UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 22, 2013

Mr. Michael J. Pacilio
President and Chief
Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 - INTERIM STAFF EVALUATION RELATING TO OVERALL INTEGRATED PLAN IN RESPONSE TO ORDER EA-12-049 (MITIGATION STRATEGIES) (TAC NOS. MF0845 AND MF0846)

Dear Mr. Pacilio:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12054A736). By letter dated February 28, 2013, (ADAMS Accession No. ML13059A305), Exelon Generation Company, LLC (Exelon, the licensee) submitted its Overall Integrated Plan (OIP) for Peach Bottom Atomic Power Station, Units 2 and 3, in response to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13246A412), Exelon submitted a six-month update to the OIP.

Based on a review of the licensee's plan, including the six-month update dated August 28, 2013, and information obtained through the mitigation strategies audit process,[1] the NRC concludes that the licensee has provided sufficient information to determine that there is reasonable assurance that the plan, when properly implemented, will meet the requirements of Order EA-12-049 at Peach Bottom Atomic Power Station, Units 2 and 3. This conclusion is based on the assumption that the licensee will implement the plan as described, including the satisfactory resolution of the open and confirmatory items detailed in the enclosed Interim Staff Evaluation and Audit Report. As identified in Section 4.0 of the enclosed report, the open item warranting the greatest attention to ensure successful implementation is the generic concern regarding Boiling Water Reactor Owners Group Emergency Procedure Guidelines/Severe Accident Guidelines, Revision 3, regarding the potential effects of the revised BWR venting strategy, identified as Open Item Number 3.2.3.A.

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[1] A description of the mitigation strategies audit process may be found at ADAMS Accession No. ML13234A503.

If you have any questions, please contact Mr. Randy Hall, Senior Project Manager in the Mitigating Strategies Directorate, at (301) 415-4032.

Sincerely,

Jeremy S. Bowen, Chief
Mitigating Strategies Projects Branch
Mitigating Strategies Directorate
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosures:
1. Interim Staff Evaluation
2. Technical Evaluation Report

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
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INTERIM STAFF EVALUATION AND AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO ORDER EA-12-049 MODIFYING LICENSES WITH REGARD TO REQUIREMENTS FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS

EXELON GENERATION COMPANY, LLC

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

DOCKET NOS. 50-277 and 50-278

1.0 INTRODUCTION

The earthquake and tsunami at the Fukushima Dai-ichi nuclear power plant in March 2011 highlighted the possibility that extreme natural phenomena could challenge the prevention, mitigation and emergency preparedness defense-in-depth layers. At Fukushima, limitations in time and unpredictable conditions associated with the accident significantly challenged attempts by the responders to preclude core damage and containment failure. During the events in Fukushima, the challenges faced by the operators were beyond any faced previously at a commercial nuclear reactor. The Nuclear Regulatory Commission (NRC) determined that additional requirements needed to be imposed to mitigate beyond-design-basis external events. Accordingly, by letter dated March 12, 2012, the NRC issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" [Reference 1]. The order directed licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities in the event of a beyond-design-basis external event (BDBEE).

By letter dated February 28, 2013 [Reference 2], Exelon Generation Company, LLC (the licensee or Exelon) provided the Overall Integrated Plan for compliance with Order EA-12-049 for the Peach Bottom Atomic Power Station, Units 2 and 3 (Peach Bottom)(hereafter referred to as the Integrated Plan). The Integrated Plan describes the guidance and strategies under development for implementation by Exelon for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. As further required by the order, by letter dated August 28, 2013 [Reference 3], the licensee submitted the first six-month status report since the submittal of the Integrated Plan, describing the progress made in implementing the requirements of the order.

2.0 REGULATORY EVALUATION

Following the events at the Fukushima Dai-ichi nuclear power plant on March 11, 2011, the NRC established a senior-level agency task force referred to as the Near-Term Task Force (NTTF). The NTTF was tasked with conducting a systematic and methodical review of the NRC's regulations and processes, and with determining whether the agency should make improvements to these programs in light of the events at Fukushima Dai-ichi. As a result of this review, the NTTF developed a comprehensive set of recommendations, documented in SECY-11-0093, "Near-Term Report and Recommendations for Agency Actions Following the Events in Japan," dated July 12, 2011 [Reference 4]. These recommendations were enhanced by the NRC staff following interactions with stakeholders. Documentation of the NRC staff's efforts is contained in SECY-11-0124, "Recommended Actions to be Taken without Delay from the Near-Term Task Force Report," dated September 9, 2011 [Reference 5] and SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," dated October 3, 2011 [Reference 6].

