from wide-range level instruments capable of meeting the conditions specified in paragraph (b)(1) and to provide information to support effective prioritization of event mitigation and recovery actions." "(i) The imposition of the paragraph (c)(2)(i) to the wide-range level instrumentation does not invoke imposition of any other mitigation strategy

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					unnecessary and unintended requirements for SFPI.	requirement on the wide-range level instrumentation,"
57	SFPI	FRN	70645	§50.155(c)(2): (i) Each licensee that received the March 12, 2012, NRC letter issued under § 50.54(f) concerning reevaluations of seismic and flooding hazard levels, shall provide reasonable protection against that reevaluated seismic or flooding hazard(s) if it exceeds the design basis of its facility.		See comment above on section-by-section analysis at FRN page 70633
58	FLEX SFPI	FRN	70645		10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," does not apply to FLEX equipment or SFP level instrumentation whose primary design	The proposed regulation should state that the Maintenance Rule (10 CFR 50.65) is not applicable to FLEX equipment or SFPI level instrumentation required by § 50.155(c) .

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					function is to support strategies developed to comply with this rule. The Maintenance Rule is intended to apply to SSCs whose failure impacts safety related functions, are relied upon for the mitigation of design basis events, and required for an EOP mitigating function. The failure of FLEX equipment or SFP level instrumentation with the primary design function of supporting this rule does not impact any safety related function nor is this equipment relied upon or required for a design basis or an EOP mitigating	

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					function.	
59	FLEX SFPI	FRN	70645		The NRC's cyber security rule codified in 10 CFR 73.54 would not apply to FLEX equipment or SFP level instrumentation. The cyber rule provides the programmatic requirements to defend against the design basis threat of radiological sabotage cyber attack. The regulation applies to digital SSCs within the nuclear power plant that, if compromised, could directly or indirectly result in radiological sabotage (i.e., significant core damage or spent fuel sabotage). The FLEX equipment and SFPI level instrumentation	The proposed regulation should state that the Cyber Security Rule (10 CFR 73.54) is not applicable to FLEX equipment or SFPI level instrumentation required by § 50.155(c). The proposed regulation should also state that the wide-range level instruments are not subject to the requirements of the cybersecurity rule regardless of the use of the information provided by the instruments for any emergency action level(s).

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					do not provide safety-related or important-to-safety functions. Nor do the FLEX equipment and SFPIlevel instrumentation constitute support systems or equipment necessary for safety-related systems to perform their intended safety functions. Accordingly, the NRC's cyber security regulations do not apply. Additionally, given the FLEX equipment would be covered by a maintenance program, imposing the cyber security requirements would not provide a significant safety benefit.	

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60	EP	FRN	70646	Proposed 10 CFR 50, Appendix E, Section VII	The wording in this section notwithstanding, future readers may interpret that these requirements must be described in a site emergency plan. Since 10 CFR 50.155(b)(4) addresses staffing and (e)(1 through 4) address communications, the clarity of MBDBE requirements would be improved if the related staffing and communications aspects were consolidated in 10 CFR 50.155. Recommendations on change control are contained in our responses to the	Recommend relocating the contents/requirements of proposed 10 CFR 50, Appendix E, Section VII, to proposed 10 CFR 50.155 as section (f), and re-designate Change Control as section (g) and Implementation as (h). Also make conforming changes throughout the FRN.

Comment #	Tech Area	Document	Page	Text	Concern	Suggestion for Change
					rulemaking questions (see Attachment 3 questions 1 and 2) Change control is described in NEI 12-02 App. 1 (QA).	
61	New Plants	FRN	70646	Proposed Part 50, Appendix E, VII. Communications and Staffing Requirements for the Mitigation of Beyond Design Basis Events, requires holders of combined licenses (COLs) issued under Part 52, where the Commission has not yet made the finding under 52.103(g) to perform a detailed analysis and submit it to the NRC "at least 2 years before the date specified for completion of the last inspections, tests, and analyses in the inspections, tests, analyses, and acceptance criteria (ITAAC) completion schedule required by § 52.99(a) of this chapter for the plant."	Some COL holders are on schedule to complete all their ITAAC less than 2 years from the rule's expected effective date (i.e., a Jan. 2019 fuel load date with a Jan. 2017 rule effective date). Under the proposed rule, such a licensee could not comply with the implementation schedule in the proposed rule. As a practical matter, a licensee in that situation may have to complete and submit the required analysis before the rule even	Suggest revising proposed Part 50, Appendix E, VII.1.b as follows: b. A holder of a combined license issued under 10 CFR part 52 before the Commission has made the finding under § 52.103(g) of this chapter shall perform this analysis and submit it to the NRC under § 52.3 of this chapter ~~at least~~ 2 years before the date specified for completion of the last inspections, tests, and analyses in the inspections, tests, analyses, and acceptance criteria (ITAAC) completion schedule required by § 52.99(a) of

Comment #	Tech Area	Document	Page	Text	Concern	Suggestion for Change
					becomes effective to avoid the need for an exemption. To give licensees a reasonable amount of time to comply with this rule, COL holders who are already within 2 years of the specified date for their last ITAAC completion when the rule becomes effective should be given the same submittal schedule as operating plants.	this chapter for the plant OR [DATE 365 DAYS AFTER EFFECTIVE DATE OF THE FINAL RULE], whichever is later.
62	EP	NEI 13-06	---	Various – see attached "redline/strikeout" version and "clean" version of NEI 13-06, Revision 1 that are included in Attachments 4 and 5.	Since the submittal of revision 0 of NEI 13-06 in September of 2014, additional NRC documents have been issued that should be referenced in the document. Section 3.3.1 should be revised to reflect that training on common	Various – see attached "redline/strikeout" version and "clean" version of NEI 13-06, Revision 1 in Attachments 4 and 5. Includes editorial/minor changes to improve clarity; these are non-intent changes.

Attachment 1: MBDBE Rulemaking Comment Table

Comment #	Tech Area	Document	Page	Text	Concern	Suggestion for Change
					elements may be addressed by a non-SAT training program acceptable for meeting regulatory required training, and non-SAT training programs that meet the needs for common elements do not need to be revised to use the SAT process (both these points will bring the guidance into better alignment with Training discussion in the rule FRN). Section 3.3.2, Plant-Referenced Simulator, should be revised to better align the wording with related guidance in NEI 12-06. Consistent with SRM-SECY-15-0065, clarify that SAMG drills are not a regulatory	

Comment #	Tech Area	Document	Page	Text	Concern	Suggestion for Change
					requirement and are conducted on a voluntary basis. Section 5.3.7, Drills Demonstrating the Use of Strategy-Related Equipment, should address expected action if placement of portable equipment during a drill is not practicable (e.g., due to plant safety or configuration control issues). Replace "Regional Response Center" with correct title – "National SAFER Response Center."	
63	EP	NEI 14-01	---	Various – see attached "redline/strikeout" version and "clean" version of NEI 14-01, Revision 1 that are included in Attachments 6 and 7.	Since the submittal of revision 0 of NEI 14-01 in September of 2014, additional NRC documents have been issued that should be referenced in the	Various – see attached "redline/strikeout" version and "clean" version of NEI 14-01, Revision 1in attachments 6 and 7. Includes editorial/minor changes to improve clarity;

Attachment 1: MBDBE Rulemaking Comment Table

Comment #	Tech Area	Document	Page	Text	Concern	Suggestion for Change
					document. A reference to the strengthened industry initiative on maintenance of SAMGs (approved by the NEI NSIAC) should also be included.	these are non-intent changes.

Attachment 2: Comment Table Text Changes

EP Text Change 1

FRN, starting on page 58

Staffing

The NRC proposes to require licensees to provide the staffing necessary for having an integrated response capability to support implementation of the FSGs and EDMGs. To be effective, staffing ~~for an expanded response capability~~ should include the trained and qualified individuals who would be relied upon to analyze, recommend, authorize, and implement the mitigating strategies. The staffing must directly support the assessment and implementation of a range of mitigation strategies intended to maintain or restore the functions of core cooling, containment, and spent fuel pool cooling.

The staffing analyses required by proposed appendix E, section VII, should determine the required staff necessary for responding to a beyond design basis external event that affects all units on a site. A staffing analysis must confirm that sufficient personel are available to implement FSGs within the timeframes necessary to ~~when personnel performing expanded response functions should report to the site, within a timeframe sufficient to support implementation of the strategies that are not assigned to the on- shift staff. This would~~ ensure that the functions of core cooling, containment, and spent fuel pool cooling are continuously maintained or are promptly restored. The analysis will consider the availability of both on-shift and augmenting responders and, for multi-unit sites, an expanded emergency response organization that enables performance of unit-specific accident assessment and mitigation functions.

The NRC has endorsed the industry guidance for conducting staffing analyses, NEI 10-05, "Assessment of On-Shift Emergency Response Organization Staffing and Capabilities," Revision 0, and NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities," Revision 0, and the NRC has issued Interim Staff Guidance (ISG), NSIR/DPR-ISG-01, "Emergency Planning for Nuclear Power Plants," that provides the requisite details for determining the staffing levels and for which positions, as well as which beyond design basis external events, the applicants and licensees should evaluate. The NRC has also reviewed and concurred with related guidance presented in NEI White Paper, "Generic Basis for Responses to Staffing Assessment Questions Related to Use of Security Personnel During a BDB Event Response."

The recommended minimum positions and staffing levels for emergency plans were initially provided in NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants." Following the September 11, 2001, events, the NRC issued Enhancements to Emergency Preparedness Regulations (EP final rule) (76 FR 72560) to amend 10 CFR part 50, appendix E, to address, in part, concerns about the assignment of tasks or responsibilities to on-shift emergency response organization (ERO) personnel that would potentially overburden them and prevent the timely performance of their functions under the emergency plan. Licensees must have enough on-shift staff to perform specified tasks in various functional areas of emergency response 24 hours a day, 7 days a week. This proposed rule would address the staffing requirements for the ~~expanded~~ response

capabilities for on-shift response and the ERO, including an expanded response capability for multi-unit sites.

This proposed rule would require adequate staffing to implement the FSGs and EDMGs with the EOPs without requiring further analysis to supplement analyses that were completed as a result of post-Fukushima orders, responses to the § 50.54(f) request for information of March 12, 2012, or the EP final rule. Staffing levels should be established to ensure that if strategies are executed there would be no delays in completing them caused by the lack of qualified personnel. The NRC expects that the use of drills, existing training analyses and other methods would verify sufficient staffing levels.

Attachment 2: Comment Table Text Changes

Training Text Change 1

FRN, starting on page 67

The NRC acknowledges that licensee training programs, such as those required for licensed operators under 10 CFR part 55, "Operators' Licenses," the programs for plant personnel specified under § 50.120, "Training and Qualification of Nuclear Power Plant Personnel," and the training for emergency response personnel required by 10 CFR part 50, appendix E, section IV.F, "Training," would likely provide for many of the knowledge and abilities required for performing activities in accordance with the strategies and guidelines that would be required by this proposed rule. The NRC also recognizes that while each of these programs is currently acceptable for meeting regulatory required training, some ~~there are other training programs~~ are based on a Systems Approach to Training (SAT) process as defined in § 55.4 while others ~~that are currently acceptable for meeting other regulatory required training (e.g., 10 CFR part 50, appendix E, section IV.F) that~~ do not use the SAT process.~~-~~[7] Training programs that do not use a SAT approach have been found acceptable for more frequently occurring design-basis events; therefore, the NRC has determined that these training programs can meet the needs for common elements with beyond-design-basis mitigation and would not require licensees to revise these training programs to use the SAT process to meet the proposed requirements. Nevertheless, as noted previously, the NRC anticipates that mitigating ~~these~~ strategies and guidelines may use new methods or equipment that require knowledge and abilities not currently addressed under existing training programs and, as a result, there may be gaps in these training programs that must be addressed to support effective use of the strategies and guidelines. Accordingly, this proposed rule would further require that licensees provide for the training of personnel using a SAT process ~~systems approach to training~~ as defined in § 55.4 ~~(the Systems Approach to Training (SAT) process)~~, except for elements already covered under other NRC regulations.~~7~~ Licensees would assess the jobs to be performed in order to ~~The SAT process, which is acceptable for meeting training requirements under 10 CFR part 55 and § 50.120, would also be appropriate for licensee~~ identify~~ication and resolution of~~ any current gaps or future modifications to personnel training that may be necessary to provide for the training of personnel performing activities in accordance with the mitigating strategies and guidelines that would be required by this proposed rule.~~-~~ The licensee would then address the identified training needs in a SAT-based training program or, for common elements, in a program acceptable for meeting other regulatory required training. ~~The NRC recognizes that there are other training programs that are currently acceptable for meeting other regulatory required training (e.g., 10 CFR part 50, appendix E, section IV.F) that do not use the SAT process. In light of the existence of these training programs, which have been found acceptable for more frequently occurring design-basis events, the NRC has determined that these training programs can meet the needs for common elements with beyond-design basis event mitigation. Therefore, the NRC would not require licensees to revise these training programs to use the SAT process to meet the proposed requirements. Licensees would be required to use the SAT process for newly identified training requirements supporting the effective use of the strategies and guidelines that would be required by this proposed rule~~

By identifying training needs and then using the SAT process or another process within an approved training program, licensees ~~would identify and~~ will train on any additional tasks that would be necessary to implement the strategies and guidelines for the mitigation of beyond design-basis

events as defined in this proposed rule. The additional tasks identified would be incorporated into the training program to ensure appropriate training would be administered for each qualified individual designated to implement the strategies and guidelines required by this proposed rule. The NRC is not requiring that initial training provided to personnel to achieve compliance with post-Fukushima NRC Orders be re-delivered to those personnel if the training was not developed using a SAT-based process.

Attachment 2: Comment Table Text Changes

EP Text Change 2

FRN, starting on page 73

2. Staffing assessment

This proposed rule would require an assessment that is considered essential for effective implementation of the FSGs. This assessment matches the one that was conducted under the March 12, 2012, request for information that was developed to align with the requirements included in Order EA-12-049 (i.e., the staffing analysis specifically considered the staffing needs for implementing Order EA-12-049); licensees would not be required to repeat the staffing analysis. A lesson-learned from the Fukushima event is that there are increased staffing demands following a beyond-design-basis external event, and this coupled with the subsequent NRC requirements issued in Order EA-12-049 required the staffing analysis to provide a level of assurance that the FSGs can be implemented. This provision would then support the proposed requirements of the rule to have sufficient staffing to implement the FSGs ~~and EDMGs~~ in conjunction with the EOPs.

Attachment 2: Comment Table Text Changes

EP Text Change 3

FRN, starting on page 85

Proposed § 50.155(b)(4) would establish requirements for licensees to provide the staffing necessary for having an integrated response capability to support implementation of the strategies and guidelines in proposed (b)(1) and (2). The number and composition of the response staff should be sufficient to implement (b)(1) mitigation strategies and guidelines ~~intended to maintain or restore the functions of core cooling, containment, and spent fuel pool cooling~~ for all on-site ~~affected~~ units and (b)(2) mitigation strategies and guidelines for the affected unit. The word "sufficient" is used in the proposed paragraph to reflect its meaning "adequate."

Attachment 3: Responses to Questions in Sections VI and XI

Specific Requests for Comments (FRN Section VI)

1.) Change Control

We understand the intent of proposed 10 CFR 50.155(f) is to allow the licensee to make changes in the implementation of the requirements in § 50.155 and 10 CFR part 50, appendix E, section VII, without NRC approval as long as the licensee continues to meet the provisions of § 50.155 and 10 CFR part 50, appendix E, section VII. This is an appropriate change control standard for these beyond-design-basis event requirements. We propose the following minor clarification to § 50.155(f)(1):

> *(f) Change Control. (1) A licensee may make changes in the implementation of the requirements in this section and 10 CFR part 50, appendix E, section VII, without NRC approval, provided that before implementing each such change, the licensee ~~performs an evaluation demonstrating~~ demonstrates that the provisions of this section and 10 CFR part 50, appendix E, section VII, continue to be met.*

The associated guidance for the proposed regulation will be key to understanding that the proposed change control provision is intended to allow such changes without NRC approval. In accordance with the endorsed change control guidance in NEI 12-06, the licensee need not obtain prior NRC approval to make a change, provided that the licensee's assessment determines that the provisions of § 50.155 and 10 CFR part 50, appendix E, section VII continue to be met. The supplementary information seems to contradict this by stating that "the proposed change control provisions may result in licensees seeking NRC review and approval of proposed changes that do not follow current regulatory guidance for this proposed rulemaking potentially *through a license amendment*."[1] Under the plain language of both proposed § 50.155(f) and NEI 12-06, a licensee would not need a license amendment to implement strategies that are not approved in regulatory guidance if the licensee performs a documented assessment demonstrating that the change continues to meet applicable regulatory requirements.

Current paragraph (f)(2) would be renumbered as (f)(3) as follows:

> *(f)(3) Documentation of all changes, including those required by paragraph (f)(1) of this section, shall be maintained until the requirements of this section and section VII of appendix E to 10 CFR part 50 no longer apply.*

[1] 80 Fed. Reg. at 70,628 (emphasis added).

2.) Application of Other Change Control Processes

Section 50.155(f)(2) should explicitly and clearly address the application of "Other Change Control Processes" given that facility changes can impact multiple aspects of the plant having different applicable requirements, and being subject to different change control requirements. The rule and associated guidance should consistently differentiate between design basis conditions and beyond-design-basis conditions by clarifying that other change control processes such as § 50.59, § 50.54(p), § 50.54(q), and fire protection change controls are not applied to changes affecting only implementation of the strategies and guidelines required by 10 CFR 50.155(b). This would reflect the NRC staff position stated in an NRC letter from Dean to Pollock, dated April 17, 2015 (see ML14147A073). Specifically,

> "Provided that such changes do not also involve changes to the plant or procedures as described in the UFSAR, the associated guidance in NRC endorsed documents such as NEI 96-07, 'Guidelines for 10 CFR 50.59 [Title 10 of the Code of Federal Regulations (10 CFR), Section 50.59] Implementation,' and NEI 97-04, 'Design Basis Program Guidelines,' would support 'screening out' those changes and not needing to evaluate them in accordance with the regulatory processes associated with the UFSAR (i.e., 10 CFR 50.59 and 50.71). The same is true for other key licensing basis documents such as the security plan and emergency plan, and their related change control and reporting requirements, provided the changes being evaluated impact only mitigating strategies for BDBEEs and do not affect the content of the other licensing basis documents."

As noted, NRC endorsed documents allow the determination that 10 CFR 50.59 does not apply to changes that are determined to be beyond-design-basis (i.e., changes to the plant or procedures that are **not** described in the UFSAR). In the same manner and based on the applicability determination made under 10 CFR 50.59, other change control processes for the security plan, emergency plan and fire protection plan would not be applicable to changes affecting only implementation of the strategies and guidelines required by 10 CFR 50.155(b).

In this regard, the following is the suggested change control language for § 50.155(f)(2):

> *(f)(2) Changes in implementation of requirements in this section and 10 CFR part 50, appendix E, section VII are not subject to change control processes other than paragraph (f)(1) provided the changes being evaluated impact only mitigation of beyond-design-basis events.*

Alternatively, the regulation could contain a provision that allows licensees to deem acceptable a change evaluated through these other change processes provided the change affects only the implementation of the strategies and guidelines required by this section. The suggested provisions would be particularly relevant to streamlining the assessment of potential change impacts on programmatic requirements associated with Security, Emergency Preparedness, and Fire Protection that would only be implemented during an actual beyond-design-basis event.

Attachment 3: Responses to Questions in Sections VI and XI

3.) Reasonable Protection

Background

The Mitigating Beyond Design Basis Events rulemaking package asked for feedback on the cost to licensees of implementing the proposed requirement that equipment supporting mitigating strategies be protected from the effects of natural phenomenon including both those in the current plant design basis as well as the reevaluated hazard under the March 12, 2012 section 50.54(f) request concerning the flooding and seismic hazards.

The estimates provided in response to this question are based on the guidance for Mitigating Strategies Assessment (MSA) contained in NEI 12-06, a document that has been endorsed by the NRC. Our interpretation of the proposed rule's requirements for a MSA differs from the guidance in NEI 12-06. Specifically, the language in section 50.155(c)(2) seems to focus the assessment on the protection of mitigating strategies equipment, whereas the guidance allows the use of alternate mitigating strategies to cope with the hazards. We propose changes to the rule language to address this discrepancy in our response to question VI.9. If the final rule precludes these alternate mitigating strategies, industry compliance costs would be significantly greater than reflected here, without any corresponding safety benefit. With that caveat, NEI offers the following feedback on the costs and impacts licensees expect occur because of a new requirement to address the reevaluated hazards within their mitigation strategies for beyond-design-basis external events.

Survey

In December 2015, NEI surveyed the utilities to obtain information related to the NRC's request. Our survey characterized its questions as follows.

> The purpose of this survey is to collect cost and implementation information that may support some of the industry comments on the rulemaking package and allow NEI to submit a response to these questions that summarizes industry input.
>
> The questions below provide some task details that will help answer the NRC's questions. The cost or implementation schedule estimates provided should be based on the evaluations and changes that will be necessary under the new rule, the estimates should not include the costs or time associated with implementing the existing Orders or any previous rulemaking but may include costs associated with response to the NRC 50.54(f) letter to the extent they are being used in support of mitigating strategies.
>
> With respect to estimating mitigating strategies changes to address the reevaluated seismic and flooding hazards, we recognize that Mitigating Strategies Assessments (MSAs) have not been completed, but the guidance has been issued (see NEI 12-06 rev 2) and you probably know the difference between the FLEX DB hazard and the reevaluated hazard results. As a result, you may have an idea of what changes you need to make to accommodate these differences. Your best estimate of the cost and implementation schedule is all that is requested.

Attachment 3: Responses to Questions in Sections VI and XI

The questions asked in the survey were the following.

> A. Please provide man-hour or cost estimates for the following (indicate which is provided):
>
> 1. Completion of a flooding MSA per NEI 12-06 rev 1 Appendix G
> 2. Indicate what strategy will be used for the flooding MSA (FLEX OK, mod FLEX, AMS, or THMS)
> 3. Completion of a seismic MSA per NEI 12-06 rev 1 Appendix H
> 4. Indicate what path will be used in the seismic MSA (Path 1, 2, 3, 4, or 5)
> 5. Complete NRC submittal of flooding and seismic MSA results
> 6. Revise FLEX program and OIP or FIP documents to reflect MSA results
> 7. Revise FLEX Support Guidelines, if necessary, to reflect MSA results
> 8. Train staff on revised FLEX Support Guidelines
> 9. Completed plant modifications, if necessary, to address results of MSA
>
> B. Please provide a brief summary of the modifications to mitigating strategies and the plant that you expect to have to make, and how long (in terms of years or RFOs) it will take to design and implement the changes. Also briefly indicate what is driving the schedule.

There are several key assumptions and observations related to interpreting the results of the survey.

- All costs are on a per site basis.
- The guidance for completing Mitigating Strategies Assessments (MSA) was not final at the time of the survey. The survey referred to revision 1 of NEI 12-06. Revision 2 had just been completed at the time of the survey; the utilities may not have been fully aware of its contents or the changes since revision 1, especially in the seismic area.
- MSA guidance may be affected by NRC comments during the endorsement process.
- No utility had actually completed a MSA at the time of the survey. As a result:
    - The effort required to complete a MSA is a best estimate.
    - The effort required to implement any changes to plant programs and procedures and complete any necessary training is dependent on the results of the MSA. Since these results are not known, estimates have a large uncertainty.
    - The extent of any plant modifications is dependent on both the mitigating strategy used and the results of the evaluation as compared to existing plant design. Both of these factors have a very large effect on estimate uncertainty.
- One of available seismic strategies uses a probabilistic approach. The cost of developing the underlying seismic PRA is not included in the estimates.
- Costs of maintaining configuration control for the resulting programs, procedures and modifications were not included in the estimates.
- NRC review fees are not included in the estimates. Experience indicates that the review fees for some submittals can be close to the development costs for the information.

- Some utilities responded with manhour estimates, some with cost. An assumption of $100 per manhour was used to consolidate the information.

Because of all of these uncertainties, the information provided below will use averages or ranges.

Survey Results

NEI received responses from approximately 60% of the sites. For those that responded:

MSA Cost

The average effort necessary to complete a flooding MSA may be approximately:

- 690 manhours if the existing FLEX strategy is OK (~two-thirds of responding sites)
- 2,450 manhours if the FLEX strategy needs to be modified (~one-third of responding sites)
- 1,550 manhours if an AMS strategy is used (~one-tenth of responding sites)
- 2,500 manhours if a THMS strategy is used

The average effort necessary to complete a seismic MSA may be approximately:

- 60 manhours for path 1 (~one-third of responding sites)
- 450 manhours for path 2 (~one-seventh of responding sites)
- 3,800 manhours for path 3 (~one-seventh of responding sites)
- 7,300 manhours for path 4 (~one-fifth of responding sites)
- 10,000 manhours for path 5 (~one-fifth of responding sites)

Implementation Cost

Implementation costs depend on the combination of flooding and seismic strategies adopted, and, of course, how much the existing FLEX implementation plans would need to change. For the reasons mentioned above, the estimates varied widely. The information below is presented in manhour ranges per site for those that expect to perform implementation tasks. Note that some sites expect zero costs for programs, procedures, or training efforts if no changes are expected.

- MSA submittal costs ranged from approximately 400 to 1000 manhours
- Program revision costs ranged from approximately 100 to 700 manhours
- Procedure development and revision costs ranged from approximately 50 to 1,500 manhours
- Training costs ranged from approximately 50 to 1,500 manhours

Modification Cost

The estimates of plant modification costs varied tremendously between sites; in fact many respondents submitted a very broad range for the potential modification efforts at a given site. This is due to the fact that licensees do not yet have a good picture of what plant changes will be necessary. Individual plant estimates ranged from zero (no modifications expected) to tens of millions of dollars for sites that may need to enhance their flood protection features. The average

anticipated potential modification cost for the respondents was 4.5 million dollars. This cost is in addition to the other implementation costs discussed above.

Implementation Time

The expected time necessary to achieve full compliance with the proposed rule varied widely due to site specific differences in the status of evaluations and the effects of the evaluation on the plant, but as a rule, many of those that had to make changes considered the time allowed in the draft rulemaking package (2 years from the effective date of the rule),insufficient. This observation, and our recommendation to deal with this fact, is provided in our response to the rulemaking package question in Section VI on Implementation Deadline.

4.) Mitigation of Beyond-Design-Basis Events Staffing Analysis

The industry prefers that the two staffing analyses - one for Proposed 10 CFR part 50, appendix E, section VII and the other for 10 CFR part 50, appendix E, section IV - and their corresponding requirements not be combined. In general, we believe that there should be a clear demarcation between response planning and capabilities described in a site emergency plan, associated with the requirements of 10 CFR 50 Appendix E, and those for beyond design basis events governed by proposed 10 CFR 50.155. This separation facilitates better understanding of the underlying requirements and planning bases for various program elements, and the application of change control processes.

5.) Training Requirements

Industry has provided proposed changes to address any potential unintended consequences of the proposed rule language for programs not currently required to be SAT-based, see Attachment 2.

6.) Drill or Exercise Frequency

The industry believes that the drill or exercise frequency proposed by § 50.155(e)(3) and (4) is appropriate. Personnel performing activities in accordance with FLEX and EDMG strategies and guidelines will receive training developed by the SAT process or other processes used by training programs that are acceptable for meeting regulatory required training (e.g., 10 CFR part 50, appendix E, section IV.F, "Training.") These processes and training programs have proven effective in preparing individuals for job performance. In addition, many of the job tasks/skills that emergency response personnel would perform during a BDB event response drill are the same as, or similar to, those performed during EP Program drills and exercises conducted to meet the requirements of 10 CFR 50, Appendix E. The proposed BDB drill or exercise frequency provides sufficient performance enhancing opportunities in light of the new training requirements, and responder participation in more frequent EP Program drills and exercises.

7.) Equipment Requirements

The NRC requested comments on "the need for a separate maintenance provision." The industry does not see a need for a separate provision in the rule addressing maintenance of the equipment addressed in § 50.155(c). The more general requirement of § 50.155(b)(1) is sufficient, and, along with the guidance in NEI 12-06, as endorsed by DG-1301, adequately addresses equipment maintenance.

However, if § 50.155(c)(3) is retained, it is not seen to be inconsistent with the guidance in Section 11.5 of NEI 12-06. The proposed rule language states that the equipment must receive "adequate" maintenance. Adequate is a subjective term that would be open to wide variation in its interpretation. For this reason, the word "adequate" should be eliminated. The remainder of the proposed rule language more appropriately and specifically addresses the intent of "adequate" in saying that the maintenance is performed "such that the equipment is capable of fulfilling its intended function."

8.) Equipment Protection Implementation Deadline

Section 50.155(g)(1) would require that each holder of an operating license comply with all provisions of this section no later than 2 years following the effective date of the rule. As explained below, this timeframe is not adequate.

The degree to which the reevaluated seismic or flooding hazard(s) may impact the implementation of mitigating strategies varies widely across the operating reactor fleet, and the various evaluations necessary to prepare for any necessary modifications are in different stages of completion, for example:

- Some sites have not yet finished their flooding hazard reevaluations: These situations are due to work that must be completed by the US Army Corps of Engineers.
- Some sites have simple evaluations: A number of sites have reevaluated hazards that are bounded by the design basis of the facility and the level of effort to demonstrate compliance with the proposed rule may be complete in advance of the effective date of the rule.
- Some sites will need to complete additional evaluations: These sites have reevaluated hazards that exceed the design basis of the facility. They must perform detailed Mitigating Strategies Assessments or MSAs in order to evaluate the effect of the external hazard on their mitigating strategies.
- Some sites still must develop the methodology needed to perform their MSAs: For example, the input for Seismic MSAs that use Path 5 (SSE greater than 2xSSE) may be risk-informed based upon a seismic PRA, which is currently in progress. A two year implementation timeline would not provide adequate time for review of the SPRA results by the NRC Staff prior to completion of modifications under the Rule.