As directed by the Commission's Staff Requirement Memorandum (SRM) for SECY-11-0093 [Reference 7], the NRC staff reviewed the NTTF recommendations within the context of the NRC's existing regulatory framework and considered the various regulatory vehicles available to the NRC to implement the recommendations. SECY-11-0124 and SECY-11-0137 established the NRC staff's prioritization of the recommendations based upon the potential safety enhancements.

After receiving the Commission's direction in SRM-SECY-11-0124 [Reference 8] and SRM-SECY-11-0137 [Reference 9], the NRC staff conducted public meetings to discuss enhanced mitigation strategies intended to maintain or restore core cooling, containment, and SFP cooling capabilities following beyond-design-basis external events. At these meetings, the industry described its proposal for a Diverse and Flexible Mitigation Capability (FLEX), as documented in the Nuclear Energy Institute's (NEI's) letter, dated December 16, 2011 [Reference 10]. FLEX was proposed as a strategy to fulfill the key safety functions of core cooling, containment integrity, and spent fuel cooling. Stakeholder input influenced the NRC staff to pursue a more performance-based approach to improve the safety of operating power reactors than envisioned in NTTF Recommendation 4.2, SECY-11-0124, and SECY-11-0137.

On February 17, 2012, the NRC staff provided SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," [Reference 11] to the Commission, including the proposed order to implement the enhanced mitigation strategies. As directed by SRM-SECY-12-0025 [Reference 12], the NRC staff issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" [Reference 1].

Order EA-12-049, Attachment 2[1], requires that operating power reactor licensees and construction permit holders use a three-phase approach for mitigating beyond-design-basis external events. The initial phase requires the use of installed equipment and resources to maintain or restore core cooling, containment and SFP cooling capabilities. The transition phase requires providing sufficient portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site. The final phase requires obtaining sufficient offsite resources to sustain those functions indefinitely. Specific operational requirements of the order are listed below:

1) Licensees or construction permit (CP) holders shall develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event.

2) These strategies must be capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink [UHS] and have adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities at all units on a site subject to the order.

3) Licensees or CP holders must provide reasonable protection for the associated equipment from external events. Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities at all units on a site subject to the order.

4) Licensees or CP holders must be capable of implementing the strategies in all modes.

5) Full compliance shall include procedures, guidance, training, and acquisition, staging, or installing of equipment needed for the strategies.

On May 4, 2012, NEI submitted document 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision B [Reference 13] to provide specifications for an industry developed methodology for the development, implementation, and maintenance of guidance and strategies in response to the Mitigating Strategies Order. On May 13, 2012, NEI submitted NEI 12-06, Revision B1 [Reference 14]. The guidance and strategies described in NEI 12-06 expand on those that industry developed and implemented to address the limited set of beyond-design-basis external events that involve the loss of a large area of the plant due to explosions and fire required pursuant to paragraph (hh)(2) in Section 50.54, "Conditions of licenses" of Title 10 of the *Code of Federal Regulations*.

On May 31, 2012, the NRC staff issued a draft version of the interim staff guidance (ISG) document, JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses

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[1] Attachment 3 provides the requirements for Combined License holders

with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," [Reference 15] and published a notice of its availability for public comment in the *Federal Register* (77 FR 33779), with the comment period running through July 7, 2012. JLD-ISG-2012-01 proposed endorsing NEI 12-06, Revision B1, as providing an acceptable method of meeting the requirements of Order EA-12-049. The NRC staff received seven comments during this time. The NRC staff documented its analysis of these comments in "NRC Response to Public Comments, JLD-ISG-2012-01 (Docket ID NRC-2012-0068)" [Reference 16].

On July 3, 2012, NEI submitted comments on JLD-ISG-2012-01, including Revision C to NEI 12-06 [Reference 17], incorporating many of the exceptions and clarifications included in the draft version of the ISG. Following a public meeting held July 26, 2012, to discuss the remaining exceptions and clarifications, on August 21, 2012, NEI submitted Revision 0 to NEI 12-06 [Reference 18].

On August 29, 2012, the NRC staff issued the final version of 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" [Reference 19], endorsing NEI 12-06, Revision 0, as an acceptable means of meeting the requirements of Order EA-12-049, and published a notice of its availability in the *Federal Register* (77 FR 55230).

The NRC staff determined that the overall Integrated Plans submitted by licensees in response to Order EA-12-049, Section IV.C.1.a should follow the guidance in NEI 12-06, Section 13, which states that:

> The Overall Integrated Plan should include a complete description of the FLEX strategies, including important operational characteristics. The level of detail generally considered adequate is consistent to the level of detail contained in the Licensee's Final Safety Analysis Report (FSAR). The plan should provide the following information:
>
> 1. Extent to which this guidance, NEI 12-06, is being followed including a description of any alternatives to the guidance, and provide a milestone schedule of planned actions.
>
> 2. Description of the strategies and guidance to be developed to meet the requirements contained in Attachment 2 or Attachment 3 of the order.
>
> 3. Description of major installed and portable FLEX components used in the strategies, the applicable reasonable protection for the FLEX portable equipment, and the applicable maintenance requirements for the portable equipment.
>
> 4. Description of the steps for the development of the necessary procedures, guidance, and training for the strategies; FLEX equipment acquisition, staging or installation, including necessary modifications.
>
> 5. Conceptual sketches, as necessary to indicate equipment which is installed or equipment hookups necessary for the strategies. (As-built

piping and instrumentation diagrams (P&ID) will be available upon completion of plant modifications.)

6. Description of how the portable FLEX equipment will be available to be deployed in all modes.

By letter dated August 28, 2013 [Reference 20], the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049. That letter described the process to be used by the staff in its reviews, leading to the issuance of an interim staff evaluation and audit report for each site. The purpose of the staff's audits is to determine the extent to which licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the order. Additional NRC staff review and inspection may be necessary following full implementation of those actions to verify licensees' compliance with the order.

3.0 TECHNICAL EVALUATION

The NRC staff contracted with MegaTech Services, LLC (MTS) for technical support in the evaluation of the Integrated Plan for Peach Bottom, submitted by Exelon's letter dated February 28, 2013, as supplemented. NRC and MTS staff have reviewed the submitted information and held clarifying discussions with Exelon in evaluating the licensee's plans for addressing beyond-design-basis external events and its progress towards implementing those plans.

A simplified description of the Peach Bottom Integrated Plan to mitigate the postulated extended loss of ac power event is that the licensee will initially remove the core decay heat by using the Reactor Core Isolation Cooling (RCIC) system. The steam-driven RCIC pump will initially supply water to the reactor from the condensate storage tank or the suppression pool, depending on availability. Steam from the reactor will then be vented through the main steam safety relief valves (SRVs) to the suppression pool to gradually cool down the reactor pressure vessel (RPV). The primary makeup water source to the suppression pool is the Conowingo Pond, the ultimate heat sink (UHS), which will provide a sustained water source for core cooling using RCIC or a portable FLEX pump. If the UHS is not available, the water inventory in the Emergency Cooling Tower can be used as a makeup source. Either source can be aligned to provide RPV injection using a portable FLEX pump.

A FLEX generator will be used to reenergize selected 480 volt ac load centers. This will allow energizing selected motor control centers so that power is available to critical loads such as required motor-operated valves, direct current (dc) components through the installed battery chargers, and desired ac instrumentation. In the long-term, additional equipment, such as 4160 volt ac generators, will be delivered from the Regional Response Center to provide supplemental accident mitigation equipment.

In the postulated extended loss of power event, the SFP will initially heat up due to the unavailability of the normal cooling system. A FLEX pump taking suction from the UHS (or the Emergency Cooling Tower, if necessary) will be aligned and used to add water to the SFP to maintain level as the pool boils. This will maintain a sufficient amount of water above the top of the fuel assemblies for cooling and shielding purposes.