Completion of the engineering, design, planning and installation of any identified modifications or other plant changes is a complex process; sufficient time should be provided to completed the work efficiently, for example:

- Utilities will not start the modification process until their MSAs have been approved by the NRC (note that utilities will not start this process when their hazard report results have been approved as stated on page 70634 of the FRN because it is the MSA that will determine the results of the hazard on mitigating strategies, not the hazard report.) At this point they will need to prepare, plan, and implement the necessary modifications or procedure changes and train their staff. Some of the plant modifications will require access to plant equipment or spaces that are not available except during outages.
- If greater than minor modifications are indicated, a two year implementation window would tend to require that the modifications be performed at risk or fast-tracked, where engineering/design would be performed in parallel with installation of the change. This is inefficient and increases the risk for errors and rework.

By allowing each licensee to develop and submit to NRC a unit-specific implementation schedule, the NRC would allow for more precise implementation schedules that could account for this variation. Under this approach, some licensees would accelerate their implementation quicker than required by

the proposed rule when, for example, their reevaluated hazards are bounded by the design basis of the facility. On the other hand, this approach would accommodate other licensees that cannot address their reevaluated hazards within the time required by the proposed rule because, for example, they are still awaiting input from other government agencies. Therefore, the industry suggests that each holder of an operating license submit a schedule for achieving full compliance with the requirements of 50.155 within 90 days from the effective date of the rule. We propose the following:

> 50.155(g)(1) - *Each holder of an operating license under this part on [EFFECTIVE DATE OF FINAL RULE] shall submit to the U.S. Nuclear Regulatory Commission a schedule for achieving full compliance with the requirements of 50.155 no later than 90 days following [EFFECTIVE DATE IF THE FINAL RULE].*

9.) Methodology for Addressing Reevaluated Hazards

The NRC is requesting comments on the following statement: "The NRC is proposing to require licensees for operating nuclear power plants to address the reevaluated flooding hazard levels by reasonably protecting the mitigating strategies equipment to those levels if they exceed the design-basis flood level for the facility."

The need for a licensee's strategies and guidelines to be capable of execution in the context of the reevaluated flooding and seismic hazards' information should be addressed in § 50.155(b)(1) rather than § 50.155(c)(2). Consistent with NRC-endorsed guidance, the reasonable protection concept only applies to FLEX equipment and is an element of a viable mitigating strategy but is not, in itself, a mitigating strategy. As proposed, the incorporation of the reevaluated hazards into § 50.155(c)(2)(i) would expand the reasonable protection concept beyond FLEX equipment and yet still not achieve the intended objective of developing mitigating strategies for the reevaluated flood and seismic hazards.

Rather than focus narrowly on the reevaluated hazards in § 50.155(c)(2), the NRC should place this requirement in § 50.155(b)(1). Doing so would require that licensees consider the reevaluated hazards more broadly in the context of developing mitigation strategies as directed by the Commission in the Staff Requirements Memorandum issued on March 30, 2015 for COMSECY 14-0037. This would allow further flexibility in the licensee's strategies and guidelines for addressing the reevaluated hazards by 1) establishing an alternative means of compliance that does not include the surrogate conditions of a loss of all alternating current power and loss of normal access to the ultimate heat sink, and 2) providing different success criteria for targeted or scenario-specific mitigating strategies (i.e., namely requiring core cooling and spent fuel pool cooling but not the containment capability to be maintained).

Order EA-12-049 required maintaining or restoring core cooling, containment, and spent fuel pool cooling capabilities. Allowing the containment capability to not be maintained for targeted hazard strategies when addressing the reevaluated hazard is acceptable because the reevaluated hazards were not considered by the Order. Rather, the Staff Requirements Memorandum issued on March 30, 2015 for COMSECY 14-0037 addressed the use of a mitigating strategies approach when the Commission approved the staff recommendation "to address the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events."

As such, § 50.155(b) and (c) should be modified as follows:

(b) *Integrated response capability.* Each applicant or licensee shall develop, implement, and maintain an integrated response capability that includes:

(1) *Mitigation Strategies for Beyond-Design-Basis External Events.* Strategies and guidelines to mitigate beyond-design-basis external events from natural phenomena that result in an extended loss of all ac power concurrent with either a loss of normal access to the ultimate heat sink or, for passive reactor designs, a loss of normal access to the normal heat sink.

(i) Each licensee that received the March 12, 2012, NRC letter issued under § 50.54(f) concerning reevaluations of seismic and flooding hazard levels and determined that the

reevaluated flooding or seismic hazard level exceeded the design basis of its facility must:

(A) Demonstrate the adequacy of the strategies and guidelines required by paragraph (b)(1) to mitigate the effects of the reevaluated hazard;

(B) Modify the strategies and guidelines required by (b)(1) to mitigate the effects of the reevaluated hazard;

(C) Develop event-specific strategies and guidelines, which need not assume the consequences in paragraph (b)(1), to mitigate the effects of the reevaluated hazard;

(D) Develop strategies and guidelines, or demonstrate the adequacy of the strategies and guidelines required by paragraphs (b)(1), (b)(1)(i)(B), or (b)(1)(i)(C), using risk insights from a probabilistic risk assessment; or

(E) Develop an alternate approach or assessment that provides, as determined by the NRC upon its evaluation of the specific circumstances of each licensee, reasonable assurance that the licensee has adequately addressed the reevaluated hazard.

(ii) These strategies and guidelines must be capable of being implemented site-wide and must include:

(A) Maintaining or restoring core cooling, containment, and spent fuel pool cooling capabilities except that the containment capability does not need to be maintained or restored in the case of targeted hazard mitigating strategies and guidelines under paragraph (b)(1)(i)(C); and

(B) The acquisition and use of offsite assistance and resources to support the functions required by paragraph (b)(1)(ii)(A) indefinitely, or until sufficient site functional capabilities can be maintained without the need for the mitigation strategies.

(c) *Equipment.*

(1) The ~~capacity and capability of the~~ equipment relied on for the mitigation strategies required by paragraph (b)(1) of this section must ~~be~~ have sufficient capacity and capability to simultaneously respond to the event described in paragraph b(1) ~~at maintain or restore core cooling, containment, and spent fuel pool cooling capabilities~~ for all the power reactor units within the site boundary.

(2) The equipment relied on for the mitigation strategies required by paragraph (b)(1) of this section must be ~~reasonably~~ protected from the effects of natural phenomena ~~that are equivalent to the design basis of the facility~~.

~~(i) Each licensee that received the March 12, 2012, NRC letter issued under § 50.54(f) concerning reevaluations of seismic and flooding hazard levels, shall provide reasonable~~

~~protection against that reevaluated seismic or flooding hazard(s) if it exceeds the design basis of its facility.~~

The above proposed changes to the rule include a section (b)(1)(i)(E) to allow the use of other approaches, including the use of risk insights. The rule should allow for the use of risk insights to demonstrate that licensees can reasonably address the mitigation of beyond design basis seismic events. The seismic safety of a facility involves both the site seismic hazard and the capacity of individual SSCs. The seismic probabilistic risk assessment (SPRA) is the best tool to use to make an overall assessment of the level of protection provided by the as-built plant. The NRC has requested that SPRAs be performed for plants with the greatest potential for the design capacity to be exceeded, (i.e., those plants with the greatest GMRS to SSE ratio). The results of the SPRA can be used to identify the areas of greatest potential for safety enhancement.

The MBDBE rulemaking codifies the requirements for providing reasonable assurance of adequate protection in mitigating the consequences of beyond-design-basis external events. One such requirement involves providing protection of the mitigation strategies equipment. For the reevaluated seismic hazards, the SPRAs provide an appropriate tool for demonstrating reasonable protection of this equipment because the SPRAs are helpful in focusing on the most safety significant aspects of a licensee's strategies.

A long standing position of the Commission has been that "reasonable assurance of adequate protection" does not equate to "zero risk." This position is also important in considering the level of risk acceptable for demonstrating reasonable protection of mitigating strategies equipment as the SPRA considers a spectrum of earthquakes that exceed the re-evaluated seismic hazards developed in response to the NRC 50.54(f) request for information.

Plants performing SPRAs are investing significant resources in the evaluation of plant seismic capabilities in the performance of detailed plant specific SPRAs. The industry is developing guidance in NEI 12-06 that will build upon this significant investment in order to maximize safety effectiveness.

Plants that are developing an SPRA should be permitted to utilize a risk informed process to assess whether the mitigating strategies are reasonably protected against the re-evaluated seismic hazard. Using the fragility calculations of SSCs and the logic models developed for the SPRAs, the risk-informed process can be used to determine reasonable protection for mitigation. A total of 35 operating reactors with a broad spectrum of seismic hazards and plant capacities have been requested to develop SPRAs. Consequently, the seismic safety insights are expected to be very plant-specific.

Based on insights from the SPRAs being performed using the re-evaluated hazard, some plants may find that the inherent robustness of their plant design minimizes the potential for scenarios that mitigating strategies were designed to address (i.e., ELAP/LUHS). This effectively demonstrates the robustness of the mitigating strategies without the need for a licensee to take additional action to reasonably protect the mitigation strategies equipment. In other words, if the SPRA demonstrates a low level of risk, then protecting the mitigating strategies equipment consistent with the strategies developed per NEI 12-06 constitutes reasonable protection of that equipment. On the other hand,

plants with more significant re-evaluated seismic hazards or those that find limited robustness in as-built SSCs may well find that enhancements to mitigating strategies play an important role in maintaining plant safety.

Based on past SPRA experience, the SPRA results may indicate that the ELAP/LUHS scenarios that mitigating strategies are designed to address are driven by specific low capacity components. They may also indicate that the SSCs in the plant systems, whose failure could cause the risk from ELAP/LUHS sequences to become high, are sufficiently rugged. In other cases, the risk from ELAP/LUHS scenarios may occur due to the low capacity of one or more components. The SPRA can be used to target the most effective means to enhance plant safety and provide reasonable protection of the integrated plant mitigation capability.

Industry is developing a systematic process that uses the insights from the plant-specific SPRAs to identify where enhancements to plant mitigation strategies provide the potential for significant improvement in plant safety. The industry guidance being developed in NEI 12-06 utilizes a risk-informed process that considers small changes in risk defined in integrated decision-making process outlined in RG 1.174 and credits the defense-in-depth attributes of the plant design, including redundancy, diversity, and radiological release barriers.

Defense in depth and diversity are addressed implicitly in the SPRA by conservatively considering the capacities of the relevant redundant systems and features that protect the reactor. Barrier redundancy is addressed by consideration of both the core damage and the large early release insights.

Therefore, for plants that have performed an SPRA, the results provide detailed plant-specific insights into the seismically-induced scenarios that can impact plant safety. These insights can, in turn, assist the plant in understanding the specific susceptibilities to ELAP/LUHS scenarios that the mitigating strategies implemented under EA 12-049 are targeted to address. Plants can utilize the results and insights from an SPRA to identify the degree to which protection for the reevaluated seismic hazard is achieved. Because the SPRA considers the reevaluated seismic hazard, it also provides insights into whether these mitigation strategies should be enhanced. If the SPRA demonstrates that the risk from ELAP/LUHS scenarios that the mitigation strategies implemented under EA 12-049 are intended to address is low, the mitigating strategies developed per NEI 12-06 would be determined to be adequate for the reevaluated hazard. The proposed rule language appears broad enough to allow a licensee to satisfy proposed section 50.155(c)(2)(i) by demonstrating that the risk from ELAP/LUHS scenarios is sufficiently low. However, to make this point more explicit the industry is suggesting proposed rule language in 50.155(b)(1)(i)(d). Implementation guidance to support this risk-informed demonstration of reasonable protection of mitigating strategies equipment for the reevaluated hazard will be provided in a subsequent revision to NEI 12-06.

10.) Command and Control

The industry prefers that the expansion of scope of regulatory oversight of the organizational structures be accomplished through the imposition of a new requirement, as currently proposed, and not by communicating the understanding that the scope of the existing requirements covers the full spectrum of events that would be included in this rulemaking. In general, we believe that there should be a clear demarcation between response planning and capabilities described in a site emergency plan, associated with the requirements of 10 CFR 50 Appendix E, and those for beyond design basis events to be governed by proposed 10 CFR 50.155. This separation facilitates better understanding of the underlying requirements and planning bases for various program elements, and the application of change control processes.

Cumulative Effects of Regulation Questions (FRN Section XI)

1.) Rule Compliance Dates

The rule language in 50.155(g)(1) would require that each holder of an operating license comply with all provisions of this section no later than 2 years following the effective date of the rule. As noted in our response to (refer to response to prior question), this timeframe is not adequate.

The degree to which the reevaluated seismic or flooding hazard(s) may impact the implementation of mitigating strategies varies widely across the operating reactor fleet, and the various evaluations necessary to prepare for any necessary modifications are in different stages of completion, for example:

- Some sites have not yet finished their flooding hazard reevaluations: These situations are due to work that must be completed by the US Army Corps of Engineers.
- Some sites have simple evaluations: A number of sites have reevaluated hazards that are bounded by the design basis of the facility and the level of effort to demonstrate compliance with the proposed rule may be complete in advance of the effective date of the rule.
- Some sites will need to complete additional evaluations: These sites have reevaluated hazards that exceed the design basis of the facility. They must perform detailed Mitigating Strategies Assessments or MSAs in order to evaluate the effect of the external hazard on their mitigating strategies.
- Some sites still must develop the methodology needed to perform their MSAs: For example, the input for Seismic MSAs that use Path 5 (SSE greater than 2xSSE) may be risk-informed based upon a seismic PRA, which is currently in progress. A two year implementation timeline would not provide adequate time for review of the SPRA results by the NRC Staff prior to completion of modifications under the Rule.

Completion of the engineering, design, planning and installation of any identified modifications or other plant changes is a complex process; sufficient time should be provided to completed the work efficiently, for example:

- Utilities will not start the modification process until their MSAs have been approved by the NRC (note that utilities will not start this process when their hazard report results have been approved as stated on page 70634 of the FRN because it is the MSA that will determine the results of the hazard on mitigating strategies, not the hazard report.) At this point they will need to prepare, plan, and implement the necessary modifications or procedure changes and train their staff. Some of the plant modifications will require access to plant equipment or spaces that are not available except during outages.
- If greater than minor modifications are indicated, a two year implementation window would tend to require that the modifications be performed at risk or fast-tracked, where engineering/design would be performed in parallel with installation of the change. This is inefficient and increases the risk for errors and rework.

Therefore, the industry suggests that each holder of an operating license submit a schedule for achieving full compliance with the requirements of 50.155 within 90 days from the effective date of the rule.

> 50.155(g)(1) - *Each holder of an operating license under this part on [EFFECTIVE DATE OF FINAL RULE] shall submit to the U.S. Nuclear Regulatory Commission a schedule for achieving full compliance with the requirements of 50.155 no later than 90 days following [EFFECTIVE DATE IF THE FINAL RULE].*

In addition, to address the potential for rule compliance date issues for new plants, we suggest revising proposed Part 50, Appendix E, VII.1.b as follows:

b. A holder of a combined license issued under 10 CFR part 52 before the Commission has made the finding under § 52.103(g) of this chapter shall perform this analysis and submit it to the NRC under § 52.3 of this chapter ~~at least~~ 2 years before the date specified for completion of the last inspections, tests, and analyses in the inspections, tests, analyses, and acceptance criteria (ITAAC) completion schedule required by § 52.99(a) of this chapter for the plant OR [DATE 365 DAYS AFTER EFFECTIVE DATE OF THE FINAL RULE], whichever is later.

2.) CER Challenges

The circumstances of each plant in implementing the proposed rule requirements will be unique and there will be instances where additional time for full implementation of rule requirements will be necessary. In these instances it is incumbent upon the licensee to request modification of implementation dates through existing processes (e.g., 10 CFR 50.12 and 10 CFR 50.90) with sufficient supporting basis for the change. It is equally important, as directed by the Commission in its response to SECY 15-0050, that NRC apply risk-informed decision-making in its review of such relief requests.

3.) Implementation

There likely will be instances where conflicts will arise in the implementation of the proposed rule's requirements. In these cases it will be important for NRC to allow licensees the latitude to resolve the conflicts in a manner that best meets the objectives of safety and security. Plants should be allowed to prioritize regulatory activities where conflicts in schedule are identified or provide alternative means for compliance in instances where conflicts require an alternative to be established. NRC should review and approve such requests through existing processes.

4.) Unintended Consequences

There may be unintended consequences that result from the proposed new requirements if the NRC does not set forth a transparent transition from Orders EA-12-049 and EA-12-051 to 10 CFR 50.155. Some licensees have already achieved compliance with Orders EA-12-049 and EA-12-051 in accordance with JLD-ISG-2012-01 Rev. 0, and JLD-ISG-2012-03 Rev. 0, and their associated NEI guidance documents. 10 CFR 50.155 and the RG's associated with DG-1301, and DG-1317 may specify actions that are additional to, and/or different from, the actions required by the JLDs to achieve to compliance with the NRC Orders. 10 CFR 50.155 and the associated RG's also may specify actions that are less restrictive than the corresponding actions needed for compliance with the orders. It is not clear if and when compliance with Orders EA-12-049 and EA-12-051 will no longer be required following issuance of 10 CFR 50.155 and the associated RG's. To avoid unintended consequences associated with two similar—but potentially not identical—sets of requirements, the NRC should rescind Orders EA-12-049 and EA-12-051 once § 50.155 becomes effective. See, e.g., 78 Fed. Reg. 16,922 (Mar. 19, 2013) (discussing the rescission of orders following issuance of 10 C.F.R. Part 37). For the same reasons, the NRC should formally close out its § 50.54(f) information requests and eliminate license conditions that duplicate requirements currently in § 50.54(hh)(2).

5.) Regulatory Analysis

The Commission properly concluded that the imposition of SAMG requirements is unwarranted and that SAMGs should continue to be implemented through a voluntary industry initiative.

The industry agrees with the Commission's decision against including requirements that would, in essence, codify the industry initiative on severe accident management guidelines (SAMGs). Although the draft regulatory analysis properly rejects the option of including a SAMG requirement in the regulations, it contains statements that could mislead the public on the status and strength of industry's SAMG initiative. Specifically, the draft regulatory analysis claims that "new" information reveals that the industry's SAMG initiative "was not entirely successful."[2] According to the draft regulatory analysis, this means that "the NRC cannot have a sufficient level of regulatory assurance that SAMGs will be updated and maintained over time and that licensees will maintain their capability to effectively implement SAMGs" absent a regulatory requirement for SAMGs.[3] This conclusion is incorrect and fails to mention post-Fukushima improvements to the industry's approach to SAMGs. By letter dated October 26, 2015, the industry informed the NRC that NEI's Nuclear Strategic Issues Advisory Committee (NSIAC) recently approved an industry initiative on SAMGs.[4] Under this new initiative, each licensee will perform timely updates of their site-specific SAMGs based on revisions to Owners Group generic severe accident technical guidelines. Licensees will also ensure that SAMGs are considered within plant configuration management processes, integrated with other emergency response guideline sets and symptom-based EOPs and validated. To begin implementation of this industry initiative, each licensee has sent a letter to the NRC docketing their site-specific commitments. To ensure the final regulatory analysis is accurate, the NRC should accurately reflect the current status of the industry initiative on SAMGs.

In our May 11, 2015 letter, NEI also expressed industry's generic concern with the misuse of qualitative information to support regulatory decisions and provided a detailed discussion of how the proposal to incorporate SAMGs into the proposed rule exemplified such misuse.[5] The Commission's decision not to include the SAMG requirement in the proposed rule strikes the appropriate balance in considering the available quantitative information, as well as qualitative considerations.

The Commission's decision is consistent with the agency's internal guidance on management of industry commitments, which is provided in NRR Office Instruction "Managing Regulatory Commitments Made by Licensees to the NRC," LIC-105, Rev. 5 (Sept. 5, 2013). As explained in the *Federal Register* notice soliciting public comment on the proposed rule, although not required by NRC regulations "SAMGs are well established guidance documents that have been developed by the

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[2] NRC, Regulatory Analysis, Proposed Rulemaking to Address Mitigation of Beyond-Design-Basis Events, at p 60 (Oct. 2015).
[3] *Id.*
[4] Letter from A. Pietrangelo (NEI) to M. Johnson, "Industry Initiative to Maintain Severe Accident Management Guidelines," Oct. 26, 2015.
[5] Letter from A. Pietrangelo (NEI) to M. Satorius, "Use of Qualitative Factors in Regulatory Decision Making," May 11, 2015.

nuclear power industry with substantial NRC involvement, have been implemented by every operating nuclear power reactor licensee for decades, and are the subject of a license condition for combined licenses."[6] Further, the industry has committed to strengthening its SAMG program since the Fukushima accident.[7]

LIC-105 reinforces the continued importance of regulatory commitments in the NRC's regulatory scheme, stating:

> Issues concerning the use of regulatory commitments usually center on the legal standing of the commitment and the NRC staff's ability to enforce the action committed to by a licensee. The staff determined that keeping regulatory commitments as an element of licensing basis information should continue because, when handled properly, the commitments support the overall licensing process by adding flexibility, improving efficiency, and maintaining the flow of information between the staff and licensees. These advantages usually outweigh concerns that a licensee is not "legally bound" to fulfill and subsequently control an action appropriately classified as a regulatory commitment. Various assessments performed by the NRC staff supported this view. See, for example, the "Assessment of Regulatory Processes That Utilize Regulatory Commitments," dated November 26, 2008 (Ref. 5).[8]

Further, the 2008 "Assessment of Regulatory Processes That Utilize Regulatory Commitments" cited above provides the following guidance on deciding whether it is appropriate to convert regulatory commitments to "obligations" (i.e., legally binding requirements):

> Consistent with the guidance in SECY-98-224, and the definition of "obligation" in NRR Office Instruction LIC-100, escalating a licensee commitment into a legally binding regulatory requirement should be reserved for matters that warrant:
>
> (1) inclusion in the technical specifications based on the criteria in 10 CFR 50.36; or
>
> (2) inclusion in the license based on determination by the NRC staff that the issue is of high safety or regulatory significance.[9]

We note that the Commission's decision not to include a SAMG requirement in the proposed rule is also consistent with the criteria provided above. That is, a SAMG requirement would not warrant inclusion in the technical specifications under the criteria provided in § 50.36 and – given the results of the regulatory and backfitting analyses provided with the proposed rule – would not rise to the level of high safety or regulatory significance.

We encourage the NRC to keep the guidance provided in LIC-105, as well as the historical references supporting that document, in mind when evaluating issues associated with the management of industry commitments.

The NRC has failed to justify invoking the "adequate protection" backfit exception to impose the new multiple source term dose assessment requirement.

The proposed rule and regulatory analysis properly recognizes that the new requirement to monitor and assess multiple source terms constitutes a backfit.[10] But rather than perform a systematic and

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[6] 80 Fed. Reg. 70,610, 70,616.
[7] *See id*. at 70,617.
[8] LIC-105, at pg. 1.
[9] "Assessment of Regulatory Processes That Utilize Regulatory Commitments," (Nov. 26, 2008), at pg. 11.
[10] *See* 80 Fed. Reg. at 70,638; Regulatory Analysis at p. 2.

documented analysis demonstrating that this new requirement will result in a cost-justified substantial increase in safety, the NRC has invoked backfit exception in 10 C.F.R. § 50.109(a)(4)(ii) for regulatory actions that are "necessary to ensure that the facility provides adequate protection to the health and safety of the public." As discussed below, the draft regulatory analysis fails to demonstrate that this proposed new requirement warrants invoking the adequate protection exception.

An NRC decision to invoke the adequate protection exception is an extremely significant decision. Because NRC's regulations are presumed to ensure adequate protection, "that presumption can be overcome only by significant new information or some showing that the regulations do not address some significant safety issue."[11] Such occurrences should be rare and only after careful deliberation by the Commission. As Commissioner Ostendorff observed: "This agency must vigilantly ensure that the memory of Fukushima Daiichi does not result in loose interpretations of our adequate protection mandate. Fukushima Daiichi was a terrible accident, and that should never be forgotten. But what also should not be forgotten is that it was an accident that occurred in another country—a country with a different regulatory structure and a different regulatory culture. I have not seen any evidence that suggests our current regulatory structure in the United States is broken or that there is any need to divert from the stable, predictable way that the NRC evaluates issues. The NRC must adhere to its well-proven approach to regulation. If we do not, the regulations will be only as predictable as the five individuals carrying the title 'Commissioner.'"[12]

While the operating experience at Fukushima Daiichi demonstrated that the ability to assess multiple source terms could help plant personnel prioritize emergency actions after a beyond-design-basis external event, the draft regulatory analysis does not show that the absence of such capabilities during the Fukushima accident contributed in any way to radiological consequences. Given the extensive, required actions that licensees are already taking in the name of adequate protection to mitigate beyond-design-basis external events, the NRC should not use this exception to tack on an additional, less significant requirement. To be sure, the industry decided after Fukushima to voluntarily implement multiple source term dose assessment capabilities. But this voluntary action does not give the NRC a "free pass" to lower the threshold for an adequate protection decision. Yet the draft regulatory analysis fails to explain why this new requirement, on top of the extensive required and voluntary actions already being undertaken to address beyond-design-basis external events, is necessary to ensure adequate protection.

Instead of providing a reasonable justification for invoking the adequate protection exception, the draft regulatory analysis discusses existing emergency preparedness requirements. It then claims that this new requirement "is considered to be part of the essential emergency preparedness regulatory infrastructure that is required to meet current emergency preparedness regulatory objectives, and as such, is considered part of the set of emergency preparedness requirements to provide reasonable assurance of adequate protection of public health and safety, consistent with the

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[11] *See* Final Rule, Revision of Backfitting Process for Power Reactors, 53 Fed. Reg. 20,603, 20,608 (June 6, 1988).

[12] Commissioner W.C. Ostendorff & K.A. Sexton, "Adequate Protection After the Fukushima Daiichi Accident: A Constant in a World of Change," OECD Nuclear Law Bulletin, No. 91, Vol. 1, p.21 (Sept. 2013).

regulatory basis for emergency preparedness that has existed for more than three decades."[13] These unsupported, conclusory statements about meeting "current emergency preparedness regulatory objectives" are insufficient to support an adequate protection finding.

In summary, the draft regulatory analysis fails to overcome the presumption that current regulations and orders currently ensure adequate protection because it identifies no significant safety issue that is going unaddressed. On top of the extensive, required actions that licensees are already taking, the industry is voluntarily implementing multiple source term dose assessment capabilities to assist in the mitigation of remote, yet potentially serious beyond-design-basis external events. Rather than place these actions in their proper context, the draft regulatory analysis offers generic platitudes about meeting existing emergency preparedness regulatory objectives. Accordingly, the NRC has not justified using the adequate protection exception and should not impose this new requirement absent an analysis demonstrating that it will result in a cost-justified substantial increase in safety.

[13] Regulatory Analysis at p. 54-55.

NEI 13-06 [Revision 1]

Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents

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NEI 13-06 [Revision 1]

Nuclear Energy Institute

Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents

February 2016

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This document was developed by the Nuclear Energy Institute (NEI) Emergency Preparedness (EP) Working Group with assistance from the Beyond Design Basis (BDB) Event Response Drill Task Force.

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NOTICE

EXECUTIVE SUMMARY

This technical report provides guidance for the completion of actions necessary to address the Tier 2 Emergency Preparedness (EP) enhancements identified in US Nuclear Regulatory Commission (NRC) Report, *Recommendations for Enhancing Reactor Safety in the 21st Century* [*The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*].[1&2] These actions reflect the approach discussed in COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, and related NRC staff and Nuclear Energy Institute (NEI) documents. Specifically, the NRC staff determined that certain Tier 2 EP items are being addressed adequately through implementation of NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*.

Order EA-12-049 addresses NRC NTTF Report Recommendation 4 and stemmed directly from Recommendation 4.2. The activities undertaken by the industry to comply with the Order will resolve two of the three Tier 2 items contained in NRC NTTF Report Recommendation 9.3; these items are periodic training and drills, and EP equipment and facilities, both associated with responses to a multi-unit and/or extended loss of AC power event.[3] The remaining Tier 2 item from Recommendation 9.3 deals with multi-unit dose assessment capability and is not within scope of Order EA-12-049 activities.

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, provides guidance on the format and content of licensee responses to Order EA-12-049. The guidance also covers information related to FLEX deployment, including training and drills, and equipment and facility topics captured in Recommendation 9.3. For example, NEI 12-06, states, "Where appropriate, the integrated FLEX drills should be organized on a team or crew basis and conducted periodically; with all time-sensitive actions to be evaluated over a period of not more than eight years." It further states, "Periodic training should be provided to site emergency response leaders on beyond design-basis emergency response strategies and implementing guidelines," and "procedures/guidance should identify the protective clothing or other equipment or actions necessary.…"

In addition, NEI 12-06 recommends utilization of the staffing and communication resources identified in NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*. The latter document was developed to address the two Tier 1 topics from Recommendation 9.3 - staffing and communications. NEI 12-01 states, "[a] licensee should identify additional work areas necessary for the performance of expanded response functions. The use of alternate emergency response facilities should be considered." This statement addresses the facilities needed to house the response staff.

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[1] This report is commonly referred to as the NRC NTTF Report.
[2] The tier assignments made to the EP enhancements are discussed in SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011
[3] Staff documents may refer to an "extended loss of AC power" as a "prolonged Station Blackout (SBO)."

With the preceding in mind, NEI and the industry have created this technical report to promote consistent implementation of the actions that address the Tier 2 EP enhancements discussed above.

Three of the topics addressed by COMSECY-13-0010 are also relevant to NRC NTTF Recommendation 8. These topics are training, drills and exercises, and they are discussed in an NRC document entitled, *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013.[4] The Recommendation 8 regulatory basis was subsequently incorporated into *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015, with changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015. In recognition of the interrelationship between of the discussions presented in the COMSECY, the regulatory basis and the proposed rule, and the desirability of having well-integrated guidance, this document addresses training, and drills and exercises for beyond design basis events and severe accidents.