Peach Bottom plans to use containment venting to maintain containment pressure and temperature within acceptable values, as necessary. However, in an Extended Loss of ac Power (ELAP) event, containment venting may be initiated earlier to maintain peak suppression pool temperature below the maximum allowed for RCIC operation. RPV depressurization will be stopped at a pressure of 200 psig, to ensure sufficient steam pressure for continued RCIC operation. The exact timing and strategy for venting is still under evaluation by the licensee.

By letter dated November 20, 2013 [Reference 21], MTS documented the interim results of the Integrated Plan review in the attached technical evaluation report (TER). The NRC staff has reviewed this TER for consistency with NRC policy and technical accuracy and finds that it accurately reflects the state of completeness of the Integrated Plan. The NRC staff therefore adopts the findings of the TER with respect to individual aspects of the requirements of Order EA-12-049.

4.0 OPEN AND CONFIRMATORY ITEMS

This section contains a summary of the open and confirmatory items identified as part of the technical evaluation. The NRC and MTS have assigned each review item to one of the following categories:

A. Acceptable item – an item that the NRC considers resolved, consistent with the endorsed guidance, or otherwise acceptable to the staff. No further NRC review is required, provided the licensee implements the plan as described. Licensee implementation may be subject to inspection.

B. Confirmatory item – an item that the NRC considers conceptually acceptable, but for which resolution may be incomplete. These items are expected to be acceptable, but are expected to require some minimal follow up review or audit prior to the licensee's compliance with order EA-12-049.

C. Open item – an item for which the licensee has not presented a sufficient basis for NRC to determine that the issue is on a path to resolution. The intent behind designating an issue as an open item is to document significant items that need resolution during the review process, rather than being verified after the compliance date through the inspection process.

As discussed in Section 3.0, above, the NRC staff has reviewed MTS' TER for consistency with NRC policy and technical accuracy and finds that it accurately reflects the state of completeness of the licensee's Integrated Plan. The NRC staff therefore adopts the open and confirmatory items identified in the TER and listed in the tables below. These summary tables provide a brief description of the issue of concern. Further details for each open and confirmatory item are provided in the corresponding sections of the TER, identified by the item number.

4.1 Open Items

Item Number	Description	Notes
3.2.3.A	Revision 3 to the BWROG EPG/SAG is a Generic Concern because the BWROG has not addressed the potential for the revised venting strategy to increase the likelihood of detrimental effects on containment response for events in which the venting strategy is invoked.	Significant Concern
3.2.4.3.A	Freeze protection has not been discussed in the Integrated Plan or during the audit process.	
3.2.4.4.A	Portable and emergency lighting during an ELAP has not been discussed in the Integrated Plan or during the audit process.	
3.2.4.5.A	Access to protected and internal locked plant areas during an ELAP has not been discussed in the Integrated Plan or during the audit process.	

4.2 Confirmatory Items

Item Number	Description	Notes
3.1.1.1.A	The method selected for protection of equipment during a BDBEE was not discussed in the Integrated Plan or during the audit process. There was no discussion of the specifications stated in NEI 12-06, Sections 5.3.1, 6.2.3.1, 7.3.1, 8.3.1, and 9.3.1. Also, there was no discussion of securing large portable equipment for protection during a seismic hazard.	
3.1.1.2.A	Deployment routes have not yet been finalized or reviewed for possible impacts due to debris and potential soil liquefaction.	
3.1.1.2.C	Protection of vehicles used to deploy and re-fuel portable/FLEX equipment during a BDBEE was not discussed in the Integrated Plan or during the audit process.	
3.1.1.3.A	Seismic procedural interface consideration NEI 12-06, section 5.3.3, consideration 1, which considers the possible failure of seismically qualified electrical equipment by beyond-design-basis seismic events, was not discussed in the Integrated Plan or during the audit process.	
3.1.1.3.B	Seismic procedural interface considerations NEI 12-06, section 5.3.3, 2 and 3, which considers flooding from large internal sources and also mitigation of ground water, was not discussed in the Integrated Plan or during the audit process.	
3.1.1.4.A	Utilization of offsite resources - the local staging area was not discussed in the Integrated Plan or during the audit process.	