Finally, fleet and site leadership teams should carefully consider which department(s) will be assigned a responsibility for addressing one or more of the EP and emergency response-related enhancements discussed in this document. It is important that leadership teams have a full understanding of the requirements related to EP and Beyond Design Basis (BDB) emergency response capabilities in order to identify potential gaps in organizational knowledge, "skill sets," and alignment/coordination that could impact sustainability. In particular, opportunities to leverage organizational resources and synergies in order to improve performance should be pursued.

[4] Available on regulations.gov; see Docket ID: NRC-2012-0031.

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ENHANCEMENTS TO EMERGENCY RESPONSE CAPABILITIES FOR BEYOND DESIGN BASIS EVENTS AND SEVERE ACCIDENTS

1 INTRODUCTION

1.1 SCOPE AND PURPOSE OF NEI 13-06

This technical report provides guidance for the performance of licensee actions that will address certain aspects of recommendations contained in US Nuclear Regulatory Commission (NRC) Report, *Recommendations for Enhancing Reactor Safety in the 21st Century* [*The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*]. The specific recommendations are:

- Recommendation 4.2 – "Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented."

- Recommendation 8.1 – "Order licensees to modify the EOP technical guidelines (required by Supplement 1, 'Requirements for Emergency Response Capability,' to NUREG-0737, issued January 1983 (GL 82-33), to (1) include EOPs, SAMGs, and EDMGs in an integrated manner, (2) specify clear command and control strategies for their implementation, and (3) stipulate appropriate qualification and training for those who make decisions during emergencies."

- Recommendation 8.4 – "Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors."

- Recommendation 9.3 [*relevant wording excerpted*] – "Order licensees to do the following until rulemaking is complete:

    - Add guidance to the emergency plan that documents how to perform a multiunit dose assessment (including releases from spent fuel pools) using the licensee's site-specific dose assessment software and approach.

    - Conduct periodic training and exercises for multiunit and prolonged SBO [*Station Blackout*] scenarios. Practice (simulate) the identification and acquisition of offsite resources, to the extent possible.

    - Ensure that EP equipment and facilities are sufficient for dealing with multiunit and prolonged SBO scenarios."

These recommendations were subsequently evaluated by the NRC staff and refined into various regulatory positions and actions. NEI 13-06 addresses the positions and actions discussed in COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*. The topics in the COMSECY include multi-unit dose assessment, training, EP facilities and equipment, and drills and exercises.

Additionally, the COMSECY makes reference to certain topics that are also within the scope of Recommendation 8; these topics are training, drills and exercises related to implementation of FLEX Support Guidelines (FSGs), Severe Accident Management Guidelines (SAMGs) and Extensive Damage Mitigation Guidelines (EDMGs). In recognition of the need for well-integrated guidance, NEI 13-06 addresses the training, and drill and exercise aspects of the COMSECY and *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015. The latter reflects changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015.

Finally, this document uses the term "FLEX Support Guidelines" or "FSGs" to connote the document(s) developed or enhanced in response to NRC Order EA-12-049, *Order Modifying Licenses with regard to Requirements for Mitigating Strategies for Beyond Design Basis External Events*, and which describe/direct the operator and field actions necessary to implement mitigating strategies in response to a beyond design basis external event. Depending upon Owners Group guidance, and fleet and site standards, these actions may be contained in a document(s) with a different name. Each licensee should ensure that their appropriate site-specific documents are utilized when addressing the FLEX-related guidance contained in this document.

2 MULTI-UNIT DOSE ASSESSMENT

2.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

2.1.1 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Add guidance to the emergency plan that documents how to perform a multiunit dose assessment (including releases from spent fuel pools) using the licensee's site-specific dose assessment software and approach."

2.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NEI Letter, *Industry Implementation of Multi-unit Dose Assessment Capability*, Pollock to Wiggins, dated January 28, 2013

NRC Letter, Wiggins to Pollock, dated February 27, 2013

NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pollock to Wiggins, dated March 14, 2013

NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pietrangelo to Nuclear Strategic Issues Advisory Committee Steering Group, dated March 22, 2013

COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

Site-specific letter to NRC staff concerning the intent to implement multi-unit (source) dose assessment capability, dated on or around June 30, 2013

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

2.3 RECOMMENDED ACTIONS

2.3.1 Industry Performance Standard for Multi-Unit Dose Assessment

All single and multi-unit sites should establish the capability to perform offsite dose assessments during an event involving concurrent radiological releases from all on-site

units and/or multiple release points (i.e., whether from one or multiple units[5]), consistent with the description contained in the site-specific licensee letter to the NRC staff dated on or around June 30, 2013.

The multi-unit dose assessment capability should be computerized (i.e., offsite dose projections are generated using a computer-based model), and reflect the normally expected use of radiological and meteorological indications, e.g., incorporated into the site's emergency dose projection software as an assessment option. It should be available to support responses during events both within and beyond the plant design basis. In particular, the capability should exist to project offsite doses during an event involving an extended loss of AC power affecting all onsite units.

In addition to the normally used calculation methods and input indications, the capability should also accommodate the use of alternate methods and indications to address instances when normal data sources may be unavailable. For example, in cases where a plant vent radiation monitor is non-functional, a dose projection model might have the capability to project offsite doses based on a source term derived from a dose rate measurement in the plant or field. Or if onsite meteorological data is not available, then dose assessments are performed using parameter values obtained from a pre-identified near-site source or the National Weather Service.

A licensee may elect to also include a backup method (e.g., a manual method) to supplement the computerized method discussed above; if this option is pursued, the backup method should be capable of producing results within a reasonable time period (e.g., within about 30 minutes). In addition, consideration should be given to establishing a procedurally-driven peer/second person check of manually derived output, where warranted.

Implementation of this enhancement may necessitate the addition of a backup power source (e.g., an uninterruptable power supply) to onsite dose assessment computing platforms or ensuring the availability of computing platforms at locations away from the site (e.g., at an ERO alternate facility or an Emergency Operations Facility). It does not require the installation of new, or modification of existing, plant equipment such as radiation monitors, flow detectors and meteorological instrumentation (including associated data processors and power sources).

Each licensee should discuss their capability to perform multi-unit dose assessment with the appropriate Offsite Reponses Organization (ORO) agency officials, and determine if any changes are necessary to ORO plans and procedures.

2.3.2 Emergency Classification and Protective Action Recommendations

Multi-unit dose assessment results should be assessed in accordance with the licensee's existing emergency classification scheme and Protective Action Recommendation (PAR) decision-making process.

[5] This topic is referred to as "multi-unit dose assessment" for ease of reading; however, it should be understood to mean the capability to assess concurrent releases from multiple release sources/points such as reactor cores and spent fuel pools. It is therefore applicable to single-unit sites as well.

Each licensee should verify that the capability exists to issue a PAR for appropriate areas beyond the Emergency Planning Zone (EPZ) boundary, in accordance with existing regulatory requirements and guidance.

Consideration should be given to addressing the following points in the site-specific procedure or guideline that implements the multi-unit dose assessment capability.

- Projected offsite doses should be compared against the Emergency Action Levels (EALs) to determine if a change in the emergency classification is warranted.
- Projected offsite doses should be compared against appropriate decision-making criteria to determine if a change in PARs is warranted.

2.3.3 Training

Each licensee should provide training to the personnel responsible for performing a multi-unit dose assessment. Training materials, delivery methods and frequencies, and evaluation techniques should be developed using established Systematic Approach to Training (SAT) processes.

2.3.4 Performance Enhancing Experience

Periodic opportunities for a performance enhancing experience should be provided to personnel responsible for performing multi-unit dose assessment and assessing the results. Such opportunities may include performance during a drill or exercise (as an in sequence or out-of-sequence activity) or a separate/stand-alone mini-drill. These opportunities should be provided consistent with the extent-of-play and methods normally used to implement mini-drills, drills or exercises involving a demonstration of dose assessment capabilities.

2.3.5 Quality and Maintenance-Related Requirements

Equipment and software used to implement a multi-unit dose assessment capability should be procured and installed under the commercial and site requirements normally applicable to the EP Program.

Programmatic controls should be applied to appropriate equipment and software to ensure availability and reliability, including the performance of periodic inventory checks and functionality testing.

2.3.6 Considerations for Program Documents

A capability for performing multi-unit dose assessment need not be described in the site emergency plan; however, this capability should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

3 TRAINING

3.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

3.1.1 Recommendation 4

"The Task Force recommends that the Commission direct the staff to begin the actions given below to further enhance the ability of nuclear power plants to deal with the effects of prolonged SBO conditions at single and multiunit sites without damage to the nuclear fuel in the reactor or spent fuel pool and without the loss of reactor coolant system or primary containment integrity.

. . .

4.2 Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design-basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented.

- This existing equipment currently provides some of the coping capability that is recommended for the long term, but current storage requirements do not ensure that it will be available after a design-basis external event. This requirement would increase the likelihood that the equipment will be available if called upon.

- The staff should also consider conforming changes to the requirements in 10 CFR 50.54(hh)(2) to address multiunit response capacity."

3.1.2 Recommendation 8

"The Task Force recommends that the Commission direct the staff to further enhance the current capabilities for onsite emergency actions in the following ways:

. . .

8.1 Order licensees to modify the EOP technical guidelines (required by Supplement 1, 'Requirements for Emergency Response Capability,' to NUREG-0737, issued January 1983 (GL 82-33), to (1) include EOPs, SAMGs, and EDMGs in an integrated manner, (2) specify clear command and control strategies for their implementation, and (3) stipulate appropriate qualification and training for those who make decisions during emergencies.

. . .

8.4 Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors."

3.1.3 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Conduct periodic training and exercises for multiunit and prolonged SBO scenarios. Practice (simulate) the identification and acquisition of offsite resources, to the extent possible."

3.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012

Site-specific letter to NRC staff transmitting results of a communications assessment performed in response to NRC 50.54(f) letter; initial letter dated on or around October 31, 2012 and a possible follow-up letter dated on or around February 28, 2013

COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

Site-specific letter to NRC staff transmitting results of a first-phase staffing assessment performed in response to NRC 50.54(f) letter, dated on or around April 30, 2013; a second-phase staffing assessment is due to the NRC staff no later than 4 months prior to the beginning of the second refueling outage (as described in the site response to NRC Order EA-12-049

Site-specific Integrated Plan for implementing NRC Order EA-12-049

Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8, dated October 1, 2013

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

3.3 RECOMMENDED ACTIONS

3.3.1 BDB Event Response Training

Each licensee should provide training to the key personnel relied upon to implement the procedures and guidelines for responding to a beyond design basis event or severe accident, including the site-specific integrated use of FLEX Support Guidelines (FSGs), Extensive Damage Mitigation Guidelines (EDMGs) and Severe Accident Management Guidelines (SAMGs).[6] Training materials, delivery methods and frequencies, and evaluation techniques should be developed using established processes that address the "Systems approach to training" (SAT) elements listed in 10 CFR 55.4, except for elements already covered under other NRC regulations. Training on these common elements can be addressed in a non-SAT training program that is acceptable for meeting regulatory required training (e.g., 10 CFR part 50, appendix E, section IV.F). Position-specific qualification requirements should also be identified, as appropriate.

The primary focus of licensed operator initial and requalification training programs should continue to be on developing and maintaining the knowledge, skills and abilities of operators to implement the Emergency Operating Procedures (EOPs). This goal should be balanced with the need to provide the additional SAT-based training necessary to ensure that operators have the capability to respond to a beyond design basis event or severe accident in accordance with site-specific strategies. Site administrative controls should be established to ensure that an individual has successfully completed all required training prior to assuming a licensed operator position on-shift (e.g., training could be performed after receipt of an initial operator license but before being assigned on-shift duties in the Control Room).

The SAT process may identify operator knowledge, skills and abilities necessary for the execution of site-specific FSG, EDMG and SAMG strategies beyond those associated with the Knowledge and Abilities (K/As) described in NRC guidance documents (e.g. from NUREG-1122 or NUREG-1123). These items should be included in and evaluated as part of station's SAT-based training program.

Dynamic exams may be used consistent with simulator capabilities.

In addition to licensed operators, training should be provided to other licensee personnel with supporting responsibilities, including:

[6] This training may be accomplished in different settings since implementation of some emergency response procedures and guidelines are dependent upon the nature of the postulated initiating event, the plant response/accident sequence, and the ability of responders to select and implement mitigation/management strategies.

- Non-licensed operators, health physics staff, maintenance personnel, and other positions that would be called upon to perform implementing tasks.

- Support staff that would be evaluating plant conditions and recommending appropriate accident mitigating and management strategies for implementation.

- Personnel who would be requesting and coordinating the delivery of Final Phase (Phase 3) mitigating strategy equipment from an offsite location (e.g., from the National SAFER Response Center).

Training and qualification elements may be incorporated into a new training program, into an existing training program(s), or a combination of both. Non-SAT training programs that meet the needs for common elements do not need to be revised to use the SAT process.

The development of training and qualification requirements and materials should consider the degree to which the knowledge and abilities normally expected of a given position can be readily applied to an assigned task. Development should also recognize the availability of job/user aids and built-in equipment/hardware features that can improve human performance during stressful or adverse conditions (e.g., color coding, standardized connections, etc.).

Training program developers should assess and implement reasonable methods that may be used to facilitate practice at performing tasks under expected adverse conditions. The use of these methods should maintain an appropriate focus on the safety of plant personnel and equipment.

3.3.2 Plant-Referenced Simulator

The fidelity of the plant-referenced simulator should be maintained in accordance with 10 CFR 55.46 as additional equipment is installed in the facility and utilized to support operation. Certification of simulator fidelity in accordance with ANSI/ANS-3.5, *Nuclear Power Plant Simulators for Use in Operator Training and Examination*, if used, is considered to be sufficient for the initial stages of a beyond-design-basis external event scenario until the existing capability of the simulator model is exceeded. Increasing the capability of the plant-referenced simulator to specifically model conditions associated with a beyond design basis event or severe accident is not required (e.g., models need not be upgraded to accommodate FLEX training or drills). Voluntary upgrades to one or more model aspects (e.g., instrumentation responses) may be performed using a “best estimate” basis for the modelling.

3.3.3 Ultimate Decision-Maker Qualifications

As part of the required planning for responses to emergency conditions, each licensee has established a command and control structure for their Emergency Response Organization (ERO). Within this structure, there should be a position(s) with the assigned authority and responsibility for providing overall direction on the implementation of EOPs, FSGs, EDMGs and SAMGs for a unit or set of units; this authority and responsibility is referred

to as the Ultimate Decision-Maker (UDM) function.[7] Qualification requirements should be developed for the position(s) performing this function. These requirements should ensure that each UDM-qualified individual has sufficient technical understanding and leadership ability to make timely and informed decisions during a beyond design basis event or severe accident.

The need for periodic requalification should also be assessed in order to ensure that individuals have maintained the necessary knowledge and skills. Applicable program controls should be updated as necessary to reflect requalification requirements.

3.3.4 Training Development Guidance from Regulatory Responses

In addition to the topics discussed above, training programs should also address the training-related actions described in:

- FLEX program implementing documents developed in accordance with NRC Order EA-12-049.
- The communications and staffing assessment responses provided to the NRC staff in accordance with the 50.54(f) letter dated March 12, 2012.

3.3.5 Considerations for Program Documents

The training and qualifications for responding to a beyond design basis event or severe accident need not be described in the site emergency plan; however, this material should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

[7] The UDM function is described in NEI 14-01, *Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents*.

4 EP FACILITIES AND EQUIPMENT[8]

4.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

4.1.1 Recommendation 4

"The Task Force recommends that the Commission direct the staff to begin the actions given below to further enhance the ability of nuclear power plants to deal with the effects of prolonged SBO conditions at single and multiunit sites without damage to the nuclear fuel in the reactor or spent fuel pool and without the loss of reactor coolant system or primary containment integrity."

. . .

4.2 Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design-basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented.

- This existing equipment currently provides some of the coping capability that is recommended for the long term, but current storage requirements do not ensure that it will be available after a design-basis external event. This requirement would increase the likelihood that the equipment will be available if called upon.

- The staff should also consider conforming changes to the requirements in 10 CFR 50.54(hh)(2) to address multiunit response capacity."

4.1.2 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Ensure that EP equipment and facilities are sufficient for dealing with multiunit and prolonged SBO scenarios."

[8] As used here, EP facilities and equipment refers to those facilities in which ERO members would perform their assigned functions during a Beyond Design Basis event response, and the necessary equipment located therein. It does not include the systems, structures, components or portable equipment used to implement accident mitigating or management strategies described in Abnormal/Emergency Operating Procedures, or FLEX Support, Severe Accident Management or Extensive Damage Mitigation Guidelines.

4.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012

Site-specific letter to NRC staff transmitting results of a communications assessment performed in response to NRC 50.54(f) letter; initial letter dated on or around October 31, 2012 and a possible follow-up letter dated on or around February 28, 2013

COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

Site-specific letter to NRC staff transmitting results of a first-phase staffing assessment performed in response to NRC 50.54(f) letter, dated on or around April 30, 2013; a second-phase staffing assessment is due to the NRC staff no later than 4 months prior to the beginning of the second refueling outage (as described in the site response to NRC Order EA-12-049

Site-specific Integrated Plan for implementing NRC Order EA-12-049

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

4.3 RECOMMENDED ACTIONS

4.3.1 Industry Performance Standard for EP Facilities and Equipment

Each licensee should implement the Emergency Preparedness (EP) facility and equipment enhancements identified in their communications and staffing assessments provided to the NRC staff in accordance with the 50.54(f) letter.

For EP facility and equipment enhancements not addressed by the requirements or guidance discussed above, the following approaches are recommended.

- Determine applicable design and configuration control measures.
- Items may be procured and installed under the commercial and site requirements normally applied to EP facilities and equipment.
- For multi-unit sites, ensure that sufficient quantities of radiation protection equipment and supplies are, or can be made, available to support protracted operation of an expanded Emergency Response Organization (ERO).
- Programmatic controls should be developed to ensure the availability and reliability of EP facilities and equipment, including the performance of periodic inventory checks, functionality testing and maintenance.
- Supporting contracts with vendors should be periodically verified.

4.3.2 Considerations for Program Documents

The facilities and equipment used exclusively for responding to a beyond design basis event or severe accident need not be described in the site emergency plan; however, these items should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

5 DRILLS AND EXERCISES

5.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

5.1.1 Recommendation 4

"The Task Force recommends that the Commission direct the staff to begin the actions given below to further enhance the ability of nuclear power plants to deal with the effects of prolonged SBO conditions at single and multiunit sites without damage to the nuclear fuel in the reactor or spent fuel pool and without the loss of reactor coolant system or primary containment integrity.

. . .

4.2 Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design-basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented.

- This existing equipment currently provides some of the coping capability that is recommended for the long term, but current storage requirements do not ensure that it will be available after a design-basis external event. This requirement would increase the likelihood that the equipment will be available if called upon.

- The staff should also consider conforming changes to the requirements in 10 CFR 50.54(hh)(2) to address multiunit response capacity."

5.1.2 Recommendation 8

"The Task Force recommends that the Commission direct the staff to further enhance the current capabilities for onsite emergency actions in the following ways:

. . .

8.4 Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors."

5.1.3 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Conduct periodic training and exercises for multiunit and prolonged SBO scenarios. Practice (simulate) the identification and acquisition of offsite resources, to the extent possible."

5.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012

COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

Site-specific letter to NRC staff transmitting results of a first-phase staffing assessment performed in response to NRC 50.54(f) letter, dated on or around April 30, 2013; a second-phase staffing assessment is due to the NRC staff no later than 4 months prior to the beginning of the second refueling outage (as described in the site response to NRC Order EA-12-049

Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8, dated October 1, 2013

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

5.3 RECOMMENDED ACTIONS

5.3.1 Industry Performance Standards for BDB Event Response Drills

Each licensee should demonstrate the capability for effective integrated use of their accident mitigation and management procedure and guideline sets. In particular, the ability to transition between procedure and guideline sets, and select the best strategy for preventing or mitigating fuel damage and limiting radiological releases, is demonstrated. Complementary methods will be necessary to accomplish this demonstration since the procedures and guidelines implemented for a given scenario are dependent upon the

nature of the postulated initiating event, the plant response/accident sequence, and the ability of responders to select and implement mitigation/management strategies. The use of complementary methods will also promote more effective use of resources (e.g., facilitates targeted drill objectives, avoids excessive drill "down time" and durations, etc.), and minimize potential safety challenges to personnel and equipment. These methods are discussed below and involve conducting:

- A drill that demonstrates the integrated use of FLEX strategies under the control of an Abnormal Operating Procedure (AOP) or Emergency Operating Procedure (EOP), as appropriate to the postulated scenario. Specific considerations for this drill are discussed in section 5.3.4.

- A drill that demonstrates the transition from a controlling AOP, EOP or Extensive Damage Mitigation Guidelines (EDMG) into Severe Accident Management Guidelines (SAMGs), and the selection of appropriate severe accident management strategies. The integrated use of FLEX strategies may occur if directed by the controlling SAMG and as appropriate to the postulated scenario. Specific considerations for this drill are discussed in section 5.3.5.[9]

- A drill that demonstrates the use of EDMG strategies.[10] The integrated use of AOPs and EOPs, and FLEX strategies, may occur if directed by the controlling EDMG as appropriate to the postulated scenario. Specific considerations for this drill are discussed in section 5.3.6.

- A drill or drills to demonstrate the capability to utilize equipment necessary to implement each strategy for responding to a beyond design basis event or severe accident. Specific considerations for this drill are discussed in section 5.3.7.

The initial occurrence of each drill type listed above should be aligned with the implementation milestones for the Mitigation of Beyond-Design-Basis Events Rule. Also for each drill type listed above, a subsequent drill should be conducted within 8 calendar years of the preceding occurrence. For example, an initial FLEX strategy drill is conducted in June, 2017; the next FLEX strategy drill should be conducted by December 31, 2025.

5.3.2 Common BDB Event Response Drill Attributes

5.3.2.1 The following attributes apply to any BDB event response drill requiring implementation of FSGs, SAMGs or EDMGs, and the Drill Manager should consider them when developing the drill scenario and implementation methods.

- If not leading the effort, it is recommended that a fleet or site Emergency Preparedness (EP) Department be involved with the development and

[9] The SAMG drill is not a regulatory requirement and is performed on a voluntary basis.
[10] As used here, EDMG should be understood to mean the site document(s) developed to address 10 CFR 50.54(hh)(2), and the related guidance in NEI 06-12, B.5.b Phase 2 & 3 Submittal Guideline.

implementation of the drill[11].

- Two or more of the drills described above may be combined and conducted as one activity. A drill(s) may also be included within the scope of another drill (e.g., a scheduled ERO drill) or an evaluated exercise conducted to meet the requirements of 10 CFR 50, Appendix E.

- Conducting a BDB event response drill may require a set of site resources different from those normally used to conduct EP drills. The Drill Manager should identify the site resources (e.g., staffing and equipment) necessary to conduct the drill and ensure that they are scheduled/reserved. In particular, consider items that should be available to support the selected demonstrations of in-field/plant actions (e.g., movement of a portable pump).

- All normal site security, radiation protection and personnel safety requirements should be followed during the drill. These requirements should be carefully considered when developing the drill scope, extent-of-play and scenario.

- Scenario time jumps/compression may be used during the drill; however, the Drill Manager should be aware that operating experience has indicated such techniques may cause confusion among drill participants unless carefully scripted and controlled.

- Emergency response functions described in the site emergency plan should be implemented as appropriate to the drill scope, extent-of-play and scenario, and consistent with normal EP drill program practices.

- The licensee should determine whether drill performance will count towards the DEP and ERO performance indicators, consistent with the guidance in NEI 99-02.

- Drill controller and evaluator duty assignments and responsibilities should be consistent with normal fleet or site drill program practices. In particular, assignments should be made to observe and assess player performance in a manner similar to that done for other drills.

- Use of radiation protection equipment by personnel responsible for deploying portable equipment in the field/plant should be performed.

- Following a drill, the licensee should conduct a drill critique and develop a drill report. The report should include a timeline of the decisions and actions taken to implement the selected BDB event response strategies.

[11] This recommendation is limited to drill development and implementation. No position is taken with respect to which fleet or site department(s) should be assigned ownership of BDB event response programs or program elements.

- Identified drill weaknesses and deficiencies should be placed into the appropriate fleet or site corrective action program.

5.3.3 Use of a Plant-Referenced Simulator during BDB Event Response Drills

Drills should utilize the capabilities of the plant-referenced simulator(s) to the degree practicable by current simulator modeling.

In cases where the postulated drill scenario events exceed the limits of the simulator model, or such limits would be exceeded soon after the drill is commenced, the simulator should not be used. Key parameter values supporting the drill should be generated and supplied to participants through other means (e.g., "best estimate" values are developed and provided using paper data sheets).

For a multiple-unit site with one plant-referenced simulator, the simulator may be used during a drill and the resulting data taken as representative of all onsite units if consistent with the postulated scenario conditions (i.e., the postulated events affect all onsite units in a similar manner).

5.3.4 Drill Demonstrating Integrated Use of FLEX Strategies Under the Control of an AOP or EOP

5.3.4.1 The following organizations and facilities should participate in the drill.

- A simulated Control Room for all on-site units. The Control Room(s) may be simulated in any location, consistent with the guidance in step 5.3.3 (e.g., simulator, conference room or classroom, TSC, etc.). Control Room players may be limited to those necessary for the planned demonstration.

- The primary Emergency Operations Facility (EOF) or alternate EOF, if the use of the facility is anticipated during the response to the postulated event.

- An offsite facility to which the onsite Emergency Response Organization (ERO) would report during the period when the site is inaccessible (e.g., an ERO alternative facility[12]), if the use of the facility is anticipated during the response to the postulated event.

- Offsite Response Organizations (OROs)[13] should be invited to participate; however, their participation is not required.

- The National SAFER Response Center should be invited to participate; however, actual delivery of equipment is not required.

[12] An ERO alternative facility is the staging area for augmented ERO personnel used during a response to a hostile action, as described in the site emergency plan.
[13] OROs are those state, local and tribal agencies with primary responsibility for coordinating and implementing offsite emergency measures.

5.3.4.2 The Drill Manager[14] should consider the following items when developing the drill scope and extent-of-play.

- As used in this section, "drill" means a performance enhancing experience during which participant performance is assessed against a certain standard (e.g., a drill objective). Such experiences typically exclude classroom training and facilitated meetings where on-the-spot instruction and coaching is expected.

- Control Room players should process through the operating procedures and guidelines that would be used to respond to the postulated event.

- The drill duration need not exceed the assumed elapsed time necessary for augmented ERO personnel to access the site following the initiating event, as specified in the licensee's staffing assessments performed pursuant to the NRC's 50.54(f) letter dated March 12, 2012. This elapsed time is typically 6 hours.[15] Since the arrival times of ERO personnel reporting to the site from offsite locations during the drill should be consistent with the times specified in the staffing assessments, it is unlikely that the onsite TSC and OSC will be activated during the drill (unless the drill duration exceeds the assumed time necessary for ERO personnel to access the site).

- The arrival times of response personnel reporting to the EOF and/or an ERO alternate facility should reasonably reflect the postulated scenario conditions and the facility's distance from the plant site.

- Sufficient drill time should be allowed for the appropriate augmented ERO position to demonstrate the ability to assume command and control of the event response from the Shift Manager.

- Drill players should use the communications systems and equipment that would be employed during an actual response to the postulated event. This equipment may be simulated if changes or modifications would be required to support drill use (e.g., the simulated Control Room could not use a system without the installation of a new antenna and cabling). The decision to use or simulate this equipment should also include resource and equipment safety considerations.

- A control cell should be established to simulate non-participating organizations.

- Appropriate personnel at ERO facilities should demonstrate the ability to request the acquisition, and coordinate the delivery, of equipment from the National SAFER Response Center (NSRC) consistent with site procedures and guidelines; however, activation of the NSRC is not required. If the

[14] As used in this document, "Drill Manager" refers to the individual with the overall responsibility for coordinating preparation and implementation of a BDB event response drill.
[15] Refer to NEI 12-01, assumption 2.2.4, and site-specific staffing assessments.

NSRC is not participating, then a control cell should be established to simulate the appropriate contact point. Actual delivery of equipment from an NSRC will be simulated or occur as an out-of-sequence activity as coordinated with, and agreed to in advance, by the NSRC.

5.3.4.3 The Drill Manager should consider the following items when developing the drill scenario and implementation methods.

- Determine the strategies, procedures and guidelines to be demonstrated during the drill, and specify the necessary operating mode(s) for each onsite unit in the scenario initial conditions.
- The assumed drill start time for the initiating event should occur during a period of minimum on-shift staffing, i.e., during a backshift, weekend or holiday.[16]
- The drill should be initiated by a beyond design basis event that results in an extended loss of AC power (ELAP) simultaneously affecting all onsite units.
- The postulated drill scenario conditions should be generally consistent with the event assumptions listed in NEI 12-01 and NEI 12-06.
- Controllers should track the assignment/deployment of on-shift personnel, and promptly identify any instances where such assignments/deployments exceed to the number of available individuals[17]. Such instances should be reported to the players, documented in a controller log and discussed in the drill critique. The players are responsible for determining what changes to assignments/deployments are necessary during the drill to account for staffing constraints identified by a controller.
- The scenario need not include the postulated failure of portable equipment.
- The drill scenario need not include a postulated radiological release.
- The scenario may assume that requested response assistance provided by OROs and other offsite resource providers (e.g., corporate support) is available within reasonably expected timeframes.

5.3.5 Drill Demonstrating the Transition from a Controlling AOP, EOP or EDMG into SAMGs

5.3.5.1 The following organizations and facilities should participate in the drill.

[16] To allow for drill conduct during a normal work day, the scenario may use an assumed day and/or start time (e.g., a drill conducted during normal work hours on a Tuesday may assume that the scenario takes place on a Saturday).
[17] The number of available individuals should be determined from, and consistent with, the staffing assessments performed in response to the NRC 50.54(f) letter of March 12, 2012.

- A simulated Control Room for all on-site units. The Control Room(s) may be simulated in any location, consistent with the guidance in step 5.3.3 (e.g., simulator, conference room or classroom, TSC, etc.). Control Room players may be limited to those necessary for the planned demonstration.

- The primary or alternate emergency response facilities which house personnel with responsibility for evaluation of SAMG strategies and related decision-making for implementation. Players may be limited to these individuals.

- Offsite Response Organizations (OROs) should be invited to participate; however, their participation is not required.

- Participation by the NSRC is not required.

5.3.5.2 The Drill Manager should consider the following items when developing the drill scope and extent-of-play.

- As used in this section, "drill" means a performance enhancing experience during which participant performance is assessed against a certain standard (e.g., a drill objective). Such experiences typically exclude classroom training and facilitated meetings where on-the-spot instruction and coaching is expected.

- Control Room players should process through the operating procedures and guidelines that would be used to respond to the postulated event.

- The drill should facilitate demonstration of the ability of the appropriate ERO decision-maker to assume command and control of the event response from the Shift Manager.

- Drill players should use the communications systems and equipment that would be employed during an actual response to the postulated event. This equipment may be simulated if changes or modifications would be required to support drill use (e.g., the simulated Control Room could not use a system without the installation of a new antenna and cabling). The decision to use or simulate this equipment should also include resource and equipment safety considerations.

- A control cell should be established to simulate non-participating organizations. For example, if portions of the Technical Support Center staff are participating, the Drill Manager should consider establishing a control cell to simulate needed contacts with the Operational Support Center and EOF staffs.

- The drill should facilitate demonstration of the evaluation and decision-making for at least two SAMG strategies.

5.3.5.3 The Drill Manager should consider the following items when developing the drill scenario and implementation methods.

- The drill initial conditions should reflect the occurrence of an accident or event that resulted in the onset of conditions leading to fuel damage, and driving entry into SAMGs for at least one unit.[18] The initial conditions should also specify the operating mode(s) of each onsite unit that existed prior to the accident or event, based on the strategies, procedures and guidelines to be demonstrated during the drill. The transition from the procedure(s) in effect, and into SAMGs, should be demonstrated.

- All ERO facilities may be assumed to be activated.

- The scenario may assume that requested response assistance provided by OROs and other offsite resource providers (e.g., corporate support) is available within reasonably expected timeframes.

5.3.6 Drill Demonstrating the Use of EDMG Strategies

5.3.6.1 The following organizations and facilities should participate in the drill.

- Appropriate on-shift personnel should be selected based on whether or not the drill scenario assumes that the control room command and control structure remains available.

  - If available, establish a simulated Control Room for all on-site units. The Control Room(s) may be simulated in any location, consistent with the guidance in step 5.3.3 (e.g., simulator, conference room or classroom, TSC, etc.). Control Room players may be limited to those necessary for the planned demonstration.

  - If not available, personnel should be those that can be expected to respond to an event involving a loss of large areas of the plant due to explosions or fire, and causing a loss of the normal on-shift command and control structure.

- On-site emergency response facilities or other locations that would be expected to be available following an event involving a loss of large areas of the plant due to explosions or fire, as described in the drill scenario.

- Offsite Response Organizations (OROs) should be invited to participate; however, their participation is not required.

- Participation by the NSRC is not required.

[18] For example, a BDB seismic event occurred several hours ago that resulted in implementation of FLEX strategies. A second BDB seismic event occurred that impacted the ability to sustain one or more FLEX strategies, and more hours have elapsed. The drill would begin with conditions that are then degrading into those requiring a transition into SAMGs.

5.3.6.2 The Drill Manager should consider the following items when developing the drill scope and extent-of-play.

- As used in this section, "drill" means a performance enhancing experience during which participant performance is assessed against a certain standard (e.g., a drill objective). Such experiences typically exclude classroom training and facilitated meetings where on-the-spot instruction and coaching is expected.

- Operators and other appropriate players should process through the operating procedures and guidelines that would be used to respond to the postulated event.

- The arrival times of response personnel reporting to the site from offsite locations should be consistent with those described in the site emergency plan.

- Sufficient drill time should be allowed for the appropriate augmented ERO position to demonstrate the ability to assume command and control of the event response.

- Drill players should use the communications systems and equipment that would be employed during an actual response to the postulated event. This equipment may be simulated if changes or modifications would be required to support drill use. The decision to use or simulate this equipment should also include resource and equipment safety considerations.

- A control cell should be established to simulate non-participating organizations.

- The drill should facilitate demonstration of the evaluation and decision-making for at least two extensive damage mitigating strategies.

5.3.6.3 The Drill Manager should consider the following items when developing the drill scenario and implementation methods.

- The assumed drill start time for the initiating event should occur during a period of minimum on-shift staffing, i.e., during a backshift, weekend or holiday.[19]

- The drill should be initiated by an event involving a loss of large areas of the plant due to explosions or fire. The scenario should specify whether or not the concurrent loss of the normal on-shift command and control structure is assumed to have occurred. These conditions should result in operators or other available on-shift personnel implementing EDMGs.

[19] To allow for drill conduct during a normal work day, the scenario may use an assumed day and/or start time (e.g., a drill conducted during normal work hours on a Tuesday may assume that the scenario takes place on a Saturday).

- Controllers should track the assignment/deployment of on-shift personnel, and promptly identify any instances where such assignments/deployments exceed to the number of available individuals[20]. Such instances should be reported to the players, documented in a controller log and discussed in the drill critique. The players are responsible for determining what changes to assignments/deployments are necessary during the drill to account for staffing constraints identified by a controller.

- The scenario need not include the postulated failure of portable equipment.

- The drill scenario need not include a postulated radiological release.

- The scenario may assume that requested response assistance provided by OROs and other offsite resource providers (e.g., corporate support) is available within reasonably expected timeframes.

5.3.7 Drills Demonstrating the Use of Strategy-Related Equipment

5.3.7.1 Each licensee should create a list of the mitigating strategies described in site-specific FSGs, SAMGs and EDMGs.[21] An example list of strategies is presented in Attachment B.[22] The capability to mobilize equipment used for debris removal should also be included in the list. For each listed strategy, the capability to utilize the key equipment necessary for performing an implementing method should be periodically demonstrated as discussed in step 5.3.1.

5.3.7.2 The capability to implement a strategy using installed plant equipment may be demonstrated during a drill or as an out-of-sequence activity. The licensee may include an out-of-sequence demonstration within the scope of another scheduled activity. Such opportunities may include, but are not limited to, a mini-drill or Dynamic Learning Activity, a Job Performance Measure/Task Performance Evaluation or a demonstration associated with another program activity (e.g., a fire protection program inspection). Demonstration credit may also be given for performance during an actual event. All such demonstrations must be consistent with plant configuration control requirements and sound operational decision-making. Actual manipulation or operation of equipment is not required.

5.3.7.3 The capability to implement a strategy using portable equipment may be demonstrated during a drill or as an out-of-sequence activity. The licensee may include an out-of-sequence demonstration within the scope of another

[20] The number of available individuals should be consistent with the site emergency plan plus any additional personnel filling positions for which administrative controls exist to ensure 24/7 staffing.
[21] SAMG strategy equipment drills are not a regulatory requirement and are performed on a voluntary basis.
[22] The example list reflects currently operating plant designs that employ "active" safety features, and is for illustrative purposes only. As noted, each facility will need to create a site-specific listing based on site-specific mitigating strategies. This includes plant designs based on "passive" safety features such as the Westinghouse AP1000 or GE-Hitachi ESBWR.

scheduled activity. Such opportunities may include, but are not limited to, a mini-drill or Dynamic Learning Activity, a Job Performance Measure/Task Performance Evaluation or a demonstration associated with another program activity (e.g., a fire protection program inspection). Demonstration credit may also be given for performance during an actual event.

The demonstration of portable equipment should entail the movement of the equipment from its storage location to the location where it would be placed and operated, consistent with plant configuration control requirements and sound operational decision-making. Should placement in the expected operating location not be practicable, movement to an alternate (drill) location is acceptable. Actual connection/hookup or operation of equipment is not required.

5.3.7.4 If the same (or essentially the same) strategy is described in two or more emergency response guideline sets, then the capability to implement that strategy need be demonstrated only once over a given 8-year period (i.e., consistent with the drill periodicity guidance in step 5.3.1). For example, a PWR site has a strategy for feeding a steam generator described in its FSGs, SAMGs and EDMGs. The demonstration of an implementing method for this strategy, such as using a portable pump in accordance with an FSG, would satisfy the strategy demonstration requirement for all three guideline sets.

5.3.7.5 The capability to mobilize equipment used for debris removal may be demonstrated during a drill or as an out-of-sequence activity. The licensee may include an out-of-sequence demonstration within the scope of another scheduled activity. Such opportunities may include, but are not limited to, a mini-drill or Dynamic Learning Activity, a Job Performance Measure/Task Performance Evaluation or a surveillance. Demonstration credit may also be given for performance during an actual event (e.g., the same equipment is used to clear site roads following a heavy snowfall).

5.3.7.6 For a mitigating strategy expected to be implemented within the assumed elapsed time necessary for ERO personnel to access the site (as specified in the licensee's staffing assessments performed pursuant to the NRC's 50.54[f] letter dated March 12, 2012), the following drill guideline should be considered.

- The number of individuals performing the demonstration should be consistent with the number expected to be available during a real event; this number may be determined from a staffing assessment. Deviations from a staffing assessment should be documented in a controller log and discussed in the drill critique.

5.3.8 BDB Event Response Drill Objectives

Appendix A, BDB Event Response Drill Objectives, presents generic drill objectives that a licensee should use to develop a site-specific set of objectives for each BDB event response drill. Each objective has an associated listing of Performance Attributes; these

attributes define successful objective performance and should be used to develop the site-specific evaluation criteria for each objective. The development of objectives and evaluation criteria should be informed by the content of site-specific procedures and guidelines, and the established drill scope and extent-of-play. While a licensee is not expected to use the generic objectives verbatim, the function(s) described by each objective, and the associated performance attributes, should be considered during the development of the drill objectives and evaluation material.

Objectives described in the fleet/site EP drill and exercise program may also be considered for demonstration during a BDB event response drill. These objectives, and their associated evaluation criteria, should be reviewed and revised as necessary to reflect differences between expected performance during a design basis event and a beyond design basis event. For example, additional time may be necessary to complete certain activities such as ORO notifications, the personnel accountability process and activation of ERO emergency response facilities during a beyond design basis event response. The licensee should determine reasonable performance standards based on site-specific capabilities, and reflect these in the objectives and evaluation criteria.

As noted above, each BDB event response drill should be critiqued to identify weaknesses and deficiencies. Licensees should modify their critique processes as necessary to ensure a thorough review and evaluation of BDB-related drill objectives.

5.3.9 Considerations for Program Documents

The drills conducted to demonstrate responses to a beyond design basis event or severe accident need not be described in the site emergency plan; however, these activities should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

Each licensee should review the condition screening and evaluation requirements described in their corrective action program(s), and determine if changes are necessary. The purpose of this review is to ensure that program criteria will properly prioritize conditions associated with beyond design basis event response capabilities and appropriately allocate resources for their correction. In particular, the prioritization and allocation of resources should be balanced with other needs, and commensurate with the anticipated benefits to overall accident or event response capabilities (e.g., changes offering lower relative or absolute benefits should be assigned lower priorities).

6 REFERENCES

- NRC Report, *Recommendations for Enhancing Reactor Safety in the 21st Century [The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident]*, dated July 12, 2011

- SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

- NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

- NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

- NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012

- NRC Letter, Wiggins to Pollock, dated February 27, 2013

- COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

- *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013

- *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015

- *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015

- NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*, dated December 2006

- NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012

- NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

- NEI Letter, *Industry Implementation of Multi-unit Dose Assessment Capability*, Pollock to Wiggins, dated January 28, 2013

- NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pollock to Wiggins, dated March 14, 2013

- NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pietrangelo to Nuclear Strategic Issues Advisory Committee Steering Group, dated March 22, 2013

- NEI 14-01, *Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents*, dated February 2016

APPENDIX A – BDB EVENT RESPONSE DRILL OBJECTIVES

Recommended Objective	Performance Attributes
1. Demonstrate the ability of on-shift operations personnel to perform integrated implementation of operating procedures and guidelines for responding to a beyond design basis event or severe accident.	• The Shift Manager provides effective command and control of the accident or event response until relieved • Perform processing of, and transitions between, applicable procedures and guidelines. • Perform evaluation and decision-making related to the selection of mitigation or management strategies and actions. • Communicate selected mitigation or management strategies and actions to the appropriate personnel.
2. Demonstrate the ability of the [*ERO position assuming UDM function from Shift Manager*] to assume command and control for the selection and implementation of mitigation and management strategies.	• Perform turnover of command and control consistent with the applicable procedures or guidelines. • Perform decision-making related to the selection of mitigation and management strategies and actions, including those associated with a multi-unit response if applicable. • Direct the communication of selected mitigation and management strategies and actions to the Control Room and other appropriate personnel.
3. Demonstrate the ability of the augmented ERO staff to evaluate and recommend mitigation and management strategies.	• Perform evaluation and recommendations related to the selection of mitigation and management strategies and actions, including those associated with a multi-unit response if applicable. • Communicate selected mitigation and management strategies and actions to the Control Room and other appropriate personnel.

Recommended Objective	Performance Attributes
4. Demonstrate the ability of the on-shift and augmented ERO staff to communicate during a beyond design basis event or severe accident.	Establish and maintain required communications in accordance with applicable procedures and guidelines. [*Wording should reflect which organizations will be represented by a controller/control cell.*] • Offsite Response Organizations • NRC ENS • Between ERO facilities • On-site and in-plant response teams • Offsite monitoring teams
5. Demonstrate the ability to operate the installed plant equipment necessary for implementing a mitigating or management strategy.	• [*Specify the mitigating or management strategy(ies) to be demonstrated during the drill; select these from the list of strategies developed per the guidance in section 5.3.7.*] • [*Specify which key implementing actions will be performed, simulated or discussed during the drill.*] • Verify that the necessary actions for implementing a mitigating or management strategy can be performed by the available staff. • Verify that personnel assigned actions do not have concurrent collateral duties which would preclude timely performance.
6. Demonstrate the ability to deploy the portable equipment necessary for implementing a mitigating or management strategy.	• [*Specify the mitigating or management strategy(ies) to be demonstrated during the drill; select these from the list of strategies developed per the guidance in section 5.3.7.*] • [*Specify which key implementing actions will be performed, simulated or discussed during the drill.*] • Verify that the necessary actions for implementing a mitigating or management strategy can be performed by the available staff. • Verify that personnel assigned actions do not have concurrent collateral duties which would preclude timely performance.

Recommended Objective	Performance Attributes
7. Demonstrate the ability to deploy equipment necessary for debris removal in order to allow/improve access to the unit(s).	• [*Specify which key implementing actions will be performed, simulated or discussed during the drill.*] • [*Specify the location(s) where demonstration will occur.*] • Verify that the necessary actions for performing debris removal can be implemented by the available staff. • Verify that personnel assigned actions do not have concurrent collateral duties which would preclude timely performance.
8. Demonstrate the adequacy of EP facilities and equipment to support the augmented ERO during a beyond design basis event.	• EP facilities can adequately accommodate expected personnel during the response to a beyond design basis event affecting all onsite units. • Augmented ERO personnel have the equipment necessary to perform assigned duties during a beyond design basis event affecting all onsite units.
9. Demonstrate the ability to perform multi-unit/source dose assessment.	Perform an offsite dose assessment following a beyond design basis event or severe accident resulting in concurrent radiological releases from all on-site units (*multi-unit site*) or multiple release points (*single-unit site*). **Note** This drill objective may demonstrated during a drill or exercise (as an in sequence or out-of-sequence activity) or a separate/stand-alone mini-drill. Refer to section 2.3.4 for additional information.
10. Demonstrate the ability to notify the National SAFER Response Center (NSRC) and coordinate the delivery of requested equipment.	The NSRC is notified of the event and equipment needs in accordance with appropriate procedures or guidelines. [*Site protocol may have this notification being made to INPO instead of directly to the NSRC; revise wording as needed. Wording should also reflect which organizations will be represented by a controller/control cell.*]

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APPENDIX B – EXAMPLE MITIGATION STRATEGY LIST

Example Boiling Water Reactor (BWR) Mitigating Strategies	
Flex Support Guidelines	1. DC load shedding/stripping 2. Use of RCIC/HPCI/IC during an ELAP 3. Repower instrumentation needed to maintain safety functions with portable power supplies 4. Use of alternate water supply to support core and spent fuel pool heat removal 5. Depressurize RPV for injection with portable injection source 6. Containment venting 7. Repower hydrogen igniters with a portable power supply (BWR Mark III containments only) 8. Spent fuel pool cooling via makeup with a portable injection source
Severe Accident Management Guidelines	1. Inject into (makeup to) reactor pressure vessel/reactor coolant system (RPV/RCS) 2. Depressurize the RPV/RCS 3. Spray within the RPV 4. Operate isolation condenser 5. Spray into containment 6. Inject into containment 7. Operate recombiners 8. Operate igniters 9. Inert the containment with noncondensable gases 10. Vent the primary containment 11. Inject into the spent fuel pool 12. Spray the spent fuel pool 13. Vent/ventilate the reactor building or auxiliary building 14. Scrub releases by external spraying of buildings
Extensive Damage Mitigation Guidelines (or other related guidelines describing mitigating actions for an event involving a loss of large areas of the plant due to explosions or fire)	1. Manual operation of RCIC/IC 2. DC power supplies to allow depressurization of RPV and injection with portable pump 3. Utilize feedwater and condensate 4. Makeup to hotwell. 5. Makeup to CST 6. Maximize CRD flow 7. Procedure to isolate RWCU 8. Manually open containment vent lines 9. Inject water into the drywell 10. Portable sprays

Example Pressurized Water Reactor (PWR) Mitigating Strategies	
Flex Support Guidelines	1. DC load shedding/stripping 2. Use of AFW/EFW during an ELAP 3. Repower instrumentation needed to maintain safety functions with portable power supplies 4. Use of alternate water supply to support core and spent fuel pool heat removal (including all portable/staged pumps) 5. Depressurize steam generator for makeup with portable injection source 6. Means to provide borated RCS makeup 7. Containment spray (if applicable) 8. Operate hydrogen igniters (ice condenser containments) 9. Spent fuel pool cooling via makeup with a portable injection source 10. Mode 5 & 6 RCS makeup using portable injection source
Severe Accident Management Guidelines	1. Inject into (makeup to) reactor vessel/reactor coolant system 2. Depressurize the RCS 3. Restart reactor coolant pump (RCP) 4. Depressurize steam generators 5. Inject into (feed) the steam generators 6. Spray into containment 7. Inject into containment 8. Operate fan coolers 9. Operate hydrogen igniters (ice condenser containments) 10. Vent the containment 11. Inject into the spent fuel pool 12. Spray the spent fuel pool 13. Vent/ventilate the auxiliary building 14. Scrub releases by external spraying of buildings
Extensive Damage Mitigation Guidelines (or other related guidelines describing mitigating actions for an event involving a loss of large areas of the plant due to explosions or fire)	1. Makeup to RWST 2. Manually depressurize steam generators to reduce RCS inventory loss 3. Manual operation of turbine (or diesel)-driven AFW/EFW pump 4. Manually depressurize steam generators and use portable pump 5. Makeup to CST 6. Containment flooding with portable pump 7. Portable sprays (if available) 8. Internal Spent Fuel Pool Makeup 9. External Spent Fuel Pool Makeup

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Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents

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Nuclear Energy Institute

Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents

~~September 2014~~
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This document was developed by the Nuclear Energy Institute (NEI) Emergency Preparedness (EP) Working Group with assistance from the Beyond Design Basis (BDB) Event Response Drill Task Force.

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NOTICE

EXECUTIVE SUMMARY

This technical report provides guidance for the completion of actions necessary to address the Tier 2 Emergency Preparedness (EP) enhancements identified in US Nuclear Regulatory Commission (NRC) Report, *Recommendations for Enhancing Reactor Safety in the 21st Century* [*The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*].[1&2] These actions reflect the approach discussed in COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, and related NRC staff and Nuclear Energy Institute (NEI) documents. Specifically, the NRC staff determined that certain Tier 2 EP items are being addressed adequately through implementation of NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*.

Order EA-12-049 addresses NRC NTTF Report Recommendation 4 and stemmed directly from Recommendation 4.2. The activities undertaken by the industry to comply with the Order will resolve two of the three Tier 2 items contained in NRC NTTF Report Recommendation 9.3; these items are periodic training and drills, and EP equipment and facilities, both associated with responses to a multi-unit and/or extended loss of AC power event.[3] The remaining Tier 2 item from Recommendation 9.3 deals with multi-unit dose assessment capability and is not within scope of Order EA-12-049 activities.

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, provides guidance on the format and content of licensee responses to Order EA-12-049. The guidance also covers information related to FLEX deployment, including training and drills, and equipment and facility topics captured in Recommendation 9.3. For example, NEI 12-06, states, ~~"[w]here~~"Where appropriate, the integrated FLEX drills should be organized on a team or crew basis and conducted periodically; with all time-sensitive actions to be evaluated over a period of not more than eight years." It further states, "Periodic training should be provided to site emergency response leaders on beyond design-basis emergency response strategies and implementing guidelines," and "procedures/guidance should identify the protective clothing or other equipment or actions necessary.…"

In addition, NEI 12-06 recommends utilization of the staffing and communication resources identified in NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*. The latter document was developed to address the two Tier 1 topics from Recommendation 9.3 - staffing and communications. NEI 12-01 states, "[a] licensee should identify additional work areas necessary for the performance of expanded response functions. The use of alternate emergency response facilities should be considered." This statement addresses the facilities needed to house the response staff.

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[1] This report is commonly referred to as the NRC NTTF Report.
[2] The tier assignments made to the EP enhancements are discussed in SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011
[3] Staff documents may refer to an "extended loss of AC power" as a "prolonged Station Blackout (SBO)."

With the preceding in mind, NEI and the industry have created this technical report to promote consistent implementation of the actions ~~which~~that address the Tier 2 EP enhancements discussed above.

Three of the topics addressed by COMSECY-13-0010 are also relevant to NRC NTTF Recommendation 8. These topics are training, drills and exercises, and they are discussed in an NRC document entitled, *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013.[4] The Recommendation 8 regulatory basis was subsequently incorporated into *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015, with changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015. In recognition of the interrelationship between of the discussions presented in the COMSECY, the regulatory basis and the ~~regulatory basis~~proposed rule, and the desirability of having well-integrated guidance, this document ~~also~~ addresses training, ~~qualifications,~~and drills and exercises for beyond design basis events and severe accidents.

Finally, fleet and site leadership teams should carefully consider which department(s) will be assigned a responsibility for addressing one or more of the EP and emergency response-related enhancements discussed in this document. It is important that leadership teams have a full understanding of the requirements related to EP and Beyond Design Basis (BDB) emergency response capabilities in order to identify potential gaps in organizational knowledge, "skill sets," and alignment/coordination that could impact sustainability. In particular, opportunities to leverage organizational resources and synergies in order to improve performance should be pursued.

[4] Available on regulations.gov; see Docket ID: NRC-2012-0031.

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ENHANCEMENTS TO EMERGENCY RESPONSE CAPABILITIES FOR BEYOND DESIGN BASIS EVENTS AND SEVERE ACCIDENTS

1 INTRODUCTION

1.1 SCOPE AND PURPOSE OF NEI 13-06

This technical report provides guidance for the performance of licensee actions that will address certain aspects of recommendations contained in US Nuclear Regulatory Commission (NRC) Report, *Recommendations for Enhancing Reactor Safety in the 21st Century* [*The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*]. The specific recommendations are:

- Recommendation 4.2 – "Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented."

- Recommendation 8.1 – "Order licensees to modify the EOP technical guidelines (required by Supplement 1, 'Requirements for Emergency Response Capability,' to NUREG-0737, issued January 1983 (GL 82-33), to (1) include EOPs, SAMGs, and EDMGs in an integrated manner, (2) specify clear command and control strategies for their implementation, and (3) stipulate appropriate qualification and training for those who make decisions during emergencies."

- Recommendation 8.4 – "Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors."

- Recommendation 9.3 [*relevant wording excerpted*] – "Order licensees to do the following until rulemaking is complete:

    - Add guidance to the emergency plan that documents how to perform a multiunit dose assessment (including releases from spent fuel pools) using the licensee's site-specific dose assessment software and approach.

    - Conduct periodic training and exercises for multiunit and prolonged SBO [*Station Blackout*] scenarios. Practice (simulate) the identification and acquisition of offsite resources, to the extent possible.

    - Ensure that EP equipment and facilities are sufficient for dealing with multiunit and prolonged SBO scenarios."

These recommendations were subsequently evaluated by the NRC staff and refined into various regulatory positions and actions. NEI 13-06 addresses the positions and actions discussed in COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency*

Preparedness for Japan Lessons Learned. The topics in the COMSECY include multi-unit dose assessment, training, EP facilities and equipment, and drills and exercises.

Additionally, the COMSECY makes reference to certain topics that are also within the scope of Recommendation 8; these topics are training, drills and exercises~~. With respect to Recommendation 8, these topics apply to the~~ related to implementation of FLEX Support Guidelines (FSGs), Severe Accident Management Guidelines (SAMGs) and Extensive Damage Mitigation Guidelines (EDMGs). In recognition of the need for well-integrated guidance, NEI 13-06 addresses the training, ~~qualification,~~and drill and exercise aspects of the COMSECY and ~~*Onsite Emergency Response Capabilities, Regulatory*~~*Proposed Rule – Mitigation of Beyond Design* *Basis* ~~*to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8,*~~*Events (RIN 3150-AJ49)*, dated ~~October 1, 2013~~November 2, 2015. The latter reflects changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015.

Finally, this document uses the term "FLEX Support Guidelines" or "FSGs" to connote the document(s) developed or enhanced in response to NRC Order EA-12-049, *Order Modifying Licenses with regard to Requirements for Mitigating Strategies for Beyond Design Basis External Events*, and which describe/direct the operator and field actions necessary to implement mitigating strategies in response to a beyond design basis external event. Depending upon Owners Group guidance, and fleet and site standards, these actions may be contained in a document(s) with a different name. Each licensee should ensure that their appropriate site-specific documents are utilized when addressing the FLEX-related guidance contained in this document.

2 MULTI-UNIT DOSE ASSESSMENT

2.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

2.1.1 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Add guidance to the emergency plan that documents how to perform a multiunit dose assessment (including releases from spent fuel pools) using the licensee's site-specific dose assessment software and approach."

2.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NEI Letter, *Industry Implementation of Multi-unit Dose Assessment Capability*, Pollock to Wiggins, dated January 28, 2013

NRC Letter, Wiggins to Pollock, dated February 27, 2013

NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pollock to Wiggins, dated March 14, 2013

NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pietrangelo to Nuclear Strategic Issues Advisory Committee Steering Group, dated March 22, 2013

COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

Site-specific letter to NRC staff concerning the intent to implement multi-unit (source) dose assessment capability, dated on or around June 30, 2013

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

2.3 RECOMMENDED ACTIONS

2.3.1 Industry Performance Standard for Multi-Unit Dose Assessment

All single and multi-unit sites should establish the capability to perform offsite dose assessments during an event involving concurrent radiological releases from all on-site

units and/or multiple release points (i.e., whether from one or multiple units[5]), consistent with the description contained in the site-specific licensee letter to the NRC staff dated on or around June 30, 2013.

The multi-unit dose assessment capability should be computerized (i.e., offsite dose projections are generated using a computer-based model), and reflect the normally expected use of radiological and meteorological indications, e.g., incorporated into the site's emergency dose projection software as an assessment option. It should be available to support responses during events both within and beyond the plant design basis. In particular, the capability should exist to project offsite doses during an event involving an extended loss of AC power affecting all onsite units.

In addition to the normally used calculation methods and input indications, the capability should also accommodate the use of alternate methods and indications to address instances when normal data sources may be unavailable. For example, in cases where a plant vent radiation monitor is non-functional, a dose projection model might have the capability to project offsite doses based on a source term derived from a dose rate measurement in the plant or field. Or if onsite meteorological data is not available, then dose assessments are performed using parameter values obtained from a pre-identified near-site source or the National Weather Service.

A licensee may elect to also include a backup method (e.g., a manual method) to supplement the computerized method discussed above; if this option is pursued, the backup method should be capable of producing results within a reasonable time period (e.g., within about 30 minutes). In addition, consideration should be given to establishing a procedurally-driven peer/second person check of manually derived output, where warranted.

Implementation of this enhancement may necessitate the addition of a backup power source (e.g., an uninterruptable power supply) to onsite dose assessment computing platforms or ensuring the availability of computing platforms at locations away from the site (e.g., at an ERO alternate facility or an Emergency Operations Facility). It does not require the installation of new, or modification of existing, plant equipment such as radiation monitors, flow detectors and meteorological instrumentation (including associated data processors and power sources).

Each licensee should discuss their capability to perform multi-unit dose assessment with the appropriate Offsite Reponses Organization (ORO) agency officials, and determine if any changes are necessary to ORO plans and procedures.

[5] This topic is referred to as "multi-unit dose assessment" for ease of reading; however, it should be understood to mean the capability to assess concurrent releases from multiple release sources/points such as reactor cores and spent fuel pools. It is therefore applicable to single-unit sites as well.

2.3.2 Emergency Classification and Protective Action Recommendations

Multi-unit dose assessment results should be assessed in accordance with the licensee's existing emergency classification scheme and Protective Action Recommendation (PAR) decision-making process.

Each licensee should verify that the capability exists to issue a PAR for appropriate areas beyond the Emergency Planning Zone (EPZ) boundary, in accordance with existing regulatory requirements and guidance.

Consideration should be given to addressing the following points in the site-specific procedure or guideline that implements the multi-unit dose assessment capability.

- Projected offsite doses should be compared against the Emergency Action Levels (EALs) to determine if a change in the emergency classification is warranted.
- Projected offsite doses should be compared against appropriate decision-making criteria to determine if a change in PARs is warranted.

2.3.3 Training

Each licensee should provide training to the personnel responsible for performing a multi-unit dose assessment. Training materials, delivery methods and frequencies, and evaluation techniques should be developed using established Systematic Approach to Training (SAT) processes.