3.1.2.A	Characterization of the external flooding hazard in terms of warning time and persistence was not discussed in the Integrated Plan or during the audit process.	
3.1.2.1A	Protection of portable/FLEX equipment during a flooding BDBEE was not discussed in the Integrated Plan or during the audit process.	
3.1.2.2.A	Movement of equipment and restocking of supplies in the context of a flood with long persistence during a BDBEE was not discussed in the Integrated Plan or during the audit process.	
3.1.3.2.A	Availability of debris clearing equipment during a BDBEE was not discussed in the Integrated Plan or during the audit process.	
3.1.4.2.A	Snow or ice removal during a BDBEE was not discussed in the Integrated Plan or during the audit process. Additionally, there was no discussion of ice blocking the FLEX pump suctions.	
3.2.1.1.A	MAAP benchmarks should be identified and discussed which demonstrate that MAAP4 is an appropriate code for the simulation of an ELAP event.	
3.2.1.1.B	MAAP Analysis - collapsed level should remain above Top of Active Fuel (TAF) and the cool down rate should be within technical specification limits.	
3.2.1.1.C	MAAP4 should be used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper.	
3.2.1.1.D	MAAP modeling parameters. In using MAAP4, the licensee should identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (Electric Power Research Institute Report 1020236).	
3.2.1.1.E	The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan should be identified and available for review.	
3.2.1.2.A	There was no discussion of the assumed recirculation system leakage rates including the recirculation pump seal leakage rates that were used in the ELAP analysis. Questions still remain unanswered regarding pressure dependence of the assumed leakage rates, assumed leakage phase, i.e. single phase liquid, two phase, or steam, and other questions presented in the audit.	
3.2.1.4.A	Required flow rates and portable/FLEX pump characteristics were not discussed in the Integrated Plan or during the audit process. Likewise, there was no discussion of the required flow for mitigation strategies and no discussion of the calculations that verify adequate flow.	
3.2.1.4.B	There was no discussion of the assumptions used in the calculations for battery coping time and to evaluate the effectiveness of dc load reduction including the basis for the assumed minimum battery voltage.	

3.2.1.4.C	The operability of the RCIC pump at elevated suction temperature was not discussed in the Integrated Plan or during the audit process.	
3.2.1.4.D	Water quality issues and guidance on priority of water source usage were not fully addressed in the Integrated Plan or during the audit process and requires further analysis by licensee.	
3.2.2.A	Evaluation of the refueling floor SFP area for steam and condensation was not yet completed. Mitigating strategies for a vent pathway were not discussed in the Integrated Plan or during the audit process.	
3.2.4.2.A	The impact of high temperature on the operability of RCIC Room electrical and mechanical equipment, including the RCIC turbine speed controller, was not discussed in the Integrated Plan or during the audit process.	
3.2.4.2.B	Evaluation of high and low battery temperatures is to be provided during a future six-month-update.	
3.2.4.4.B	Plant communications during an ELAP were not discussed in the Integrated Plan or the audit process. Follow-up of commitments made in the communications assessment (ADAMS Accession No. ML12306A199) is necessary.	
3.2.4.6.A	Initial analysis for accessibility and habitability of critical plant locations as the RCIC Room showed relatively high temperatures. There was no discussion of the effectiveness of ventilation with portable fans. There was no discussion of long term habitability in critical plant locations during an ELAP.	
3.2.4.7.A	Emergency Cooling Tower water volume and replenishment was not discussed in the Integrated Plan or during the audit process.	
3.2.4.8.A	The licensee did not provide sufficient information regarding loading/sizing calculations of portable diesel generator(s) and strategy for electrical isolation for FLEX electrical generators from installed plant equipment.	
3.2.4.9.A	Details of portable equipment fuel storage transfer were provided during the audit process. However, the method to ensure fuel quality was not discussed in the Integrated Plan or during the audit process.	
3.4.A	The program or process to request RRC equipment was not discussed in the Integrated Plan or during the audit process.	
3.4.B	Sizing calculations of RRC FLEX equipment and the compatibility of RRC equipment to plant connection points were not discussed in the Integrated Plan or during the audit process.	