2.3.4 Performance Enhancing Experience

Periodic opportunities for a performance enhancing experience should be provided to personnel responsible for performing multi-unit dose assessment and assessing the results. Such opportunities may include performance during a drill or exercise (as an in sequence or out-of-sequence activity) or a separate/stand-alone mini-drill. These opportunities should be provided consistent with the extent-of-play and methods normally used to implement mini-drills, drills or exercises involving a demonstration of dose assessment capabilities.

2.3.5 Quality and Maintenance-Related Requirements

Equipment and software used to implement a multi-unit dose assessment capability should be procured and installed under the commercial and site requirements normally applicable to the EP Program.

Programmatic controls should be applied to appropriate equipment and software to ensure availability and reliability, including the performance of periodic inventory checks and functionality testing.

2.3.6 Considerations for Program Documents

A capability for performing multi-unit dose assessment need not be described in the site emergency plan; however, this capability should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

3 TRAINING

3.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

3.1.1 Recommendation 4

"The Task Force recommends that the Commission direct the staff to begin the actions given below to further enhance the ability of nuclear power plants to deal with the effects of prolonged SBO conditions at single and multiunit sites without damage to the nuclear fuel in the reactor or spent fuel pool and without the loss of reactor coolant system or primary containment integrity.

. . .

4.2 Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design-basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented.

- This existing equipment currently provides some of the coping capability that is recommended for the long term, but current storage requirements do not ensure that it will be available after a design-basis external event. This requirement would increase the likelihood that the equipment will be available if called upon.

- The staff should also consider conforming changes to the requirements in 10 CFR 50.54(hh)(2) to address multiunit response capacity."

3.1.2 Recommendation 8

"The Task Force recommends that the Commission direct the staff to further enhance the current capabilities for onsite emergency actions in the following ways:

. . .

8.1 Order licensees to modify the EOP technical guidelines (required by Supplement 1, 'Requirements for Emergency Response Capability,' to NUREG-0737, issued January 1983 (GL 82-33), to (1) include EOPs, SAMGs, and EDMGs in an integrated manner, (2) specify clear command and control strategies for their implementation, and (3) stipulate appropriate qualification and training for those who make decisions during emergencies.

. . .

8.4 Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors."

3.1.3 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Conduct periodic training and exercises for multiunit and prolonged SBO scenarios. Practice (simulate) the identification and acquisition of offsite resources, to the extent possible."

3.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012

Site-specific letter to NRC staff transmitting results of a communications assessment performed in response to NRC 50.54(f) letter; initial letter dated on or around October 31, 2012 and a possible follow-up letter dated on or around February 28, 2013

COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

Site-specific letter to NRC staff transmitting results of a first-phase staffing assessment performed in response to NRC 50.54(f) letter, dated on or around April 30, 2013; a second-phase staffing assessment is due to the NRC staff no later than 4 months prior to the beginning of the second refueling outage (as described in the site response to NRC Order EA-12-049

Site-specific Integrated Plan for implementing NRC Order EA-12-049

Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8, dated October 1, 2013

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

3.3 RECOMMENDED ACTIONS

3.3.1 BDB Event Response Training

Each licensee should provide training to the key personnel relied upon to implement the procedures and guidelines for responding to a beyond design basis event or severe accident, including the site-specific integrated use of FLEX Support Guidelines (FSGs), Extensive Damage Mitigation Guidelines (EDMGs) and Severe Accident Management Guidelines (SAMGs).[6] Training materials, delivery methods and frequencies, and evaluation techniques should be developed using established processes that address the "Systems approach to training" (SAT) elements listed in 10 CFR 55.4~~.~~, except for elements already covered under other NRC regulations. Training on these common elements can be addressed in a non-SAT training program that is acceptable for meeting regulatory required training (e.g., 10 CFR part 50, appendix E, section IV.F). Position-specific qualification requirements should also be identified, as appropriate.

The primary focus of licensed operator initial and requalification training programs should continue to be on developing and maintaining the knowledge, skills and abilities of operators to implement the Emergency Operating Procedures (EOPs). This goal should be balanced with the need to provide the additional SAT-based training necessary to ensure that operators have the capability to respond to a beyond design basis event or severe accident in accordance with site-specific strategies. Site administrative controls should be established to ensure that an individual has successfully completed all required training prior to assuming a licensed operator position on-shift (e.g., training could be performed after receipt of an initial operator license but before being assigned on-shift duties in the Control Room).

The SAT process may identify operator knowledge, skills and abilities necessary for the execution of site-specific FSG, EDMG and SAMG strategies beyond those associated with the Knowledge and Abilities (K/As) described in NRC guidance documents (e.g. from NUREG-1122 or NUREG-1123). These items should be included in and evaluated as part of station's SAT-based training program.

Dynamic exams may be used consistent with simulator capabilities.

[6] This training may be accomplished in different settings since implementation of some emergency response procedures and guidelines are dependent upon the nature of the postulated initiating event, the plant response/accident sequence, and the ability of responders to select and implement mitigation/management strategies.

In addition to licensed operators, ~~SAT-based~~ training should be provided to other licensee personnel with supporting responsibilities, including:

- Non-licensed operators, health physics staff, maintenance personnel, and other positions that would be called upon to perform implementing tasks.
- Support staff that would be evaluating plant conditions and recommending appropriate accident mitigating and management strategies for implementation.
- Personnel who would be requesting and coordinating the delivery of Final Phase (Phase 3) mitigating strategy equipment from an offsite location (e.g., from ~~a Regional~~the National SAFER Response Center).

Training and qualification elements may be incorporated into a new training program, into an existing training program(s), or a combination of both. Non-SAT training programs that meet the needs for common elements do not need to be revised to use the SAT process.

The development of training and qualification requirements and materials should consider the degree to which the knowledge and abilities normally expected of a given position can be readily applied to an assigned task. Development should also recognize the availability of job/user aids and built-in equipment/hardware features that can improve human performance during stressful or adverse conditions (e.g., color coding, standardized connections, etc.).

Training program developers should assess and implement reasonable methods that may be used to facilitate practice at performing tasks under expected adverse conditions. The use of these methods should maintain an appropriate focus on the safety of plant personnel and equipment.

3.3.2 Plant-Referenced Simulator

The fidelity of the plant-referenced simulator should be maintained in accordance with 10 CFR 55.46 as additional equipment is installed in the facility and utilized to support operation. ~~The~~ Certification of simulator ~~should also be updated as additional accident monitoring instrumentation is installed~~fidelity in accordance with ANSI/ANS-3.5, *Nuclear Power Plant Simulators for Use in Operator Training and Examination*, if used, is considered to be sufficient for the ~~Control Room. Modelling of instrumentation responses should use current~~ initial stages of a beyond-design-basis external event scenario until the existing capability of the simulator model ~~capabilities, and consider~~is exceeded. Increasing the ~~anticipated effects~~capability of the ~~environmental~~plant-referenced simulator to specifically model conditions associated with a beyond design basis event or severe accident ~~on the reliability of the instrumentation readings. Such consideration~~is not required (e.g., models need not be upgraded to accommodate FLEX training or drills). Voluntary upgrades to one or more model aspects (e.g., instrumentation responses) may be ~~on~~performed using a "best estimate" basis~~. Increasing the capability of the plant-referenced simulator to specifically model the conditions of the~~

~~reactor core or stored spent fuel during a beyond design basis event or severe accident is not required.~~for the modelling.

3.3.3 Ultimate Decision-Maker Qualifications

As part of the required planning for responses to emergency conditions, each licensee has established a command and control structure for their Emergency Response Organization (ERO). Within this structure, there should be a position(s) with the assigned authority and responsibility for providing overall direction on the implementation of EOPs, FSGs, EDMGs and SAMGs for a unit or set of units; this authority and responsibility is referred to as the Ultimate Decision-Maker (UDM) function.[7] Qualification requirements should be developed for the position(s) performing this function. These requirements should ensure that each UDM-qualified individual has sufficient technical understanding and leadership ability to make timely and informed decisions during a beyond design basis event or severe accident.

The need for periodic requalification should also be assessed in order to ensure that individuals have maintained the necessary knowledge and skills. Applicable program controls should be updated as necessary to reflect requalification requirements.

3.3.4 Training Development Guidance from Regulatory Responses

In addition to the topics discussed above, training programs should also address the training-related actions described in:

- FLEX program implementing documents developed in accordance with NRC Order EA-12-049.
- The communications and staffing assessment responses provided to the NRC staff in accordance with the 50.54(f) letter dated March 12, 2012.

3.3.5 Considerations for Program Documents

The training and qualifications for responding to a beyond design basis event or severe accident need not be described in the site emergency plan; however, this material should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

[7] The UDM function is described in NEI 14-01, *Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents*.

4 EP FACILITIES AND EQUIPMENT[8]

4.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

4.1.1 Recommendation 4

"The Task Force recommends that the Commission direct the staff to begin the actions given below to further enhance the ability of nuclear power plants to deal with the effects of prolonged SBO conditions at single and multiunit sites without damage to the nuclear fuel in the reactor or spent fuel pool and without the loss of reactor coolant system or primary containment integrity."

. . .

4.2 Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design-basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented.

- This existing equipment currently provides some of the coping capability that is recommended for the long term, but current storage requirements do not ensure that it will be available after a design-basis external event. This requirement would increase the likelihood that the equipment will be available if called upon.

- The staff should also consider conforming changes to the requirements in 10 CFR 50.54(hh)(2) to address multiunit response capacity."

4.1.2 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Ensure that EP equipment and facilities are sufficient for dealing with multiunit and prolonged SBO scenarios."

[8] As used here, EP facilities and equipment refers to those facilities in which ERO members would perform their assigned functions during a Beyond Design Basis event response, and the necessary equipment located therein. It does not include the systems, structures, components or portable equipment used to implement accident mitigating or management strategies described in Abnormal/Emergency Operating Procedures, or FLEX Support, Severe Accident Management or Extensive Damage Mitigation Guidelines.

4.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

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Site-specific Integrated Plan for implementing NRC Order EA-12-049

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

4.3 RECOMMENDED ACTIONS

4.3.1 Industry Performance Standard for EP Facilities and Equipment

Each licensee should implement the Emergency Preparedness (EP) facility and equipment enhancements identified in their communications and staffing assessments

provided to the NRC staff in accordance with the 50.54(f) letter.

For EP facility and equipment enhancements not addressed by the requirements or guidance discussed above, the following approaches are recommended.

- Determine applicable design and configuration control measures.
- Items may be procured and installed under the commercial and site requirements normally applied to EP facilities and equipment.
- For multi-unit sites, ensure that sufficient quantities of radiation protection equipment and supplies are, or can be made, available to support protracted operation of an expanded Emergency Response Organization (ERO).
- Programmatic controls should be developed to ensure the availability and reliability of EP facilities and equipment, including the performance of periodic inventory checks, functionality testing and maintenance.
- Supporting contracts with vendors should be periodically verified.

4.3.2 Considerations for Program Documents

The facilities and equipment used exclusively for responding to a beyond design basis event or severe accident need not be described in the site emergency plan; however, these items should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

5 DRILLS AND EXERCISES

5.1 APPLICABLE ASPECTS OF NRC NTTF REPORT RECOMMENDATIONS

5.1.1 Recommendation 4

"The Task Force recommends that the Commission direct the staff to begin the actions given below to further enhance the ability of nuclear power plants to deal with the effects of prolonged SBO conditions at single and multiunit sites without damage to the nuclear fuel in the reactor or spent fuel pool and without the loss of reactor coolant system or primary containment integrity.

. . .

4.2 Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design-basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented.

- This existing equipment currently provides some of the coping capability that is recommended for the long term, but current storage requirements do not ensure that it will be available after a design-basis external event. This requirement would increase the likelihood that the equipment will be available if called upon.

- The staff should also consider conforming changes to the requirements in 10 CFR 50.54(hh)(2) to address multiunit response capacity."

5.1.2 Recommendation 8

"The Task Force recommends that the Commission direct the staff to further enhance the current capabilities for onsite emergency actions in the following ways:

. . .

8.4 Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors."

5.1.3 Recommendation 9

"The Task Force recommends that the Commission direct the staff to do the following:

. . .

9.3 Order licensees to do the following until rulemaking is complete:

. . .

Conduct periodic training and exercises for multiunit and prolonged SBO scenarios. Practice (simulate) the identification and acquisition of offsite resources, to the extent possible."

5.2 RELATED REFERENCE DOCUMENTS

SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012

COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

Site-specific letter to NRC staff transmitting results of a first-phase staffing assessment performed in response to NRC 50.54(f) letter, dated on or around April 30, 2013; a second-phase staffing assessment is due to the NRC staff no later than 4 months prior to the beginning of the second refueling outage (as described in the site response to NRC Order EA-12-049

Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8, dated October 1, 2013

Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49), dated November 2, 2015

5.3 RECOMMENDED ACTIONS

5.3.1 Industry Performance Standards for BDB Event Response Drills

Each licensee should demonstrate the capability for effective integrated use of their accident mitigation and management procedure and guideline sets. In particular, the ability to transition between procedure and guideline sets, and select the best strategy for preventing or mitigating fuel damage and limiting radiological releases, is demonstrated. Complementary methods will be necessary to accomplish this demonstration since the

procedures and guidelines implemented for a given scenario are dependent upon the nature of the postulated initiating event, the plant response/accident sequence, and the ability of responders to select and implement mitigation/management strategies. The use of complementary methods will also promote more effective use of resources (e.g., facilitates targeted drill objectives, avoids excessive drill "down time" and durations, etc.), and minimize potential safety challenges to personnel and equipment. These methods are discussed below and involve conducting:

- A drill that demonstrates the integrated use of FLEX strategies under the control of an Abnormal Operating Procedure (AOP) or Emergency Operating Procedure (EOP), as appropriate to the postulated scenario. Specific considerations for this drill are discussed in section 5.3.4.

- A drill that demonstrates the transition from a controlling AOP, EOP or Extensive Damage Mitigation Guidelines (EDMG) into Severe Accident Management Guidelines (SAMGs), and the selection of appropriate severe accident management strategies. The integrated use of FLEX strategies may occur if directed by the controlling SAMG and as appropriate to the postulated scenario. Specific considerations for this drill are discussed in section 5.3.5.[9]

- A drill that demonstrates the use of EDMG strategies.[10] The integrated use of AOPs and EOPs, and FLEX strategies, may occur if directed by the controlling EDMG as appropriate to the postulated scenario. Specific considerations for this drill are discussed in section 5.3.6.

- A drill or drills to demonstrate the capability to utilize equipment necessary to implement each strategy for responding to a beyond design basis event or severe accident. Specific considerations for this drill are discussed in section 5.3.7.

The initial occurrence of each drill type listed above should be aligned with the implementation milestones for the Mitigation of Beyond-Design-Basis Events Rule. Also for each drill type listed above, a subsequent drill should be conducted within 8 calendar years of the preceding occurrence. For example, an initial FLEX strategy drill is conducted in June, 2017; the next FLEX strategy drill should be conducted by December 31, 2025.

5.3.2 Common BDB Event Response Drill Attributes

5.3.2.1 The following attributes apply to any BDB event response drill requiring implementation of FSGs, SAMGs or EDMGs, and the Drill Manager should consider them when developing the drill scenario and implementation methods.

- If not leading the effort, it is recommended that a fleet or site Emergency

[9] The SAMG drill is not a regulatory requirement and is performed on a voluntary basis.
[10] As used here, EDMG should be understood to mean the site document(s) developed to address 10 CFR 50.54(hh)(2), and the related guidance in NEI 06-12, B.5.b Phase 2 & 3 Submittal Guideline.

Preparedness (EP) Department be involved with the development and implementation of the drill[11].

- Two or more of the drills described above may be combined and conducted as one activity. A drill(s) may also be included within the scope of another drill (e.g., a scheduled ERO drill) or an evaluated exercise conducted to meet the requirements of 10 CFR 50, Appendix E.

- Conducting a BDB event response drill may require a set of site resources different from those normally used to conduct EP drills. The Drill Manager should identify the site resources (e.g., staffing and equipment) necessary to conduct the drill and ensure that they are scheduled/reserved. In particular, consider items that should be available to support the selected demonstrations of in-field/plant actions (e.g., movement of a portable pump).

- All normal site security, radiation protection and personnel safety requirements should be followed during the drill. These requirements should be carefully considered when developing the drill scope, extent-of-play and scenario.

- Scenario time jumps/compression may be used during the drill; however, the Drill Manager should be aware that operating experience has indicated such techniques may cause confusion among drill participants unless carefully scripted and controlled.

- Emergency response functions described in the site emergency plan should be implemented as appropriate to the drill scope, extent-of-play and scenario, and consistent with normal EP drill program practices.

- The licensee should determine whether drill performance will count towards the DEP and ERO performance indicators, consistent with the guidance in NEI 99-02.

- Drill controller and evaluator duty assignments and responsibilities should be consistent with normal fleet or site drill program practices. In particular, assignments should be made to observe and assess player performance in a manner similar to that done for other drills.

- Use of radiation protection equipment by personnel responsible for deploying portable equipment in the field/plant should be performed.

- Following a drill, the licensee should conduct a drill critique and develop a

[11] This recommendation is limited to drill development and implementation. No position is taken with respect to which fleet or site department(s) should be assigned ownership of BDB event response programs or program elements.

drill report. The report should include a timeline of the decisions and actions taken to implement the selected BDB event response strategies.

- Identified drill weaknesses and deficiencies should be placed into the appropriate fleet or site corrective action program.

5.3.3 Use of a Plant-Referenced Simulator during BDB Event Response Drills

Drills should utilize the capabilities of the plant-referenced simulator(s) to the degree practicable by current simulator modeling.

In cases where the postulated drill scenario events exceed the limits of the simulator model, or such limits would be exceeded soon after the drill is commenced, the simulator should not be used. Key parameter values supporting the drill should be generated and supplied to participants through other means (e.g., "best estimate" values are developed and provided using paper data sheets).

For a multiple-unit site with one plant-referenced simulator, the simulator may be used during a drill and the resulting data taken as representative of all onsite units if consistent with the postulated scenario conditions (i.e., the postulated events affect all onsite units in a similar manner).

5.3.4 Drill Demonstrating Integrated Use of FLEX Strategies Under the Control of an AOP or EOP

5.3.4.1 The following organizations and facilities should participate in the drill.

- A simulated Control Room for all on-site units. The Control Room(s) may be simulated in any location, consistent with the guidance in step 5.3.3 (e.g., simulator, conference room or classroom, TSC, etc.). Control Room players may be limited to those necessary for the planned demonstration.

- The primary Emergency Operations Facility (EOF) or alternate EOF, if the use of the facility is anticipated during the response to the postulated event.

- An offsite facility to which the onsite Emergency Response Organization (ERO) would report during the period when the site is inaccessible (e.g., an ERO alternative facility[12]), if the use of the facility is anticipated during the response to the postulated event.

- Offsite Response Organizations (OROs)[13] should be invited to participate;

[12] An ERO alternative facility is the staging area for augmented ERO personnel used during a response to a hostile action, as described in the site emergency plan.
[13] OROs are those state, local and tribal agencies with primary responsibility for coordinating and implementing offsite emergency measures.

however, their participation is not required.

- The ~~appropriate Regional~~National SAFER Response Center ~~(RRC)~~ should be invited to participate; however, actual delivery of equipment is not required.

5.3.4.2 The Drill Manager[14] should consider the following items when developing the drill scope and extent-of-play.

- As used in this section, "drill" means a performance enhancing experience during which participant performance is assessed against a certain standard (e.g., a drill objective). Such experiences typically exclude classroom training and facilitated meetings where on-the-spot instruction and coaching is expected.

- Control Room players should process through the operating procedures and guidelines that would be used to respond to the postulated event.

- The drill duration need not exceed the assumed elapsed time necessary for augmented ERO personnel to access the site following the initiating event, as specified in the licensee's staffing assessments performed pursuant to the NRC's 50.54(f) letter dated March 12, 2012. This elapsed time is typically 6 hours.[15] Since the arrival times of ERO personnel reporting to the site from offsite locations during the drill should be consistent with the times specified in the staffing assessments, it is unlikely that the onsite TSC and OSC will be activated during the drill (unless the drill duration exceeds the assumed time necessary for ERO personnel to access the site).

- The arrival times of response personnel reporting to the EOF and/or an ERO alternate facility should reasonably reflect the postulated scenario conditions and the facility's distance from the plant site.

- Sufficient drill time should be allowed for the appropriate augmented ERO position to demonstrate the ability to assume command and control of the event response from the Shift Manager.

- Drill players should use the communications systems and equipment that would be employed during an actual response to the postulated event. This equipment may be simulated if changes or modifications would be required to support drill use (e.g., the simulated Control Room could not use a system without the installation of a new antenna and cabling). The decision to use or simulate this equipment should also include resource and equipment safety considerations.

[14] As used in this document, "Drill Manager" refers to the individual with the overall responsibility for coordinating preparation and implementation of a BDB event response drill.
[15] Refer to NEI 12-01, assumption 2.2.4, and site-specific staffing assessments.

- A control cell should be established to simulate non-participating organizations.

- Appropriate personnel at ERO facilities should demonstrate the ability to request the acquisition, and coordinate the delivery, of equipment from the ~~supporting RRC~~National SAFER Response Center (NSRC) consistent with site procedures and guidelines; however, activation of the ~~RRC~~NSRC is not required. If the ~~RRC~~NSRC is not participating, then a control cell should be established to simulate the appropriate contact point. Actual delivery of equipment from an ~~RRC~~NSRC will be simulated or occur as an out-of-sequence activity as coordinated with, and agreed to in advance, by the ~~RRC~~NSRC.

5.3.4.3 The Drill Manager should consider the following items when developing the drill scenario and implementation methods.

- Determine the strategies, procedures and guidelines to be demonstrated during the drill, and specify the necessary operating mode(s) for each onsite unit in the scenario initial conditions.

- The assumed drill start time for the initiating event should occur during a period of minimum on-shift staffing, i.e., during a backshift, weekend or holiday.[16]

- The drill should be initiated by a beyond design basis event that results in an extended loss of AC power (ELAP) simultaneously affecting all onsite units.

- The postulated drill scenario conditions should be generally consistent with the event assumptions listed in NEI 12-01 and NEI 12-06.

- Controllers should track the assignment/deployment of on-shift personnel, and promptly identify any instances where such assignments/deployments exceed to the number of available individuals[17]. Such instances should be reported to the players, documented in a controller log and discussed in the drill critique. The players are responsible for determining what changes to assignments/deployments are necessary during the drill to account for staffing constraints identified by a controller.

- The scenario need not include the postulated failure of portable equipment.

- The drill scenario need not include a postulated radiological release.

[16] To allow for drill conduct during a normal work day, the scenario may use an assumed day and/or start time (e.g., a drill conducted during normal work hours on a Tuesday may assume that the scenario takes place on a Saturday).
[17] The number of available individuals should be determined from, and consistent with, the staffing assessments performed in response to the NRC 50.54(f) letter of March 12, 2012.

- The scenario may assume that requested response assistance provided by OROs and other offsite resource providers (e.g., corporate support) is available within reasonably expected timeframes.

5.3.5 Drill Demonstrating the Transition from a Controlling AOP, EOP or EDMG into SAMGs

5.3.5.1 The following organizations and facilities should participate in the drill.

- A simulated Control Room for all on-site units. The Control Room(s) may be simulated in any location, consistent with the guidance in step 5.3.3 (e.g., simulator, conference room or classroom, TSC, etc.). Control Room players may be limited to those necessary for the planned demonstration.

- The primary or alternate emergency response facilities which house personnel with responsibility for evaluation of SAMG strategies and related decision-making for implementation. Players may be limited to these individuals.

- Offsite Response Organizations (OROs) should be invited to participate; however, their participation is not required.

- Participation by ~~an RRC~~the NSRC is not required.

5.3.5.2 The Drill Manager should consider the following items when developing the drill scope and extent-of-play.

- As used in this section, "drill" means a performance enhancing experience during which participant performance is assessed against a certain standard (e.g., a drill objective). Such experiences typically exclude classroom training and facilitated meetings where on-the-spot instruction and coaching is expected.

- Control Room players should process through the operating procedures and guidelines that would be used to respond to the postulated event.

- The drill should facilitate demonstration of the ability of the appropriate ERO decision-maker to assume command and control of the event response from the Shift Manager.

- Drill players should use the communications systems and equipment that would be employed during an actual response to the postulated event. This equipment may be simulated if changes or modifications would be required to support drill use (e.g., the simulated Control Room could not use a system without the installation of a new antenna and cabling). The decision to use or simulate this equipment should also include resource and equipment safety considerations.

- A control cell should be established to simulate non-participating organizations. For example, if portions of the Technical Support Center staff are participating, the Drill Manager should consider establishing a control cell to simulate needed contacts with the Operational Support Center and EOF staffs.

- The drill should facilitate demonstration of the evaluation and decision-making for at least two SAMG strategies.

5.3.5.3 The Drill Manager should consider the following items when developing the drill scenario and implementation methods.

- The drill initial conditions should reflect the occurrence of an accident or event that resulted in the onset of conditions leading to fuel damage, and driving entry into SAMGs for at least one unit.[18] The initial conditions should also specify the operating mode(s) of each onsite unit that existed prior to the accident or event, based on the strategies, procedures and guidelines to be demonstrated during the drill. The transition from the procedure(s) in effect, and into SAMGs, should be demonstrated.

- All ERO facilities may be assumed to be activated.

- The scenario may assume that requested response assistance provided by OROs and other offsite resource providers (e.g., corporate support) is available within reasonably expected timeframes.

5.3.6 Drill Demonstrating the Use of EDMG Strategies

5.3.6.1 The following organizations and facilities should participate in the drill.

- Appropriate on-shift personnel should be selected based on whether or not the drill scenario assumes that the control room command and control structure remains available.

  - If available, establish a simulated Control Room for all on-site units. The Control Room(s) may be simulated in any location, consistent with the guidance in step 5.3.3 (e.g., simulator, conference room or classroom, TSC, etc.). Control Room players may be limited to those necessary for the planned demonstration.

  - If not available, personnel should be those that can be expected to respond to an event involving a loss of large areas of the plant due to

[18] For example, a BDB seismic event occurred several hours ago that resulted in implementation of FLEX strategies. A second BDB seismic event occurred that impacted the ability to sustain one or more FLEX strategies, and more hours have elapsed. The drill would begin with conditions that are then degrading into those requiring a transition into SAMGs.

explosions or fire, and causing a loss of the normal on-shift command and control structure.

- On-site emergency response facilities or other locations that would be expected to be available following an event involving a loss of large areas of the plant due to explosions or fire, as described in the drill scenario.

- Offsite Response Organizations (OROs) should be invited to participate; however, their participation is not required.

- Participation by ~~an RRC~~the NSRC is not required.

5.3.6.2 The Drill Manager should consider the following items when developing the drill scope and extent-of-play.

- As used in this section, "drill" means a performance enhancing experience during which participant performance is assessed against a certain standard (e.g., a drill objective). Such experiences typically exclude classroom training and facilitated meetings where on-the-spot instruction and coaching is expected.

- Operators and other appropriate players should process through the operating procedures and guidelines that would be used to respond to the postulated event.

- The arrival times of response personnel reporting to the site from offsite locations should be consistent with those described in the site emergency plan.

- Sufficient drill time should be allowed for the appropriate augmented ERO position to demonstrate the ability to assume command and control of the event response.

- Drill players should use the communications systems and equipment that would be employed during an actual response to the postulated event. This equipment may be simulated if changes or modifications would be required to support drill use. The decision to use or simulate this equipment should also include resource and equipment safety considerations.

- A control cell should be established to simulate non-participating organizations.

- The drill should facilitate demonstration of the evaluation and decision-making for at least two extensive damage mitigating strategies.

5.3.6.3 The Drill Manager should consider the following items when developing the drill scenario and implementation methods.

- The assumed drill start time for the initiating event should occur during a period of minimum on-shift staffing, i.e., during a backshift, weekend or holiday.[19]

- The drill should be initiated by an event involving a loss of large areas of the plant due to explosions or fire. The scenario should specify whether or not the concurrent loss of the normal on-shift command and control structure is assumed to have occurred. These conditions should result in operators or other available on-shift personnel implementing EDMGs.

- Controllers should track the assignment/deployment of on-shift personnel, and promptly identify any instances where such assignments/deployments exceed to the number of available individuals[20]. Such instances should be reported to the players, documented in a controller log and discussed in the drill critique. The players are responsible for determining what changes to assignments/deployments are necessary during the drill to account for staffing constraints identified by a controller.

- The scenario need not include the postulated failure of portable equipment.

- The drill scenario need not include a postulated radiological release.

- The scenario may assume that requested response assistance provided by OROs and other offsite resource providers (e.g., corporate support) is available within reasonably expected timeframes.

5.3.7 Drills Demonstrating the Use of Strategy-Related Equipment

5.3.7.1 Each licensee should create a list of the mitigating strategies described in site-specific FSGs, SAMGs and EDMGs.[21] An example list of strategies is presented in Attachment B.[22] The capability to mobilize equipment used for debris removal should also be included in the list. For each listed strategy, the capability to utilize the key equipment necessary for performing an implementing method should be periodically demonstrated as discussed in step 5.3.1.

5.3.7.2 The capability to implement a strategy using installed plant equipment may be demonstrated during a drill or as an out-of-sequence activity. The licensee

[19] To allow for drill conduct during a normal work day, the scenario may use an assumed day and/or start time (e.g., a drill conducted during normal work hours on a Tuesday may assume that the scenario takes place on a Saturday).
[20] The number of available individuals should be consistent with the site emergency plan plus any additional personnel filling positions for which administrative controls exist to ensure 24/7 staffing.
[21] SAMG strategy equipment drills are not a regulatory requirement and are performed on a voluntary basis.
[22] The example list reflects currently operating plant designs that employ "active" safety features, and is for illustrative purposes only. As noted, each facility will need to create a site-specific listing based on site-specific mitigating strategies. This includes plant designs based on "passive" safety features such as the Westinghouse AP1000 or GE-Hitachi ESBWR.

may include an out-of-sequence demonstration within the scope of another scheduled activity. Such opportunities may include, but are not limited to, a mini-drill or Dynamic Learning Activity, a Job Performance Measure/Task Performance Evaluation or a demonstration associated with another program activity (e.g., a fire protection program inspection). Demonstration credit may also be given for performance during an actual event. All such demonstrations must be consistent with plant configuration control requirements and sound operational decision-making. Actual manipulation or operation of equipment is not required.

5.3.7.3 The capability to implement a strategy using portable equipment may be demonstrated during a drill or as an out-of-sequence activity. The licensee may include an out-of-sequence demonstration within the scope of another scheduled activity. Such opportunities may include, but are not limited to, a mini-drill or Dynamic Learning Activity, a Job Performance Measure/Task Performance Evaluation or a demonstration associated with another program activity (e.g., a fire protection program inspection). Demonstration credit may also be given for performance during an actual event.

The demonstration of portable equipment should entail the movement of the equipment from its storage location to the location where it would be placed and operated, consistent with plant configuration control requirements and sound operational decision-making. Should placement in the expected operating location not be practicable, movement to an alternate (drill) location is acceptable. Actual connection/hookup or operation of equipment is not required.

5.3.7.4 If the same (or essentially the same) strategy is described in two or more emergency response guideline sets, then the capability to implement that strategy need be demonstrated only once over a given 8-year period (i.e., consistent with the drill periodicity guidance in step 5.3.1). For example, a PWR site has a strategy for feeding a steam generator described in its FSGs, SAMGs and EDMGs. The demonstration of an implementing method for this strategy, such as using a portable pump in accordance with an FSG, would satisfy the strategy demonstration requirement for all three guideline sets.

5.3.7.5 The capability to mobilize equipment used for debris removal may be demonstrated during a drill or as an out-of-sequence activity. The licensee may include an out-of-sequence demonstration within the scope of another scheduled activity. Such opportunities may include, but are not limited to, a mini-drill or Dynamic Learning Activity, a Job Performance Measure/Task Performance Evaluation or a surveillance. Demonstration credit may also be given for performance during an actual event (e.g., the same equipment is used to clear site roads following a heavy snowfall).

5.3.7.6 For a mitigating strategy expected to be implemented within the assumed elapsed time necessary for ERO personnel to access the site (as specified in the licensee's staffing assessments performed pursuant to the NRC's 50.54[f]

letter dated March 12, 2012), the following drill guideline should be considered.

- The number of individuals performing the demonstration should be consistent with the number expected to be available during a real event; this number may be determined from a staffing assessment. Deviations from a staffing assessment should be documented in a controller log and discussed in the drill critique.

5.3.8 BDB Event Response Drill Objectives

Appendix A, BDB Event Response Drill Objectives, presents generic drill objectives that a licensee should use to develop a site-specific set of objectives for each BDB event response drill. Each objective has an associated listing of Performance Attributes; these attributes define successful objective performance and should be used to develop the site-specific evaluation criteria for each objective. The development of objectives and evaluation criteria should be informed by the content of site-specific procedures and guidelines, and the established drill scope and extent-of-play. While a licensee is not expected to use the generic objectives verbatim, the function(s) described by each objective, and the associated performance attributes, should be considered during the development of the drill objectives and evaluation material.

Objectives described in the fleet/site EP drill and exercise program may also be considered for demonstration during a BDB event response drill. These objectives, and their associated evaluation criteria, should be reviewed and revised as necessary to reflect differences between expected performance during a design basis event and a beyond design basis event. For example, additional time may be necessary to complete certain activities such as ORO notifications, the personnel accountability process and activation of ERO emergency response facilities during a beyond design basis event response. The licensee should determine reasonable performance standards based on site-specific capabilities, and reflect these in the objectives and evaluation criteria.

As noted above, each BDB event response drill should be critiqued to identify weaknesses and deficiencies. Licensees should modify their critique processes as necessary to ensure a thorough review and evaluation of BDB-related drill objectives.

5.3.9 Considerations for Program Documents

The drills conducted to demonstrate responses to a beyond design basis event or severe accident need not be described in the site emergency plan; however, these activities should be described in a document maintained through a fleet or site document control process. The document should be retained for the life of the plant.

Each licensee should review the condition screening and evaluation requirements described in their corrective action program(s), and determine if changes are necessary. The purpose of this review is to ensure that program criteria will properly prioritize conditions associated with beyond design basis event response capabilities and appropriately allocate resources for their correction. In particular, the prioritization and

allocation of resources should be balanced with other needs, and commensurate with the anticipated benefits to overall accident or event response capabilities (e.g., changes offering lower relative or absolute benefits should be assigned lower priorities).

6 REFERENCES

- NRC Report, *Recommendations for Enhancing Reactor Safety in the 21st Century [The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident]*, dated July 12, 2011

- SECY-11-0137, *Prioritization of Recommended Actions to be taken in Response to Fukushima Lessons Learned*, dated October 3, 2011

- NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012

- NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012

- NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012

- NRC Letter, Wiggins to Pollock, dated February 27, 2013

- COMSECY-13-0010, *Schedule and Plans for Tier 2 Order on Emergency Preparedness for Japan Lessons Learned*, dated March 27, 2013

- *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013

- *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015

- *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015

- NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*, dated ~~July 2009~~December 2006

- NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012

- NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, dated August 2012

- NEI Letter, *Industry Implementation of Multi-unit Dose Assessment Capability*, Pollock to Wiggins, dated January 28, 2013

- NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pollock to Wiggins, dated March 14, 2013

- NEI Letter, *Commitment for Implementation of Multi-Unit Dose Assessment Capability*, Pietrangelo to Nuclear Strategic Issues Advisory Committee Steering Group, dated March 22, 2013

- NEI 14-01, *Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents*, dated ~~September 2014~~February 2016

APPENDIX A – BDB EVENT RESPONSE DRILL OBJECTIVES

Recommended Objective	Performance Attributes
1. Demonstrate the ability of on-shift operations personnel to perform integrated implementation of operating procedures and guidelines for responding to a beyond design basis event or severe accident.	• The Shift Manager provides effective command and control of the accident or event response until relieved • Perform processing of, and transitions between, applicable procedures and guidelines. • Perform evaluation and decision-making related to the selection of mitigation or management strategies and actions. • Communicate selected mitigation or management strategies and actions to the appropriate personnel.
2. Demonstrate the ability of the [*ERO position assuming UDM function from Shift Manager*] to assume command and control for the selection and implementation of mitigation and management strategies.	• Perform turnover of command and control consistent with the applicable procedures or guidelines. • Perform decision-making related to the selection of mitigation and management strategies and actions, including those associated with a multi-unit response if applicable. • Direct the communication of selected mitigation and management strategies and actions to the Control Room and other appropriate personnel.
3. Demonstrate the ability of the augmented ERO staff to evaluate and recommend mitigation and management strategies.	• Perform evaluation and recommendations related to the selection of mitigation and management strategies and actions, including those associated with a multi-unit response if applicable. • Communicate selected mitigation and management strategies and actions to the Control Room and other appropriate personnel.

Recommended Objective	Performance Attributes
4. Demonstrate the ability of the on-shift and augmented ERO staff to communicate during a beyond design basis event or severe accident.	Establish and maintain required communications in accordance with applicable procedures and guidelines. [*Wording should reflect which organizations will be represented by a controller/control cell.*] • Offsite Response Organizations • NRC ENS • Between ERO facilities • On-site and in-plant response teams • Offsite monitoring teams
5. Demonstrate the ability to operate the installed plant equipment necessary for implementing a mitigating or management strategy.	• [*Specify the mitigating or management strategy(ies) to be demonstrated during the drill; select these from the list of strategies developed per the guidance in section 5.3.7.*] • [*Specify which key implementing actions will be performed, simulated or discussed during the drill.*] • Verify that the necessary actions for implementing a mitigating or management strategy can be performed by the available staff. • Verify that personnel assigned actions do not have concurrent collateral duties which would preclude timely performance.
6. Demonstrate the ability to deploy the portable equipment necessary for implementing a mitigating or management strategy.	• [*Specify the mitigating or management strategy(ies) to be demonstrated during the drill; select these from the list of strategies developed per the guidance in section 5.3.7.*] • [*Specify which key implementing actions will be performed, simulated or discussed during the drill.*] • Verify that the necessary actions for implementing a mitigating or management strategy can be performed by the available staff. • Verify that personnel assigned actions do not have concurrent collateral duties which would preclude timely performance.

Recommended Objective	Performance Attributes
7. Demonstrate the ability to deploy equipment necessary for debris removal in order to allow/improve access to the unit(s).	• [*Specify which key implementing actions will be performed, simulated or discussed during the drill.*] • [*Specify the location(s) where demonstration will occur.*] • Verify that the necessary actions for performing debris removal can be implemented by the available staff. • Verify that personnel assigned actions do not have concurrent collateral duties which would preclude timely performance.
8. Demonstrate the adequacy of EP facilities and equipment to support the augmented ERO during a beyond design basis event.	• EP facilities can adequately accommodate expected personnel during the response to a beyond design basis event affecting all onsite units. • Augmented ERO personnel have the equipment necessary to perform assigned duties during a beyond design basis event affecting all onsite units.
9. Demonstrate the ability to perform multi-unit/source dose assessment.	Perform an offsite dose assessment following a beyond design basis event or severe accident resulting in concurrent radiological releases from all on-site units (*multi-unit site*) or multiple release points (*single-unit site*). **Note** This drill objective may demonstrated during a drill or exercise (as an in sequence or out-of-sequence activity) or a separate/stand-alone mini-drill. Refer to section 2.3.4 for additional information.
10. Demonstrate the ability to notify the ~~Regional~~National SAFER Response Center (~~RRC~~NSRC) and coordinate the delivery of requested equipment.	The ~~RRC~~NSRC is notified of the event and equipment needs in accordance with appropriate procedures or guidelines. [*Site protocol may have this notification being made to INPO instead of directly to the ~~RRC~~NSRC; revise wording as needed. Wording should also reflect which organizations will be represented by a controller/control cell.*]

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APPENDIX B – EXAMPLE MITIGATION STRATEGY LIST

Example Boiling Water Reactor (BWR) Mitigating Strategies	
Flex Support Guidelines	1. DC load shedding/stripping 2. Use of RCIC/HPCI/IC during an ELAP 3. Repower instrumentation needed to maintain safety functions with portable power supplies 4. Use of alternate water supply to support core and spent fuel pool heat removal 5. Depressurize RPV for injection with portable injection source 6. Containment venting 7. Repower hydrogen igniters with a portable power supply (BWR Mark III containments only) 8. Spent fuel pool cooling via makeup with a portable injection source
Severe Accident Management Guidelines	1. Inject into (makeup to) reactor pressure vessel/reactor coolant system (RPV/RCS) 2. Depressurize the RPV/RCS 3. Spray within the RPV 4. Operate isolation condenser 5. Spray into containment 6. Inject into containment 7. Operate recombiners 8. Operate igniters 9. Inert the containment with noncondensable gases 10. Vent the primary containment 11. Inject into the spent fuel pool 12. Spray the spent fuel pool 13. Vent/ventilate the reactor building or auxiliary building 14. Scrub releases by external spraying of buildings
Extensive Damage Mitigation Guidelines (or other related guidelines describing mitigating actions for an event involving a loss of large areas of the plant due to explosions or fire)	1. Manual operation of RCIC/IC 2. DC power supplies to allow depressurization of RPV and injection with portable pump 3. Utilize feedwater and condensate 4. Makeup to hotwell. 5. Makeup to CST 6. Maximize CRD flow 7. Procedure to isolate RWCU 8. Manually open containment vent lines 9. Inject water into the drywell 10. Portable sprays

Example Pressurized Water Reactor (PWR) Mitigating Strategies	
Flex Support Guidelines	1. DC load shedding/stripping 2. Use of AFW/EFW during an ELAP 3. Repower instrumentation needed to maintain safety functions with portable power supplies 4. Use of alternate water supply to support core and spent fuel pool heat removal (including all portable/staged pumps) 5. Depressurize steam generator for makeup with portable injection source 6. Means to provide borated RCS makeup 7. Containment spray (if applicable) 8. Operate hydrogen igniters (ice condenser containments) 9. Spent fuel pool cooling via makeup with a portable injection source 10. Mode 5 & 6 RCS makeup using portable injection source
Severe Accident Management Guidelines	1. Inject into (makeup to) reactor vessel/reactor coolant system 2. Depressurize the RCS 3. Restart reactor coolant pump (RCP) 4. Depressurize steam generators 5. Inject into (feed) the steam generators 6. Spray into containment 7. Inject into containment 8. Operate fan coolers 9. Operate hydrogen igniters (ice condenser containments) 10. Vent the containment 11. Inject into the spent fuel pool 12. Spray the spent fuel pool 13. Vent/ventilate the auxiliary building 14. Scrub releases by external spraying of buildings
Extensive Damage Mitigation Guidelines (or other related guidelines describing mitigating actions for an event involving a loss of large areas of the plant due to explosions or fire)	1. Makeup to RWST 2. Manually depressurize steam generators to reduce RCS inventory loss 3. Manual operation of turbine (or diesel)-driven AFW/EFW pump 4. Manually depressurize steam generators and use portable pump 5. Makeup to CST 6. Containment flooding with portable pump 7. Portable sprays (if available) 8. Internal Spent Fuel Pool Makeup 9. External Spent Fuel Pool Makeup

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Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents

February 2016

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NEI 14-01 [Revision 1]

Nuclear Energy Institute

Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents

February 2016

ACKNOWLEDGMENTS

This document was developed by the Boiling Water Reactor Owners Group (BWROG), the Pressurized Water Reactor Owners Group (PWROG) and the Nuclear Energy Institute (NEI). The lead/coordinating document contributors are presented below.

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NOTICE

EXECUTIVE SUMMARY

U.S. nuclear power plant licensees currently maintain the capability to implement beyond design basis accident mitigation and management strategies developed through several separate initiatives. Each strategy has been converted into implementing actions and recommendations within three separate sets of procedures and guidelines: Emergency Operating Procedures (EOPs), Severe Accident Management Guidelines (SAMGs), and Extensive Damage Mitigation Guidelines (EDMGs). In addition to these existing procedure and guideline sets, the industry is currently developing a new set of guidelines, referred to as FLEX Support Guidelines (FSGs), in response to Order EA-12-049 issued by the U.S. Nuclear Regulatory Commission (NRC)[1]. Having been developed separately, each of these procedure and guideline sets are subject to varying levels of regulatory requirements and industry commitments, as are the training, drills, and exercises intended to maintain the capability for effective implementation.

The EOPs were designed to restore and maintain safety functions, and place the plant in a safe shutdown condition. EOPs are required by Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," and are included in the administrative control sections of a licensee's technical specifications. The training requirements for EOPs are primarily contained within 10 CFR Part 55, "Operators' Licenses." Licensed operators are required to show sufficient knowledge of the EOPs on an initial written examination, in accordance with 10 CFR 55.41 (Reactor Operators) or 10 CFR 55.43 (Senior Reactor Operators), and the ability to implement the EOPs through an initial operating test that meets the requirements of 10 CFR 55.45. Licensed operators are required to continuously demonstrate that they have maintained their knowledge of the EOPs through the requalification program required by 10 CFR 55.59.

SAMGs provide guidance to operators and designated support staff for use in the event that accident conditions progress beyond the mitigation capabilities described in the EOPs (e.g., fuel damage is imminent or has occurred). The SAMGs were developed as a voluntary industry initiative in response to NRC Generic Letter 88-20, Supplement 2, *Accident Management Strategies for Consideration in the Individual Plant Examination Process*, dated April 4, 1990[2]. There is currently no regulatory requirement for licensees to develop, maintain, train, drill or exercise SAMGs.

Following the terrorist attacks of September 11, 2001, the NRC ordered licensees to develop strategies and specific implementing guidance for maintaining or restoring core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire. These extensive damage mitigation requirements were subsequently imposed as license conditions for individual licensees and then made generically applicable under 10 CFR 50.54(hh)(2) through the Power Reactor Security Requirements final rule (74 FR 13926; March 27, 2009). As a result, EDMGs were created to provide guidance to operating crews and other plant staff on the implementation of strategies for responding to an event involving a loss of large areas of the plant due to explosions or fire.

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[1] Refer to NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012; NRC ADAMS ML #12054A735.
[2] Refer to NRC ADAMS ML #031200551

On March 11, 2011, a magnitude 9.0 earthquake struck off the coast of the Japanese island of Honshu. Approximately 40 minutes after the earthquake, the first of several large tsunami waves inundated the Fukushima Dai-ichi Nuclear Power Plant site. The tsunami waves resulted in extensive damage to site facilities, and a complete and extended loss of AC electrical power at Fukushima Dai-ichi Units 1 through 5; one diesel generator remained functional on Unit 6. Despite the actions of the operators following the earthquake and tsunami, cooling was lost to the fuel in the Unit 1 reactor after several hours, the Unit 3 reactor after about 36 hours and the Unit 2 reactor after about 70 hours; fuel damage resulted in each unit shortly after the loss of cooling.

In the days following the Fukushima Dai-ichi accident, the NRC Chairman directed the staff to establish a senior-level agency task force to conduct a full review of the agency's processes and regulations in light of the events in Japan. This task force, referred to as the Near-Term Task Force (NTTF), was also directed to identify recommended improvements to agency policies and regulatory practices. The NTTF provided its recommendations to the Commission in a report dated July 12, 2011.[3] In Recommendation 8 of the NTTF report, the Task Force recommended strengthening and integrating the onsite emergency response capabilities described in EOPs, SAMGs, and EDMGs.

As discussed in SECY-11-0124, *Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report*, dated September 9, 2011, the NRC staff proposed to proceed with a rulemaking associated with the methodology for integration of onsite emergency response processes, procedures, training and exercises. This decision led to the development of a document entitled, *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013. The Recommendation 8 regulatory basis was subsequently incorporated into *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015, with changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015.

In the Staff Requirements Memorandum referenced above, the NRC Commissioners directed the removal of requirements for SAMGs from the proposed Mitigation of Beyond Design Basis Events rule. The industry continues to believe that SAMGs provide a useful tool to plant operators in the unlikely event of a severe accident and should be maintained. To this end, the NEI Nuclear Strategic Issues Advisory Committee (NSIAC) approved an Industry Initiative on SAMGs that requires each licensee to docket site-specific commitments concerning the updating these guidelines, and their consideration within plant configuration management processes, integration with other emergency response guideline sets and symptom-based EOPs, and validation.

This document provides guidance for ensuring that EOPs, EDMGs, FSGs and SAMGs are integrated in a cohesive, effective and usable manner. It also addresses recommendations for the development of mitigation and management guidelines, and command and control structures, for responding to beyond design basis events and severe accidents. Guidance concerning the related aspects of training, drills and exercises is contained in NEI 13-06, *Enhancements to Emergency*

[3] Refer to NRC ADAMS ML #111861807

Response Capabilities for Beyond Design Basis Events and Severe Accidents.

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EMERGENCY RESPONSE PROCEDURES AND GUIDELINES FOR BEYOND DESIGN BASIS EVENTS AND SEVERE ACCIDENTS

1 INTRODUCTION

Each nuclear power plant licensee maintains sets of operating procedures that provide direction for responding to a wide spectrum of off-normal and emergency events and conditions. Direction is provided for addressing events and conditions both within the plant design basis as well as certain events and conditions that are beyond the design basis. These procedure sets are typically known as Alarm Response Procedures (ARPs), Abnormal Operating Procedures (AOPs) and Emergency Operating Procedures (EOPs), and they instruct licensed operators on the steps necessary to maintain safe operation and protect fission product barriers during all modes of plant operation.

In response to the lessons learned from the accident at Three Mile Island, the nuclear industry developed Severe Accident Management Guidelines (SAMGs) as a voluntary initiative.[4] The SAMGs describe additional strategies meant to provide operators and the plant staff with the capability to manage accident sequences that progress beyond the capacity of the mitigating strategies contained in the EOPs (e.g., adequate core cooling cannot be maintained). In doing so, the strategy focus changes from preventing fuel damage to mitigating the consequences of fuel damage, including minimizing radiological releases and protecting personnel.

Existing site-specific EOPs and SAMGs are based on generic technical guidelines developed in response to NUREG-0737, Item I.C.1, "Guidance for the Evaluation and Development of Procedures for Transients and Accidents," and NEI 91-04, *Severe Accident Issue Closure Guidelines*, Revision 1, respectively. The generic technical guidelines were created by the Boiling Water Reactor (BWR) and Pressurized Water Reactor (PWR) Owners Groups, and, in the case of the SAMGs, utilize applicable technical research and bases materials provided by the Electric Power Research Institute (EPRI). Using these generic guidelines, each licensee has developed EOPs and SAMGs that are appropriate for their specific plant technology, and function as an integrated set of strategies and implementing instructions.

Following the terrorist attacks of September 11, 2001, the NRC ordered licensees to develop strategies and specific guidance for maintaining or restoring core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with a loss of large areas of the plant due to explosions or fire; the NRC order was eventually codified in 10 CFR 50.54 (hh). U.S. nuclear power plant operators developed their response strategies and guidelines in accordance with NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*. The guideline sets that resulted from these efforts are typically referred to Extensive Damage Mitigation Guidelines (EDMGs).

[4] Refer to NRC Generic Letter 88-20, Supplement 2, *Accident Management Strategies for Consideration in the Individual Plant Examination Process*, dated April 4, 1990.

As a result of the review of the March 11, 2011, accident at the Fukushima Dai-ichi Nuclear Power Plant, the NRC Near-Term Task Force (NTTF) made several recommendations intended to strengthen and integrate the onsite emergency response capabilities described in EOPs, SAMGs, and EDMGs; these recommendations are referred to collectively as Recommendation 8. All aspects of Recommendation 8 were subsequently evaluated by the NRC staff and refined into a regulatory basis to support future rulemaking; see *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013.[5] . The Recommendation 8 regulatory basis was subsequently incorporated into *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015, with changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015.

In the Staff Requirements Memorandum referenced above, the NRC Commissioners directed the removal of requirements for SAMGs from the proposed Mitigation of Beyond Design Basis Events rule. The industry continues to believe that SAMGs provide a useful tool to plant operators in the unlikely event of a severe accident and should be maintained. To this end, the NEI Nuclear Strategic Issues Advisory Committee (NSIAC) approved an Industry Initiative on SAMGs that requires each licensee to docket site-specific commitments concerning the updating these guidelines, and their consideration within plant configuration management processes, integration with other emergency response guideline sets and symptom-based EOPs, and validation.

This document provides guidance for addressing the SAMG Industry Initiative and certain aspects of the Recommendation 8 regulatory basis; these topics are procedure integration, requirements for SAMGs and supporting guidelines, and a command and control structure for responding to a beyond design basis event or severe accident. The guidance was developed for commercial nuclear power reactors operating in the United States as of 2016. Adoption or modification of this guidance by future operating plants should be based on discussions with the appropriate technology Owners Group and the NRC staff.

[5] Refer to NRC ADAMS ML #13101A344

2 PROCEDURE INTEGRATION

2.1 OVERVIEW

Each licensee should establish an overall framework for strategies that would be used to mitigate and manage the consequences of a beyond design basis event and severe accident. This framework should address the integrated use of emergency response procedures and guidelines such that they have been designed to work together to implement the best available strategy for preventing or mitigating fuel damage, and limiting radiological releases. The effective integration of procedures and guidelines is characterized by the attributes listed in Section 2.4, Integration of Procedure and Guideline Sets.

For purposes of this document, a "strategy" refers to a plan of action for maintaining or restoring a "safety function"[6] in order to mitigate the effects of a beyond design basis event or manage the consequences of a severe accident. A strategy can be implemented by one or more methods. As used here, a "method" is a series of actions designed to implement a specific strategy. As an illustrative example of all three terms, consider that a portable pump (a method) may be used to inject water into the reactor pressure vessel (a strategy) for the purpose of maintaining core cooling (a safety function).

It is recognized that the usage of the above terms in NRC and industry documents, although generally similar, has varied somewhat over the years depending upon the preferences of authors and the purpose of a particular document. It will therefore be necessary to carefully apply these terms within the context of site-specific documents (i.e., in cases where different terms are used for the concepts identified above).

2.2 PROCEDURES AND GUIDELINES

It is important to distinguish the difference between emergency response procedures and guidelines. Procedures are documents written as sequential instructions for performing a function or addressing plant conditions, and operators and plant staff are expected to follow the prescribed instructions in a step-by-step and verbatim manner. Exceptions to this expectation should be rare and necessary only in extraordinary circumstances.

As opposed to procedures, guidelines do not necessarily provide a prescribed set of instructions and may not be followed in a step-by-step manner. Rather, they provide suggested strategies and implementing methods that may be used to address an adverse event or condition, typically those beyond a plant's design basis. Within guidelines, operators and plant staff have the latitude to respond as necessary to unpredictable and dynamic situations. During a beyond design basis event or severe accident, guidance documents would be used to focus the attention and actions of the operators and plant staff on the most important threats to safety and provide suggested optimal strategies for addressing plant conditions.

[6] The safety functions of interest during a beyond design basis event or severe accident response are typically core cooling, containment and spent fuel pool cooling.

2.3 EMERGENCY RESPONSE PROCEDURE AND GUIDELINES SETS

This document employs the following terms when referring to procedure and guideline sets used by operators to respond to off-normal and emergency conditions. Depending upon Owners Group guidance, and fleet and site standards, a procedure and guideline set may be called by another name. Further, the decision to provide a given set of response instructions within a procedure or a guideline may vary from site-to-site. Each licensee should ensure that the appropriate site-specific document sets, and individual documents, are utilized when implementing the guidance contained in this document.

2.3.1 Abnormal Operating Procedures (AOPs)

AOPs are procedures that direct operator actions for restoring a function, system, or component to normal operating conditions following a transient or event. AOPs may also be used to mitigate an event or condition that is not severe enough to require use of an Emergency Operating Procedure (EOP), such as primary system leakage.

Further, AOPs may provide direction for responding to a wide range of off-normal and emergency conditions including, but not limited to, design basis-related events such as a Control Room evacuation, a fire, or a security threat; events initiated during shutdown or refueling operating modes; and natural and man-made hazardous conditions such as severe weather or toxic gas releases.

2.3.2 Emergency Operating Procedures (EOPs)

EOPs are procedures that direct operator actions for mitigating the consequences of transients and accidents that cause plant parameters to exceed reactor protection system or engineered safety features actuation setpoints. These procedures are developed using guidelines promulgated by the applicable Owners Group in response to NUREG-0737, *Clarification of TMI Action Plan Requirements*; Clarification Item I.C.1, "Guidance for the Evaluation and Development of Procedures for Transients and Accidents."

2.3.3 FLEX Support Guidelines (FSGs)

FSGs are guidelines that provide strategies relying upon the use of installed and portable equipment and resources to maintain or restore core cooling, containment, and SFP cooling capabilities during beyond design basis events. The strategies and capabilities reflected in these guidelines address the requirements of NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*. Guidance concerning the development of FSGs is contained in Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*.

2.3.4 Extensive Damage Mitigation Guidelines (EDMGs)

EDMGs are guidelines that provide strategies to maintain or restore core cooling, containment, and SFP cooling capabilities under the circumstances associated with the loss of large areas of the plant due to explosions or fire. These strategies and capabilities

address the requirements of 10 CFR 50.54(hh)(2). Guidance concerning the development of EDMGs is contained in NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*.

2.3.5 Severe Accident Management Guidelines (SAMGs)

SAMGs are guidelines that provide strategies to manage the consequences of an accident or event which would be implemented upon receipt of specific plant parameter values indicative of imminent or actual damage to irradiated fuel (e.g., high core exit thermocouple temperatures or low RPV water level). These guidelines employ strategies intended to arrest the progression of fuel damage, maintain the capability of the containment as long as possible, and minimize radiological releases. Guidance concerning the development of SAMGs is contained in this document.

SAMGs may be referred to as Severe Accident Guidelines (SAGs) at some sites.

2.4 INTEGRATION OF PROCEDURE AND GUIDELINE SETS

Each licensee's emergency response procedure and guideline sets should address the following considerations.

- A programmatic control document describing the framework for integration of mitigation and management strategies in response to a beyond design basis event or severe accident should be developed and maintained. The site-specific framework should consider the generic technical guidance provided by the appropriate Owners Group. Deviations from the generic technical guidance should be documented along with the supporting rationale.

  For illustrative purposes, a simplified example framework is depicted in Figure 2.1.

- Strategies should be available to address potential or actual fuel damaging conditions present in the reactor core or the spent fuel pool.

- Strategies should be reviewed to identify potential gaps or inconsistencies.

- Each strategy should be included within a controlling procedure or guideline. Where appropriate, expectations concerning parallel processing of procedures and/or guidelines should be described.

- Criteria such as plant conditions and parameters that require a transition from one controlling procedure or guideline to another should be clearly identified.

- Criteria for implementing the actions described in a supporting procedure or guideline should be clearly identified in the controlling procedure or guideline.

- Strategies should be available to address a beyond design basis event or severe accident occurring during any mode of operation, consistent with the associated NRC staff-endorsed guidance. The degree to which a controlling procedure may or may not be fully applicable during some plant operating modes should be considered.

- Strategies should be available to address an event involving a loss of large areas of the plant due to explosions or fire, including the possible loss of the Control Room command and control structure, consistent with the associated NRC staff-endorsed guidance in NEI 06-12. The degree to which a controlling procedure may or may not be fully applicable during some plant operating modes should be considered.

- Integration of EDMGs should reflect site-specific commitments made in response to NRC security orders.

- Integration of FSGs should reflect site-specific commitments related to NRC Order EA-12-049.

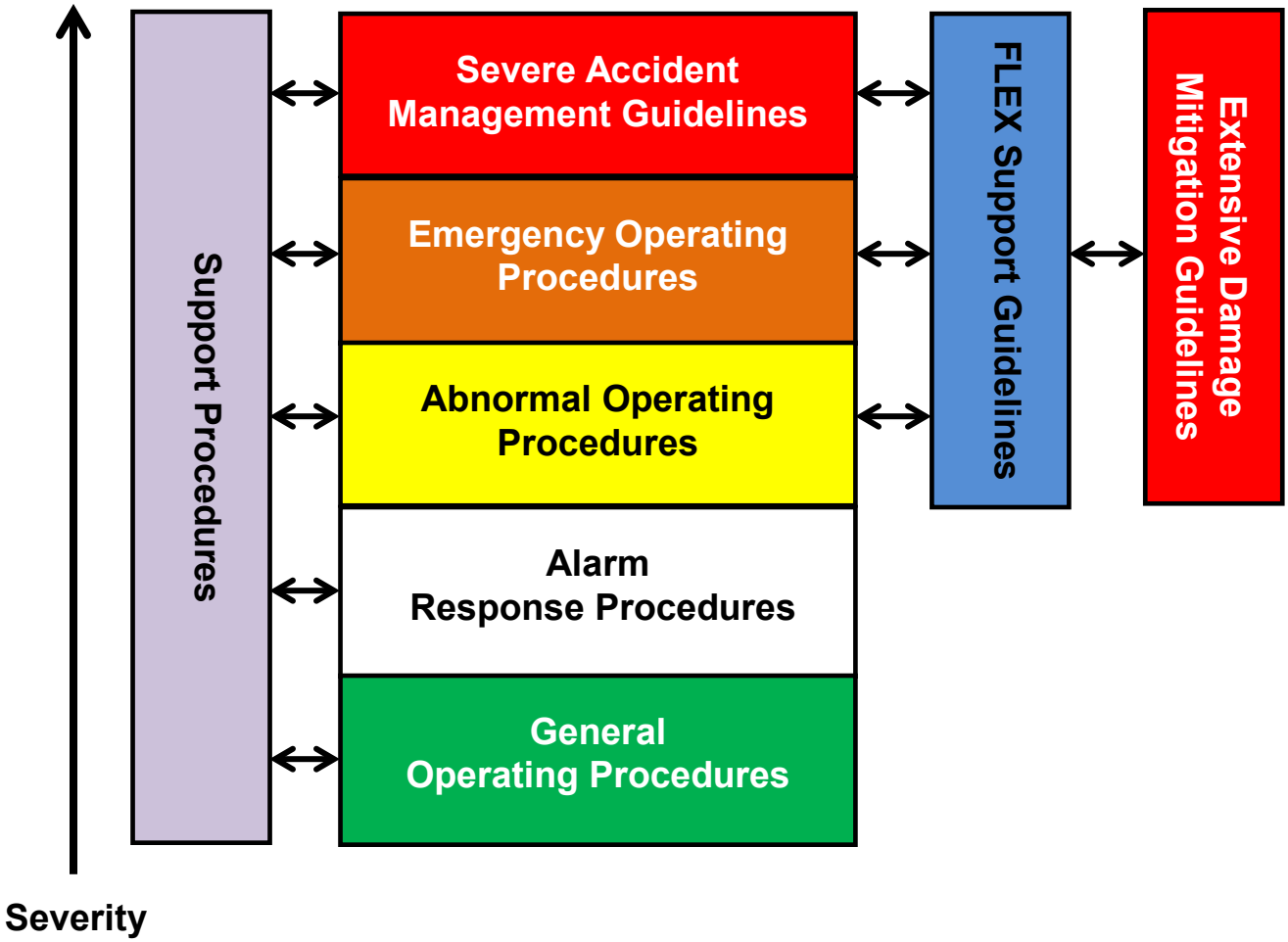
2.5 COORDINATION WITH FIRE RESPONSE STRATEGIES

SAMGs and FSGs provide a core set of strategies that can be used to respond to a variety of failures and concurrent events. SAMGs were developed to address plant conditions associated with a fuel damaging event and utilize a symptom-based approach to strategy selection. They provide a wide range of strategies and implementing methods, which, by design, can be adjusted during an emergency in response to plant conditions and concurrent events, such as a fire. FSGs provide strategies for mitigating the effects of an Extended Loss of AC Power (ELAP). Consistent with NRC staff–endorsed guidance, the development of FSG strategies assumed that there were no independent concurrent events, including a postulated fire.

Unlike analyses associated with design basis accidents, determining accident progression and consequences for beyond design basis events and severe accidents is problematic given the effectively unbounded nature of the accident sequences. This is particularly true when the coincident occurrence of two or more events or accidents is postulated (e.g., an ELAP and a fire). While recognizing that concurrent events such as a fire could occur during a beyond design basis event and severe accident, it is not possible to predict resulting strategy impacts in any reliable/certain manner beforehand. For this reason, programmatic documents, and/or procedures and guidelines, should provide direction for selecting the appropriate strategy at the time of the emergency. For example, the Emergency Response Organization position(s) holding Ultimate Decision-Maker (UDM) authority[7] could have guidance for selecting the appropriate strategy, and then determining the priorities and actions necessary for implementation.

[7] Discussed in Section 4 of this document.

Figure 2.1
Simplified Example Framework



Note – EDMG capabilities/methods may be referenced in Emergency Operating Procedures (EOPs) and/or Severe Accident Management Guidelines (SAMGs).

In addition, BWR "Support Procedures" include the Technical Support Guidelines which support implementation of EOPs and SAMGs.

3 REQUIREMENTS FOR SAMGS AND SUPPORTING GUIDELINES

3.1 OVERVIEW

Each licensee should maintain Severe Accident Management Guidelines (SAMGs) and supporting guidelines which consider the generic technical guidance provided by the applicable technology Owners Group. This includes the development of any additional guidance necessary for responding to a beyond design basis event or severe accident affecting the cooling of irradiated fuel stored in a spent fuel pool. With respect to guidance issued by the Nuclear Energy Institute (NEI), the material in this document supersedes that provided in Section 5 of NEI 91-04, *Severe Accident Issue Closure Guidelines*, for the development, implementation and maintenance of severe accident management programs.

3.2 SEVERE ACCIDENT MANAGEMENT GUIDELINES

3.2.1 Development of Generic Severe Accident Management Guidance

Following the March, 1979, accident at Three Mile Island, the Electric Power Research Institute (EPRI) engaged in an extensive research program to better understand the nature of nuclear power plant accidents that could result in significant damage of the fuel – referred to as severe accidents. Before the Three Mile Island accident, operator procedures and training had focused almost exclusively on preventing an upset condition from progressing to the point at which the fuel was damaged. To broaden the spectrum of emergency response guidance, EPRI developed generic accident management strategies and implementing methods that could be taken to limit the consequences of a severe accident. This guidance was issued in EPRI Technical Report TR-101869, *Severe Accident Management Guidance Technical Basis Report* (SAMG-TBR), dated April 1993.

The SAMG-TBR is organized into two volumes. Volume 1 defines severe accident damage conditions for the reactor core, spent fuel pool, and containment; identifies the Candidate High-Level Actions (CHLAs) that may be taken to best manage these conditions; and summarizes the effects that could result from implementation of each CHLA. Volume 2 is composed of appendices, each of which describes the physical behavior for one type of phenomenon relevant to severe accidents. These appendices also include the technical bases for calculation aids that can be used to estimate the plant response if an action is taken. Although these calculations are generally not intended to provide detailed results, they are sufficient to allow consideration of the relative benefits and possible undesired effects associated with each action.

In October, 2012, EPRI published an updated SAMG-TBR, Technical Report TR-1025295, to address lessons learned from the March, 2011, accident at Fukushima Dai-ichi, and incorporate other insights from research and analysis conducted over the intervening 20 years. While the actions described in the original report continue to represent appropriate responses to severe accident conditions, several new technical considerations arising from the Fukushima accident were incorporated (e.g., makeup

water quality, spent fuel pool actions, hydrogen buildup mitigation, etc.). EPRI also issued a separate report dealing with strategies to limit radiological releases following a severe accident; refer to Technical Report TR-1026539, *Investigation of Strategies for Mitigating Radiological Releases in Severe Accidents*, dated October 2012. The latter report is applicable to a Boiling Water Reactor with a Mk 1 or Mk 2 containment.

The Boiling Water Reactor Owners Group (BWROG) and Pressurized Water Reactor Owners Group (PWROG) have created generic technical materials to guide the development of site-specific SAMGs for each technology. These technical guidelines translate the insights from the above discussed EPRI reports into a template containing recommended technology-appropriate strategies, and implementing methods, for mitigating the consequences of a severe accident. The development of technical guidelines is based on reference plants, and utilizes engineering data derived from severe accident analyses, operating experience and phenomenological research.

3.2.2 Principles for SAMGs

The following principles should be applied to the development and implementation of SAMGs:

- Site-specific strategies and implementing methods should be based upon existing plant systems, structures and components, and available portable equipment. Modifications to the plant design are permitted but not required.
- Any plant system, structure or component, and available portable equipment, may be used to implement an accident management strategy, irrespective of safety classification or other design-related criteria. In addition, the normally-applied controls on the use or configuration of a plant system, structure or component may be altered if necessary to implement a strategy (e.g., establishing a system lineup not described in the facility licensing basis).
- The inclusion of a plant system, structure or component within a severe accident management strategy implementing method does not impose any additional design or maintenance-related requirements on that item (i.e., beyond those associated with the existing specifications and programs). For example, the design-basis safety classification of a plant system, structure or component – safety-related, important to safety, etc. – is not changed because of its employment within a strategy implementing method.
- Strategies should reflect a best-estimate understanding of accident progression and consequences.
- SAMG entry conditions and operator actions should be symptom-based and clearly linked to specific plant parameters. Identification of the initiating event should not be required in order to determine which strategy should be implemented.
- The best possible operational guidance should be specified to restore and maintain key plant parameters within limits which define controlled and stable plant conditions, irrespective of licensing or design basis assumptions or commitments.

- Operator actions and decision-making criteria (e.g., a parameter value or trend that prompts a given action) should be determined using best-estimate assumptions and calculations, irrespective of licensing or design basis analytical assumptions and calculations.

- The capability to assess decision-making criteria (e.g., a parameter value or trend that prompts a given action) should accommodate the use of any available indications. Potential uncertainties in instrumentation readings caused by anticipated severe accident environmental conditions should be considered during the development of decision-making criteria.

- SAMG strategies may employ implementing methods or capabilities described in FLEX Support Guidelines (FSGs) or Extensive Damage Mitigation Guidelines (EDMGs).

- Computational aides should be provided when direct diagnosis of key plant conditions cannot be determined solely from instrumentation.

3.2.3 Considerations for Site-Specific SAMGs

3.2.3.1 Document Development

Site-specific severe accident management strategies, and associated implementing guidance, should be based on the generic technical guideline documents developed by the applicable Owners Group. Strategies and implementing guidance should reflect the plant-specific technology, design and operating characteristics, and control parameters and values. The SAMG principles discussed above should also be considered during the development or revision of implementing guidance.

Document developers should assess the applicability and utility of each strategy, and related material, presented in the generic technical guidelines. If deviations from the guidelines are necessary, they should be identified, documented and supported with a technical basis. For example, a deviation may be necessary if a particular generic strategy cannot be reconciled with the plant design. The technical basis for a deviation should address the potential effects on other strategies and/or recommended implementing methods.

A licensee may also include an additional strategy(ies) and/or implementing method(s) within their accident mitigation and management guidance documents. As with other deviations, these additions should be identified, documented and supported with a technical basis.

Licensees electing not to use the generic Owners Group technical guidelines should prepare a technical basis for all strategies and implementing methods described in their site-specific guidelines. The technical basis for the SAMGs should cite relevant research and analysis, and address the lessons learned from industry events such as the Fukushima Dai-Ichi accident. It should also discuss investigated strategies and methods that might be taken to limit the

release of radioactive materials over an extended period following an accident.

Guidelines for responding to a severe accident should be developed in accordance with the appropriate fleet or site-specific programmatic requirements, including the applicable writer's guide. In cases where one does not exist, a writer's guide should be developed. A writer's guide should contain all the information necessary to develop the plant-specific guidelines, and provisions for documentation of deviations from the generic Owners Group guidance.

3.2.3.2 Document Verification and Validation

Guidelines for responding to a severe accident should be verified and validated in accordance with an applicable fleet or site procedure development process. This includes guidelines developed for use by operators as well as those intended for implementation by the accident management support staff (e.g., engineers in the TSC). Absent an appropriate verification and validation process, one should be developed.

Verification and validation processes should assess the technical accuracy and adequacy of the instructions, and the ability of personnel to follow and implement them. The verification process should confirm the compatibility of document instructions with referenced equipment, user-aides and supplies (e.g., portable equipment, posted job aids, strategy evaluation materials, etc.). The validation process should demonstrate that the document provides the instructions necessary to implement the guidance.

Guidelines should be verified and validated using existing plant capabilities. Increasing the capability of the plant-referenced simulator to specifically model the conditions of the reactor core or stored spent fuel during a beyond design basis event or severe accident is not required. As a consequence, the technical rigor applied to verification and validation activities may be different than that normally used for Abnormal Operating Procedures and Emergency Operating Procedures.

The verification and validation process should accommodate the differences between non-severe and severe accident conditions. In particular, the process should recognize that severe accidents are characterized by uncertainties in both their progression and consequences. Some other key differences include:

- There may be no clear outcome for an accident management strategy. For example, adding water to a damaged core undergoing melting may, or may not, result in arresting core damage and, in some cases, may introduce new accident management challenges.

- There may not be a "right" or "wrong" decision at any given point in time during a severe accident response. Every severe accident management strategy has the potential for both positive and negative consequences

related to its implementation and these consequences can be very situation dependent. In addition, there may be cases where a negative consequence can be mitigated through implementation of another strategy within some event-specific timeframe.

Due to the unbounded nature of severe accident sequences and potential resulting conditions, a limited number of scenarios should be developed for the SAMG validation process (i.e., a sample group). These scenarios should allow for reasonable assurance that key decision points and transition guidance will support implementation accident management strategies. The assumed conditions and data used in the validation process should be determined on a "best estimate" basis.

3.2.3.3 Document Updating and Maintenance

Review, revision, approval, distribution and placement of SAMGs should be performed in accordance with the appropriate fleet or site document control process. The need to make changes should be assessed whenever:

- Changes to the facility that may impact the capability to implement strategies are identified.[8]
- The applicable generic severe accident technical guidelines are updated (e.g., a change to a guideline) or revised.

Potential changes should be tracked by an appropriate fleet or site process (e.g., a corrective action program).

A revision to the applicable generic severe accident technical guidelines should be assessed and implemented within 2 refueling outages or 3 years of the publication date, whichever is greater.

3.2.3.4 User Aids

The development, verification and validation of user aids should be consistent with applicable fleet and/or site policies.

3.2.3.5 Priority Setting for Document Changes

Each licensee should update the condition screening and evaluation requirements described in their corrective action program(s) as needed to promote the appropriate prioritization of corrective actions associated with severe accident management response capabilities. In particular, work prioritization and the assignment of resources for these types of conditions should be properly balanced with other site needs, and commensurate with the anticipated benefits to overall accident or event response capabilities (e.g.,

[8] Programmatic controls should be implemented to identify these types of facility changes (e.g., proposed design changes, configuration controls, etc.).

changes offering lower relative or absolute benefits should be assigned lower priorities).

3.3 FLEX SUPPORT GUIDELINES

Following an assessment of the accident at Fukushima Dai-Ichi, the NRC issued Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, on March 12, 2012. On August 29, 2012, the NRC staff issued Interim Staff Guidance (ISG) JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, Revision 0.[9] This document assists nuclear power reactor applicants and licensees with the identification of measures needed to comply with requirements of the mitigating strategies order. The ISG endorses, with clarifications, the methodologies described in the industry guidance document, Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*.

The development, verification, validation and maintenance of FSGs should be performed in accordance with each licensee's procedure/guideline development processes, and the guidance provided in NEI 12-06.

3.4 EXTENSIVE DAMAGE MITIGATION GUIDELINES

As a result of the terrorist attacks of September 11, 2001, the NRC issued an Interim Compensatory Measures (ICM) Order to all power reactor licensees on February 25, 2002. This Order required compliance with specified interim safeguards and security compensatory measures. Section B.5.b of the ICM Order required the development of specific guidance and strategies to maintain core cooling, containment, and SFP cooling capabilities using existing or readily available resources (equipment and personnel) that could be effectively implemented under the circumstances associated with loss of large areas of the plant due to explosions or fire. Eventually, the requirements of Section B.5.b of the ICM Order were codified in 10 CFR 50.54(hh)(2); refer to SECY-08-099 and SRM-M081217B. The NRC staff-endorsed guidance for complying with 10 CFR 50.54(hh)(2) is contained in NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*.

The development, verification, validation and maintenance of EDMGs should be performed in accordance with each licensee's procedure/guideline development processes, and the guidance provided in NEI 06-12.

[9] Refer to NRC ADAMS ML #12229A174

4 COMMAND AND CONTROL

4.1 OVERVIEW

Each licensee should ensure that their emergency command and control structures are capable of directing responses to a beyond design basis event or severe accident, including those affecting multiple units on a site, in accordance with established procedure and guideline sets.

4.2 COMMAND AND CONTROL KEY FUNCTIONS

Command and control structures should clearly identify the Emergency Response Organization (ERO) position(s) with the ultimate authority for making decisions necessary for the implementation of emergency response procedures and guidelines during a beyond design basis event or severe accident. For purposes of the guidance in this document, the position with this authority is referred to as the Ultimate Decision-Maker (UDM). The position(s) assigned the UDM function should have the authority and capability of performing the following key command and control functions:

- Selection of the procedure or guideline set(s) most appropriate to address the event and/or plant conditions.
- Determination of the strategy(ies) to be implemented, and the necessary conditions and timing for implementation.
- Direction of the onsite and offsite resources needed to implement the selected strategy(ies).
- Direction of an action not contained in, or contrary to, procedures or guidelines, if it is determined that the action will provide greater protection of public health and safety.
- Interface with the ERO position holding overall command and control authority within the site ERO (and fleet-level ERO, if applicable), if the two authorities are held by different positions.

The qualifications for an UDM are discussed in NEI 13-06, *Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents*.

4.3 COMMAND AND CONTROL STRUCTURE CONSIDERATIONS

Procedures or guidelines used by the ERO should provide for implementation of command and control structures consistent with the following considerations.

- The UDM authority and responsibilities should be integrated into ERO command and control structures and protocols. It is not necessary to create a new ERO position or title.

- The Shift Manager should serve as the UDM during the implementation of Abnormal Operating Procedures (AOPs) and Emergency Operating Procedures (EOPs).

- Following a transition into Severe Accident Management Guidelines (SAMGs), the UDM authority and responsibilities may be retained by the Shift Manager, or transferred to an UDM-qualified individual located in another facility. The instructions/guidance for transferring the UDM role to a location outside the Control Room should include an assessment of the availability of the supporting personnel and resources necessary to implement all the command and control key functions.

- Following the transfer of the UDM function to an ERO position-holder located outside the Control Room (e.g., in the TSC), the support staff assisting with strategy evaluation and selection should include at least one member who holds an active SRO license, or has successfully completed an SRO licensing or certification program in the past, applicable to the affected onsite unit(s).[10] If a site hosts different technologies, then at least one individual with the SRO background described above should be available for each different unit technology (e.g., a PWR and a BWR, or an active safety feature plant and a passive safety feature plant).

- Following an event associated with loss of large areas of the plant due to explosions or fire, and causing a loss of the Control Room command and control structure, a procedure or guideline should describe the position(s) that could assume command and control of the event response. Due to the contingent and short-term nature of this assignment, and the initial focus on implementation of pre-planned EDMG strategies, it is not necessary for this position(s) to hold a UDM qualification. A procedure or guideline should specify how command and control are subsequently transferred to a position which does possess a UDM qualification.

- The UDM is able to direct changes to a pre-planned fire response strategy if necessary to support implementation of an accident or event mitigation or management strategy.

- The UDM assignment(s) should be consistent with the licensee's staffing assessments performed in accordance with NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, and the associated regulatory responses to NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012.

- The authorities and responsibilities necessary to coordinate the acquisition and delivery of offsite resources are defined.

- At sites operating within a fleet structure, fleet-level command and control capabilities should be integrated into the licensee's command and control structures if

[10] The SRO certification should meet the requirements of ANSI/ANS 3.1, Selection, Qualification and Training of Personnel for Nuclear Power Plants.

such support will be relied upon during a beyond design basis event or severe accident.

- Specific UDM authorities and/or responsibilities that may be delegated, if any, are defined.

- Where appropriate, procedures and guidelines should contain guidance concerning the implementation of emergency response actions in accordance with 10 CFR 50.54(x) and the associated approval of such actions in accordance with 10 CFR 50.54(y).

5 REFERENCES

- NUREG-0737, *Clarification of TMI Action Plan Requirements*, dated November 1980
- NRC Generic Letter 88- 20, Supplement 2, *Accident Management Strategies for Consideration in the Individual Plant Examination Process*, dated April 4, 1990
- NRC Report, *Recommendations for Enhancing Reactor Safety in the 21st Century [The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident]*, dated July 12, 2011
- SECY-11-0124, *Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report*, dated September 9, 2011
- NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012
- NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012
- NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012
- *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013
- *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015
- *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015
- Electric Power Research Institute (EPRI) Technical Report, *Severe Accident Management Guidance - Technical Basis Report,* TR-101869, dated April 1993
- Electric Power Research Institute (EPRI) Technical Report, *Severe Accident Management Guidance - Technical Basis Report*, TR-1025295, dated October 2012
- Electric Power Research Institute (EPRI) Technical Report, *Investigation of Strategies for Mitigating Radiological Releases in Severe Accidents*, TR-1026539, dated October 2012
- NEI 91-04, *Severe Accident Issue Closure Guidelines*, Revision 1, dated December 1994

- NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*, dated December 2006
- NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012
- NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*
- NEI Letter, *Industry Initiative to Maintain Severe Accident Management Guidelines*, Pietrangelo to Johnson, dated October 26, 2015
- NEI 13-06, *Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents*, dated February 2016

NEI 14-01 [Revision ~~0~~1]

Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents

~~September 2014~~
February 2016

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Nuclear Energy Institute

Emergency Response Procedures and Guidelines for Beyond Design Basis Events and Severe Accidents

~~September 2014~~
February 2016

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This document was developed by the Boiling Water Reactor Owners Group (BWROG), the Pressurized Water Reactor Owners Group (PWROG) and the Nuclear Energy Institute (NEI). The lead/coordinating document contributors are presented below.

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NOTICE

EXECUTIVE SUMMARY

U.S. nuclear power plant licensees currently maintain the capability to implement beyond design basis accident mitigation and management strategies developed through several separate initiatives. Each strategy has been converted into implementing actions and recommendations within three separate sets of procedures and guidelines: Emergency Operating Procedures (EOPs), Severe Accident Management Guidelines (SAMGs), and Extensive Damage Mitigation Guidelines (EDMGs). In addition to these existing procedure and guideline sets, the industry is currently developing a new set of guidelines, referred to as FLEX Support Guidelines (FSGs), in response to Order EA-12-049 issued by the U.S. Nuclear Regulatory Commission (NRC)[1]. Having been developed separately, each of these procedure and guideline sets are subject to varying levels of regulatory requirements and industry commitments, as are the training, drills, and exercises intended to maintain the capability for effective implementation.

The EOPs were designed to restore and maintain safety functions, and place the plant in a safe shutdown condition. EOPs are required by Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," and are included in the administrative control sections of a licensee's technical specifications. The training requirements for EOPs are primarily contained within 10 CFR Part 55, "Operators' Licenses." Licensed operators are required to show sufficient knowledge of the EOPs on an initial written examination, in accordance with 10 CFR 55.41 (Reactor Operators) or 10 CFR 55.43 (Senior Reactor Operators), and the ability to implement the EOPs through an initial operating test that meets the requirements of 10 CFR 55.45. Licensed operators are required to continuously demonstrate that they have maintained their knowledge of the EOPs through the requalification program required by 10 CFR 55.59.

SAMGs provide guidance to operators and designated support staff for use in the event that accident conditions progress beyond the mitigation capabilities described in the EOPs (e.g., fuel damage is imminent or has occurred). The SAMGs were developed as a voluntary industry initiative in response to NRC Generic Letter 88-20, Supplement 2, *Accident Management Strategies for Consideration in the Individual Plant Examination Process*, dated April 4, 1990[2]. There is currently no regulatory requirement for licensees to develop, maintain, train, drill or exercise SAMGs.

Following the terrorist attacks of September 11, 2001, the NRC ordered licensees to develop strategies and specific implementing guidance for maintaining or restoring core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire. These extensive damage mitigation requirements were subsequently imposed as license conditions for individual licensees and then made generically applicable under 10 CFR 50.54(hh)(2) through the Power Reactor Security Requirements final rule (74 FR 13926; March 27, 2009). As a result, EDMGs were created to

[1] Refer to NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012; NRC ADAMS ML #12054A735.
[2] Refer to NRC ADAMS ML #031200551

provide guidance to operating crews and other plant staff on the implementation of strategies for responding to an event involving a loss of large areas of the plant due to explosions or fire.

On March 11, 2011, a magnitude 9.0 earthquake struck off the coast of the Japanese island of Honshu. Approximately 40 minutes after the earthquake, the first of several large tsunami waves inundated the Fukushima Dai-ichi Nuclear Power Plant site. The tsunami waves resulted in extensive damage to site facilities, and a complete and extended loss of AC electrical power at Fukushima Dai-ichi Units 1 through 5; one diesel generator remained functional on Unit 6. Despite the actions of the operators following the earthquake and tsunami, cooling was lost to the fuel in the Unit 1 reactor after several hours, the Unit 3 reactor after about 36 hours and the Unit 2 reactor after about 70 hours; fuel damage resulted in each unit shortly after the loss of cooling.

In the days following the Fukushima Dai-ichi accident, the NRC Chairman directed the staff to establish a senior-level agency task force to conduct a full review of the agency's processes and regulations in light of the events in Japan. This task force, referred to as the Near-Term Task Force (NTTF), was also directed to identify recommended improvements to agency policies and regulatory practices. The NTTF provided its recommendations to the Commission in a report dated July 12, 2011.[3] In Recommendation 8 of the NTTF report, the Task Force recommended strengthening and integrating the onsite emergency response capabilities described in EOPs, SAMGs, and EDMGs.

As discussed in SECY-11-0124, *Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report*, dated September 9, 2011, the NRC staff proposed to proceed with a rulemaking associated with the methodology for integration of onsite emergency response processes, procedures, training and exercises. This decision led to the development of a document entitled, *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013. The Recommendation 8 regulatory basis was subsequently incorporated into *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015, with changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015.

In the Staff Requirements Memorandum referenced above, the NRC Commissioners directed the removal of requirements for SAMGs from the proposed Mitigation of Beyond Design Basis Events rule. The industry continues to believe that SAMGs provide a useful tool to plant operators in the unlikely event of a severe accident and should be maintained. To this end, the NEI Nuclear Strategic Issues Advisory Committee (NSIAC) approved an Industry Initiative on SAMGs that requires each licensee to docket site-specific commitments concerning the updating these guidelines, and their consideration within plant configuration management processes, integration with other emergency response guideline sets and symptom-based EOPs, and validation.

This document provides guidance for ensuring that EOPs, EDMGs, FSGs and SAMGs are

[3] Refer to NRC ADAMS ML #111861807

integrated in a cohesive, effective and usable manner. It also addresses recommendations for the development of mitigation and management guidelines, and command and control structures, for responding to beyond design basis events and severe accidents. Guidance concerning the related aspects of training, drills and exercises is contained in NEI 13-06, *Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents*.

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EMERGENCY RESPONSE PROCEDURES AND GUIDELINES FOR BEYOND DESIGN BASIS EVENTS AND SEVERE ACCIDENTS

1 INTRODUCTION

Each nuclear power plant licensee maintains sets of operating procedures that provide direction for responding to a wide spectrum of off-normal and emergency events and conditions. Direction is provided for addressing events and conditions both within the plant design basis as well as certain events and conditions that are beyond the design basis. These procedure sets are typically known as Alarm Response Procedures (ARPs), Abnormal Operating Procedures (AOPs) and Emergency Operating Procedures (EOPs), and they instruct licensed operators on the steps necessary to maintain safe operation and protect fission product barriers during all modes of plant operation.

In response to the lessons learned from the accident at Three Mile Island, the nuclear industry developed Severe Accident Management Guidelines (SAMGs) as a voluntary initiative.[4] The SAMGs describe additional strategies meant to provide operators and the plant staff with the capability to manage accident sequences that progress beyond the capacity of the mitigating strategies contained in the EOPs (e.g., adequate core cooling cannot be maintained). In doing so, the strategy focus changes from preventing fuel damage to mitigating the consequences of fuel damage, including minimizing radiological releases and protecting personnel.

Existing site-specific EOPs and SAMGs are based on generic technical guidelines developed in response to NUREG-0737, Item I.C.1, "Guidance for the Evaluation and Development of Procedures for Transients and Accidents," and NEI 91-04, *Severe Accident Issue Closure Guidelines*, Revision 1, respectively. The generic technical guidelines were created by the Boiling Water Reactor (BWR) and Pressurized Water Reactor (PWR) Owners Groups, and, in the case of the SAMGs, utilize applicable technical research and bases materials provided by the Electric Power Research Institute (EPRI). Using these generic guidelines, each licensee has developed EOPs and SAMGs that are appropriate for their specific plant technology, and function as an integrated set of strategies and implementing instructions.

Following the terrorist attacks of September 11, 2001, the NRC ordered licensees to develop strategies and specific guidance for maintaining or restoring core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with a loss of large areas of the plant due to explosions or fire; the NRC order was eventually codified in 10 CFR 50.54 (hh). U.S. nuclear power plant operators developed their response strategies and guidelines in accordance with NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*. The guideline sets that resulted from these efforts are typically referred to Extensive Damage Mitigation Guidelines (EDMGs).

[4] Refer to NRC Generic Letter 88-20, Supplement 2, *Accident Management Strategies for Consideration in the Individual Plant Examination Process*, dated April 4, 1990.

As a result of the review of the March 11, 2011, accident at the Fukushima Dai-ichi Nuclear Power Plant, the NRC Near-Term Task Force (NTTF) made several recommendations intended to strengthen and integrate the onsite emergency response capabilities described in EOPs, SAMGs, and EDMGs; these recommendations are referred to collectively as Recommendation 8. All aspects of Recommendation 8 were subsequently evaluated by the NRC staff and refined into a regulatory basis to support future rulemaking; see *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013[5]~~.~~.[6] . The Recommendation 8 regulatory basis was subsequently incorporated into *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015, with changes directed by the NRC Commissioners in *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015.

In the Staff Requirements Memorandum referenced above, the NRC Commissioners directed the removal of requirements for SAMGs from the proposed Mitigation of Beyond Design Basis Events rule. The industry continues to believe that SAMGs provide a useful tool to plant operators in the unlikely event of a severe accident and should be maintained. To this end, the NEI Nuclear Strategic Issues Advisory Committee (NSIAC) approved an Industry Initiative on SAMGs that requires each licensee to docket site-specific commitments concerning the updating these guidelines, and their consideration within plant configuration management processes, integration with other emergency response guideline sets and symptom-based EOPs, and validation.

This document provides guidance for addressing ~~three~~the SAMG Industry Initiative and certain aspects of the ~~regulatory basis associated with~~ Recommendation 8 ~~-~~regulatory basis; these topics are procedure integration, requirements for SAMGs and supporting guidelines, and a command and control structure for responding to a beyond design basis event or severe accident. The guidance was developed for commercial nuclear power reactors operating in the United States as of ~~2014~~2016. Adoption or modification of this guidance by future operating plants should be based on discussions with the appropriate technology Owners Group and the NRC staff.

[5] ~~Refer to NRC ADAMS ML #13101A344~~
[6] Refer to NRC ADAMS ML #13101A344

2 PROCEDURE INTEGRATION

2.1 OVERVIEW

Each licensee should establish an overall framework for strategies that would be used to mitigate and manage the consequences of a beyond design basis event and severe accident. This framework should address the integrated use of emergency response procedures and guidelines such that they have been designed to work together to implement the best available strategy for preventing or mitigating fuel damage, and limiting radiological releases. The effective integration of procedures and guidelines is characterized by the attributes listed in Section 2.4, Integration of Procedure and Guideline Sets.

For purposes of this document, a "strategy" refers to a plan of action for maintaining or restoring a "safety function"[7] in order to mitigate the effects of a beyond design basis event or manage the consequences of a severe accident. A strategy can be implemented by one or more methods. As used here, a "method" is a series of actions designed to implement a specific strategy. As an illustrative example of all three terms, consider that a portable pump (a method) may be used to inject water into the reactor pressure vessel (a strategy) for the purpose of maintaining core cooling (a safety function ~~(core cooling~~).

It is recognized that the usage of the above terms in NRC and industry documents, although generally similar, has varied somewhat over the years depending upon the preferences of authors and the purpose of a particular document. It will therefore be necessary to carefully apply these terms within the context of site-specific documents (i.e., in cases where different terms are used for the concepts identified above).

2.2 PROCEDURES AND GUIDELINES

It is important to distinguish the difference between emergency response procedures and guidelines. Procedures are documents written as sequential instructions for performing a function or addressing plant conditions, and operators and plant staff are expected to follow the prescribed instructions in a step-by-step and verbatim manner. Exceptions to this expectation should be rare and necessary only in extraordinary circumstances.

As opposed to procedures, guidelines do not necessarily provide a prescribed set of instructions and may not be followed in a step-by-step manner. Rather, they provide suggested strategies and implementing methods that may be used to address an adverse event or condition, typically those beyond a plant's design basis. Within guidelines, operators and plant staff have the latitude to respond as necessary to unpredictable and dynamic situations. During a beyond design basis event or severe accident, guidance documents would be used to focus the attention and actions of the operators and plant staff on the most important threats to safety and provide suggested optimal strategies for

[7] The safety functions of interest during a beyond design basis event or severe accident response are typically core cooling, containment and spent fuel pool cooling.

addressing plant conditions.

2.3 EMERGENCY RESPONSE PROCEDURE AND GUIDELINES SETS

This document employs the following terms when referring to procedure and guideline sets used by operators to respond to off-normal and emergency conditions. Depending upon Owners Group guidance, and fleet and site standards, a procedure and guideline set may be called by another name. Further, the decision to provide a given set of response instructions within a procedure or a guideline may vary from site-to-site. Each licensee should ensure that the appropriate site-specific document sets, and individual documents, are utilized when implementing the guidance contained in this document.

2.3.1 Abnormal Operating Procedures (AOPs)

AOPs are procedures that direct operator actions for restoring a function, system, or component to normal operating conditions following a transient or event. AOPs may also be used to mitigate an event or condition that is not severe enough to require use of an Emergency Operating Procedure (EOP), such as primary system leakage.

Further, AOPs may provide direction for responding to a wide range of off-normal and emergency conditions including, but not limited to, design basis-related events such as a Control Room evacuation, a fire, or a security threat; events initiated during shutdown or refueling operating modes; and natural and man-made hazardous conditions such as severe weather or toxic gas releases.

2.3.2 Emergency Operating Procedures (EOPs)

EOPs are procedures that direct operator actions for mitigating the consequences of transients and accidents that cause plant parameters to exceed reactor protection system or engineered safety features actuation setpoints. These procedures are developed using guidelines promulgated by the applicable Owners Group in response to NUREG-0737, *Clarification of TMI Action Plan Requirements*; Clarification Item I.C.1, "Guidance for the Evaluation and Development of Procedures for Transients and Accidents."

2.3.3 FLEX Support Guidelines (FSGs)

FSGs are guidelines that provide strategies relying upon the use of installed and portable equipment and resources to maintain or restore core cooling, containment, and SFP cooling capabilities during beyond design basis events. The strategies and capabilities reflected in these guidelines address the requirements of NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*. Guidance concerning the development of FSGs is contained in Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*.

2.3.4 Extensive Damage Mitigation Guidelines (EDMGs)

EDMGs are guidelines that provide strategies to maintain or restore core cooling, containment, and SFP cooling capabilities under the circumstances associated with the

loss of large areas of the plant due to explosions or fire. These strategies and capabilities address the requirements of 10 CFR 50.54(hh)(2). Guidance concerning the development of EDMGs is contained in NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*.

2.3.5 Severe Accident Management Guidelines (SAMGs)

SAMGs are guidelines that provide strategies to manage the consequences of an accident or event which would be implemented upon receipt of specific plant parameter values indicative of imminent or actual damage to irradiated fuel (e.g., high core exit thermocouple temperatures or low RPV water level). These guidelines employ strategies intended to arrest the progression of fuel damage, maintain the capability of the containment as long as possible, and minimize radiological releases. Guidance concerning the development of SAMGs is contained in this document.

SAMGs may be referred to as Severe Accident Guidelines (SAGs) at some sites.

2.4 INTEGRATION OF PROCEDURE AND GUIDELINE SETS

Each licensee's emergency response procedure and guideline sets should address the following considerations.

- A programmatic control document describing the framework for integration of mitigation and management strategies in response to a beyond design basis event or severe accident should be developed and maintained. The site-specific framework should consider the generic technical guidance provided by the appropriate Owners Group. Deviations from the generic technical guidance should be documented along with the supporting rationale.

  For illustrative purposes, a simplified example framework is depicted in Figure 2.1.

- Strategies should be available to address potential or actual fuel damaging conditions present in the reactor core or the spent fuel pool.

- Strategies should be reviewed to identify potential gaps or inconsistencies.

- Each strategy should be included within a controlling procedure or guideline. Where appropriate, expectations concerning parallel processing of procedures and/or guidelines should be described.

- Criteria such as plant conditions and parameters that require a transition from one controlling procedure or guideline to another should be clearly identified.

- Criteria for implementing the actions described in a supporting procedure or guideline should be clearly identified in the controlling procedure or guideline.

- Strategies should be available to address a beyond design basis event or severe accident occurring during any mode of operation, consistent with the associated NRC staff-endorsed guidance. The degree to which a controlling procedure may or may not be fully applicable during some plant operating modes should be considered.

- Strategies should be available to address an event involving a loss of large areas of the plant due to explosions or fire, including the possible loss of the Control Room command and control structure, consistent with the associated NRC staff-endorsed guidance in NEI 06-12. The degree to which a controlling procedure may or may not be fully applicable during some plant operating modes should be considered.

- Integration of EDMGs should reflect site-specific commitments made in response to NRC security orders.

- Integration of FSGs should reflect site-specific commitments related to NRC Order EA-12-049.

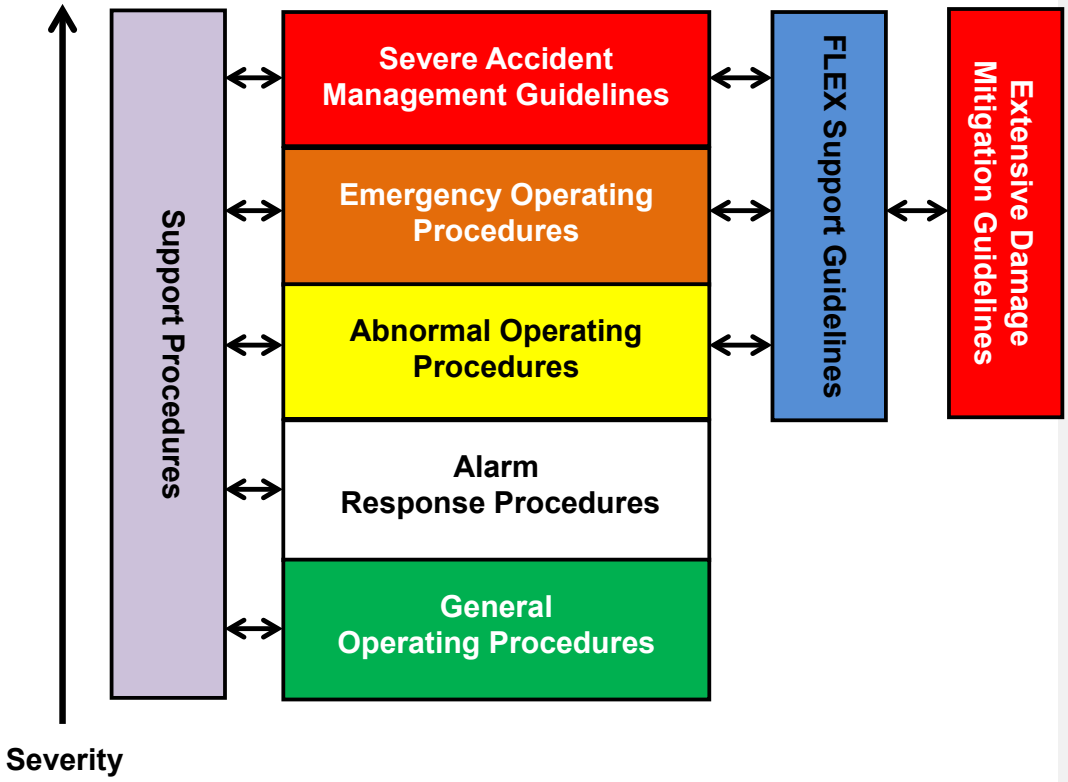
2.5 COORDINATION WITH FIRE RESPONSE STRATEGIES

SAMGs and FSGs provide a core set of strategies that can be used to respond to a variety of failures and concurrent events. SAMGs were developed to address plant conditions associated with a fuel damaging event and utilize a symptom-based approach to strategy selection. They provide a wide range of strategies and implementing methods, which, by design, can be adjusted during an emergency in response to plant conditions and concurrent events, such as a fire. FSGs provide strategies for mitigating the effects of an Extended Loss of AC Power (ELAP). Consistent with NRC staff–endorsed guidance, the development of FSG strategies assumed that there were no independent concurrent events, including a postulated fire.

Unlike analyses associated with design basis accidents, determining accident progression and consequences for beyond design basis events and severe accidents is problematic given the effectively unbounded nature of the accident sequences. This is particularly true when the coincident occurrence of two or more events or accidents is postulated (e.g., an ELAP and a fire). While recognizing that concurrent events such as a fire could occur during a beyond design basis event and severe accident, it is not possible to predict resulting strategy impacts in any reliable/certain manner beforehand. For this reason, programmatic documents, and/or procedures and guidelines, should provide direction for selecting the appropriate strategy at the time of the emergency. For example, the Emergency Response Organization position(s) holding Ultimate Decision-Maker (UDM) authority[8] could have guidance for selecting the appropriate strategy, and then determining the priorities and actions necessary for implementation.

[8] Discussed in Section 4 of this document.

Figure 2.1
Simplified Example Framework



Note – EDMG capabilities/methods may be referenced in Emergency Operating Procedures (EOPs) and/or Severe Accident Management Guidelines (SAMGs).

In addition, BWR "Support Procedures" include the Technical Support Guidelines which support implementation of EOPs and SAMGs.

3 REQUIREMENTS FOR SAMGS AND SUPPORTING GUIDELINES

3.1 OVERVIEW

Each licensee should maintain Severe Accident Management Guidelines (SAMGs) and supporting guidelines which consider the generic technical guidance provided by the applicable technology Owners Group. This includes the development of any additional guidance necessary for responding to a beyond design basis event or severe accident affecting the cooling of irradiated fuel stored in a spent fuel pool. With respect to guidance issued by the Nuclear Energy Institute (NEI), the material in this document supersedes that provided in Section 5 of NEI 91-04, *Severe Accident Issue Closure Guidelines*, for the development, implementation and maintenance of severe accident management programs.

3.2 SEVERE ACCIDENT MANAGEMENT GUIDELINES

3.2.1 Development of Generic Severe Accident Management Guidance

Following the March, 1979, accident at Three Mile Island, the Electric Power Research Institute (EPRI) engaged in an extensive research program to better understand the nature of nuclear power plant accidents that could result in significant damage of the fuel – referred to as severe accidents. Before the Three Mile Island accident, operator procedures and training had focused almost exclusively on preventing an upset condition from progressing to the point at which the fuel was damaged. To broaden the spectrum of emergency response guidance, EPRI developed generic accident management strategies and implementing methods that could be taken to limit the consequences of a severe accident. This guidance was issued in EPRI Technical Report TR-101869, *Severe Accident Management Guidance Technical Basis Report* (SAMG-TBR), dated April 1993.

The SAMG-TBR is organized into two volumes. Volume 1 defines severe accident damage conditions for the reactor core, spent fuel pool, and containment; identifies the Candidate High-Level Actions (CHLAs) that may be taken to best manage these conditions; and summarizes the effects that could result from implementation of each CHLA. Volume 2 is composed of appendices, each of which describes the physical behavior for one type of phenomenon relevant to severe accidents. These appendices also include the technical bases for calculation aids that can be used to estimate the plant response if an action is taken. Although these calculations are generally not intended to provide detailed results, they are sufficient to allow consideration of the relative benefits and possible undesired effects associated with each action.

In October, 2012, EPRI published an updated SAMG-TBR, Technical Report TR-1025295, to address lessons learned from the March, 2011, accident at Fukushima Dai-ichi, and incorporate other insights from research and analysis conducted over the intervening 20 years. While the actions described in the original report continue to represent appropriate responses to severe accident conditions, several new technical

considerations arising from the Fukushima accident were incorporated (e.g., makeup water quality, spent fuel pool actions, hydrogen buildup mitigation, etc.). EPRI also issued a separate report dealing with strategies to limit radiological releases following a severe accident; refer to Technical Report TR-1026539, *Investigation of Strategies for Mitigating Radiological Releases in Severe Accidents*, dated October 2012. The latter report is applicable to a Boiling Water Reactor with a Mk 1 or Mk 2 containment.

The Boiling Water Reactor Owners Group (BWROG) and Pressurized Water Reactor Owners Group (PWROG) have created generic technical materials to guide the development of site-specific SAMGs for each technology. These technical guidelines translate the insights from the above discussed EPRI reports into a template containing recommended technology-appropriate strategies, and implementing methods, for mitigating the consequences of a severe accident. The development of technical guidelines is based on reference plants, and utilizes engineering data derived from severe accident analyses, operating experience and phenomenological research.

3.2.2 Principles for SAMGs

The following principles should be applied to the development and implementation of SAMGs:

- Site-specific strategies and implementing methods should be based upon existing plant systems, structures and components, and available portable equipment. Modifications to the plant design are permitted but not required.
- Any plant system, structure or component, and available portable equipment, may be used to implement an accident management strategy, irrespective of safety classification or other design-related criteria. In addition, the normally-applied controls on the use or configuration of a plant system, structure or component may be altered if necessary to implement a strategy (e.g., establishing a system lineup not described in the facility licensing basis).
- The inclusion of a plant system, structure or component within a severe accident management strategy implementing method does not impose any additional design or maintenance-related requirements on that item (i.e., beyond those associated with the existing specifications and programs). For example, the design-basis safety classification of a plant system, structure or component – safety-related, important to safety, etc. – is not changed because of its employment within a strategy implementing method.
- Strategies should reflect a best-estimate understanding of accident progression and consequences.
- SAMG entry conditions and operator actions should be symptom-based and clearly linked to specific plant parameters. Identification of the initiating event should not be required in order to determine which strategy should be implemented.
- The best possible operational guidance should be specified to restore and maintain

key plant parameters within limits which define controlled and stable plant conditions, irrespective of licensing or design basis assumptions or commitments.

- Operator actions and decision-making criteria (e.g., a parameter value or trend that prompts a given action) should be determined using best-estimate assumptions and calculations, irrespective of licensing or design basis analytical assumptions and calculations.

- The capability to assess decision-making criteria (e.g., a parameter value or trend that prompts a given action) should accommodate the use of any available indications. Potential uncertainties in instrumentation readings caused by anticipated severe accident environmental conditions should be considered during the development of decision-making criteria.

- SAMG strategies may employ implementing methods or capabilities described in FLEX Support Guidelines (FSGs) or Extensive Damage Mitigation Guidelines (EDMGs).

- Computational aides should be provided when direct diagnosis of key plant conditions cannot be determined solely from instrumentation.

3.2.3 Considerations for Site-Specific SAMGs

3.2.3.1 Document Development

Site-specific severe accident management strategies, and associated implementing guidance, should be based on the generic technical guideline documents developed by the applicable Owners Group. Strategies and implementing guidance should reflect the plant-specific technology, design and operating characteristics, and control parameters and values. The SAMG principles discussed above should also be considered during the development or revision of implementing guidance.

Document developers should assess the applicability and utility of each strategy, and related material, presented in the generic technical guidelines. If deviations from the guidelines are necessary, they should be identified, documented and supported with a technical basis. For example, a deviation may be necessary if a particular generic strategy cannot be reconciled with the plant design. The technical basis for a deviation should address the potential effects on other strategies and/or recommended implementing methods.

A licensee may also include an additional strategy(ies) and/or implementing method(s) within their accident mitigation and management guidance documents. As with other deviations, these additions should be identified, documented and supported with a technical basis.

Licensees electing not to use the generic Owners Group technical guidelines should prepare a technical basis for all strategies and implementing methods

described in their site-specific guidelines. The technical basis for the SAMGs should cite relevant research and analysis, and address the lessons learned from industry events such as the Fukushima Dai-Ichi accident. It should also discuss investigated strategies and methods that might be taken to limit the release of radioactive materials over an extended period following an accident.

Guidelines for responding to a severe accident should be developed in accordance with the appropriate fleet or site-specific programmatic requirements, including the applicable writer's guide. In cases where one does not exist, a writer's guide should be developed. A writer's guide should contain all the information necessary to develop the plant-specific guidelines, and provisions for documentation of deviations from the generic Owners Group guidance.

3.2.3.2 Document Verification and Validation

Guidelines for responding to a severe accident should be verified and validated in accordance with an applicable fleet or site procedure development process. This includes guidelines developed for use by operators as well as those intended for implementation by the accident management support staff (e.g., engineers in the TSC). Absent an appropriate verification and validation process, one should be developed.

Verification and validation processes should assess the technical accuracy and adequacy of the instructions, and the ability of personnel to follow and implement them. The verification process should confirm the compatibility of document instructions with referenced equipment, user-aides and supplies (e.g., portable equipment, posted job aids, strategy evaluation materials, etc.). The validation process should demonstrate that the document provides the instructions necessary to implement the guidance.

Guidelines should be verified and validated using existing plant capabilities. Increasing the capability of the plant-referenced simulator to specifically model the conditions of the reactor core or stored spent fuel during a beyond design basis event or severe accident is not required. As a consequence, the technical rigor applied to verification and validation activities may be different than that normally used for Abnormal Operating Procedures and Emergency Operating Procedures.

The verification and validation process should accommodate the differences between non-severe and severe accident conditions. In particular, the process should recognize that severe accidents are characterized by uncertainties in both their progression and consequences. Some other key differences include:

- There may be no clear outcome for an accident management strategy. For example, adding water to a damaged core undergoing melting may, or may not, result in arresting core damage and, in some cases, may

introduce new accident management challenges.

- There may not be a “right” or “wrong” decision at any given point in time during a severe accident response. Every severe accident management strategy has the potential for both positive and negative consequences related to its implementation and these consequences can be very situation dependent. In addition, there may be cases where a negative consequence can be mitigated through implementation of another strategy within some event-specific timeframe.

Due to the unbounded nature of severe accident sequences and potential resulting conditions, a limited number of scenarios should be developed for the SAMG validation process (i.e., a sample group). These scenarios should allow for reasonable assurance that key decision points and transition guidance will support implementation accident management strategies. The assumed conditions and data used in the validation process should be determined on a "best estimate" basis.

3.2.3.3 Document Updating and Maintenance

Review, revision, approval, distribution and placement of SAMGs should be performed in accordance with the appropriate fleet or site document control process. The need to make changes should be assessed whenever:

- Changes to the facility that may impact the capability to implement strategies are identified.[9]

- The applicable generic severe accident technical guidelines are updated (e.g., a change to a guideline) or revised.

Potential changes should be tracked by an appropriate fleet or site process (e.g., a corrective action program).

A revision to the applicable generic severe accident technical guidelines should be assessed and implemented within 2 refueling outages or 3 years of the publication date, whichever is greater.

3.2.3.4 User Aids

The development, verification and validation of user aids should be consistent with applicable fleet and/or site policies.

[9] Programmatic controls should be implemented to identify these types of facility changes (e.g., proposed design changes, configuration controls, etc.).

3.2.3.5 Priority Setting for Document Changes

Each licensee should update the condition screening and evaluation requirements described in their corrective action program(s) as needed to promote the appropriate prioritization of corrective actions associated with severe accident management response capabilities. In particular, work prioritization and the assignment of resources for these types of conditions should be properly balanced with other site needs, and commensurate with the anticipated benefits to overall accident or event response capabilities (e.g., changes offering lower relative or absolute benefits should be assigned lower priorities).

3.3 FLEX SUPPORT GUIDELINES

Following an assessment of the accident at Fukushima Dai-Ichi, the NRC issued Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, on March 12, 2012. On August 29, 2012, the NRC staff issued Interim Staff Guidance (ISG) JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, Revision 0.[10] This document assists nuclear power reactor applicants and licensees with the identification of measures needed to comply with requirements of the mitigating strategies order. The ISG endorses, with clarifications, the methodologies described in the industry guidance document, Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*~~, Revision 0~~.

The development, verification, validation and maintenance of FSGs should be performed in accordance with each licensee's procedure/guideline development processes, and the guidance provided in NEI 12-06.

3.4 EXTENSIVE DAMAGE MITIGATION GUIDELINES

As a result of the terrorist attacks of September 11, 2001, the NRC issued an Interim Compensatory Measures (ICM) Order to all power reactor licensees on February 25, 2002. This Order required compliance with specified interim safeguards and security compensatory measures. Section B.5.b of the ICM Order required the development of specific guidance and strategies to maintain core cooling, containment, and SFP cooling capabilities using existing or readily available resources (equipment and personnel) that could be effectively implemented under the circumstances associated with loss of large areas of the plant due to explosions or fire. Eventually, the requirements of Section B.5.b of the ICM Order were codified in 10 CFR 50.54(hh)(2); refer to SECY-08-099 and SRM-M081217B. The NRC staff-endorsed guidance for complying with 10 CFR 50.54(hh)(2) is contained in NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*.

[10] Refer to NRC ADAMS ML #12229A174

The development, verification, validation and maintenance of EDMGs should be performed in accordance with each licensee's procedure/guideline development processes, and the guidance provided in NEI 06-12.

4 COMMAND AND CONTROL

4.1 OVERVIEW

Each licensee should ensure that their emergency command and control structures are capable of directing responses to a beyond design basis event or severe accident, including those affecting multiple units on a site, in accordance with established procedure and guideline sets.

4.2 COMMAND AND CONTROL KEY FUNCTIONS

Command and control structures should clearly identify the Emergency Response Organization (ERO) position(s) with the ultimate authority for making decisions necessary for the implementation of emergency response procedures and guidelines during a beyond design basis event or severe accident. For purposes of the guidance in this document, the position with this authority is referred to as the Ultimate Decision-Maker (UDM). The position(s) assigned the UDM function should have the authority and capability of performing the following key command and control functions:

- Selection of the procedure or guideline set(s) most appropriate to address the event and/or plant conditions.
- Determination of the strategy(ies) to be implemented, and the necessary conditions and timing for implementation.
- Direction of the onsite and offsite resources needed to implement the selected strategy(ies).
- Direction of an action not contained in, or contrary to, procedures or guidelines, if it is determined that the action will provide greater protection of public health and safety.
- Interface with the ERO position holding overall command and control authority within the site ERO (and fleet-level ERO, if applicable), if the two authorities are held by different positions.

The qualifications for an UDM are discussed in NEI 13-06, *Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents*.

4.3 COMMAND AND CONTROL STRUCTURE CONSIDERATIONS

Procedures or guidelines used by the ERO should provide for implementation of command and control structures consistent with the following considerations.

- The UDM authority and responsibilities should be integrated into ERO command and control structures and protocols. It is not necessary to create a new ERO position or title.

- The Shift Manager should serve as the UDM during the implementation of Abnormal Operating Procedures (AOPs) and Emergency Operating Procedures (EOPs).

- Following a transition into Severe Accident Management Guidelines (SAMGs), the UDM authority and responsibilities may be retained by the Shift Manager, or transferred to an UDM-qualified individual located in another facility. The instructions/guidance for transferring the UDM role to a location outside the Control Room should include an assessment of the availability of the supporting personnel and resources necessary to implement all the command and control key functions.

- Following the transfer of the UDM function to an ERO position-holder located outside the Control Room (e.g., in the TSC), the support staff assisting with strategy evaluation and selection should include at least one member who holds an active SRO license, or has successfully completed an SRO licensing or certification program in the past, applicable to the affected onsite unit(s).[11] If a site hosts different technologies, then at least one individual with the SRO background described above should be available for each different unit technology (e.g., a PWR and a BWR, or an active safety feature plant and a passive safety feature plant).

- Following an event associated with loss of large areas of the plant due to explosions or fire, and causing a loss of the Control Room command and control structure, a procedure or guideline should describe the position(s) that could assume command and control of the event response. Due to the contingent and short-term nature of this assignment, and the initial focus on implementation of pre-planned EDMG strategies, it is not necessary for this position(s) to hold a UDM qualification. A procedure or guideline should specify how command and control are subsequently transferred to a position which does possess a UDM qualification.

- The UDM is able to direct changes to a pre-planned fire response strategy if necessary to support implementation of an accident or event mitigation or management strategy.

- The UDM assignment(s) should be consistent with the licensee's staffing assessments performed in accordance with NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, and the associated regulatory responses to NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012.

[11] The SRO certification should meet the requirements of ANSI/ANS 3.1, Selection, Qualification and Training of Personnel for Nuclear Power Plants.

- The authorities and responsibilities necessary to coordinate the acquisition and delivery of offsite resources are defined.

- At sites operating within a fleet structure, fleet-level command and control capabilities should be integrated into the licensee's command and control structures if such support will be relied upon during a beyond design basis event or severe accident.

- Specific UDM authorities and/or responsibilities that may be delegated, if any, are defined.

- Where appropriate, procedures and guidelines should contain guidance concerning the implementation of emergency response actions in accordance with 10 CFR 50.54(x) and the associated approval of such actions in accordance with 10 CFR 50.54(y).

5 REFERENCES

- NUREG-0737, *Clarification of TMI Action Plan Requirements*, dated November 1980
- NRC Generic Letter 88- 20, Supplement 2, *Accident Management Strategies for Consideration in the Individual Plant Examination Process*, dated April 4, 1990
- NRC Report, *Recommendations for Enhancing Reactor Safety in the 21st Century [The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident]*, dated July 12, 2011
- SECY-11-0124, *Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report*, dated September 9, 2011
- NRC Order EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated March 12, 2012
- NRC letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 12, 2012
- NRC JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events*, dated August 29, 2012
- ~~NRC staff report,~~ *Onsite Emergency Response Capabilities, Regulatory Basis to Address Nuclear Regulatory Commission Near-Term Task Force Recommendation 8*, dated October 1, 2013
- *Staff Requirements - SECY-15-0065 – Proposed Rulemaking: Mitigation of Beyond-Design-Basis Events (RIN 3150-AJ49)*, dated August 27, 2015
- *Proposed Rule – Mitigation of Beyond Design Basis Events (RIN 3150-AJ49)*, dated November 2, 2015
- Electric Power Research Institute (EPRI) Technical Report, *Severe Accident Management Guidance - Technical Basis Report,* TR-101869, dated April 1993
- Electric Power Research Institute (EPRI) Technical Report, *Severe Accident Management Guidance - Technical Basis Report*, TR-1025295, dated October 2012
- Electric Power Research Institute (EPRI) Technical Report, *Investigation of Strategies for Mitigating Radiological Releases in Severe Accidents*, TR-1026539, dated October 2012

- NEI 91-04, *Severe Accident Issue Closure Guidelines*, Revision 1, dated December 1994
- NEI 06-12, *B.5.b Phase 2 & 3 Submittal Guideline*, dated ~~July 2009~~December 2006
- NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, dated May 2012
- NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*~~, dated August 2012~~
- NEI Letter, *Industry Initiative to Maintain Severe Accident Management Guidelines*, Pietrangelo to Johnson, dated October 26, 2015
- NEI 13-06, *Enhancements to Emergency Response Capabilities for Beyond Design Basis Events and Severe Accidents*, dated ~~September 2014~~February 2016

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