Based on a review of Exelon's plan, including the six-month update dated August 28, 2013, and information obtained through the mitigation strategies audit process, the NRC concludes that the licensee has provided sufficient information to determine that there is reasonable assurance that the plan, when properly implemented, will meet the requirements of Order EA-12-049 for Peach Bottom Atomic Power Station, Units 2 and 3. This conclusion is based on the assumption that the licensee will implement the plan as described, including the satisfactory resolution of the open and confirmatory items. As identified in Section 4.1 above, the open item warranting the greatest attention to ensure successful implementation is Item Number 3.2.3.A, regarding the potential effects of the revised BWR venting strategy. The NRC staff considers the adoption of Revision 3 to the Boiling Water Reactor Owner's Group (BWROG) Emergency Procedures Guidelines/Severe Accident Guidelines (EPG/SAG) by licensees to be a generic concern (and thus an Open Item) because the BWROG has not addressed the potential for the revised venting strategy to increase (relative to currently accepted venting strategies) the likelihood of detrimental effects on containment response for events in which the venting strategy is invoked. In particular, it has not been shown that the potential for negative pressure transients, hydrogen combustion, or loss of containment overpressure (as needed for pump NPSH) is not significantly different when implementing Revision 3 of the EPG/SAG vs. Revision 2 of the EPG/SAG. Revision 3 provides for earlier venting than previous revisions. The BWR procedures are structured such that the new venting strategy is not limited to use during the BDBEEs that are the subject of Order EA-12-049, but could also be implemented during a broad range of events.

The licensee's proposed approach has raised issues which must be addressed before the staff can conclude that the approach is consistent with the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, or that it represents an acceptable alternative.

5.0 SUMMARY

As required by Order EA-12-049, the licensee is developing, and will implement and maintain, guidance and strategies to restore or maintain core cooling, containment, and SFP cooling capabilities in the event of a beyond-design-basis external event. These new requirements provide a greater mitigation capability consistent with the overall defense-in-depth philosophy, and, therefore, greater assurance that the challenges posed by beyond-design-basis external events to power reactors do not pose an undue risk to public health and safety.

The NRC's objective in preparing this interim staff evaluation and audit report is to provide a finding to the licensee on whether or not their Integrated Plan, if implemented as described, provides a reasonable path for compliance with the order. For areas where the NRC staff has insufficient information to make this finding (identified above in Section 4.0), the staff will review these areas as they become available or address them as part of the inspection process. The staff notes that the licensee has the ability to modify their plans as stated in NEI 12-06, Section 11.8. However, additional NRC review and/or inspection may be necessary to verify compliance.

The NRC staff has reviewed the licensee's plans for additional defense-in-depth measures. With the exception of the items noted in Section 4.0 above, the staff finds that the proposed measures, properly implemented, will meet the intent of Order EA-12-049, thereby enhancing the licensee's capability to mitigate the consequences of a beyond-design-basis external event that impacts the availability of alternating current power and the ultimate heat sink. Full compliance with the order will enable the NRC to continue to have reasonable assurance of adequate protection of public health and safety. The staff will issue a safety evaluation confirming compliance with the order and may conduct inspections to verify proper implementation of the licensee's proposed measures.

6.0 REFERENCES

1. Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12054A736)

2. Letter from Exelon Generation Company, LLC, to NRC, "Peach Bottom Atomic Power Station, Units 2 and 3 - Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (EA-12-049)," dated February 28, 2013 (ADAMS Accession No. ML13059A305)

3. Letter from Exelon Generation Company, LLC, to NRC, "Peach Bottom Atomic Power Station, Units 2 and 3 -First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (EA-12-049)," dated August 28, 2013 (ADAMS Accession No. ML13246A412)

4. SECY-11-0093, "Near-Term Report and Recommendations for Agency Actions Following the Events in Japan," July 12, 2011 (ADAMS Accession No. ML11186A950)

5. SECY-11-0124, "Recommended Actions to be Taken without Delay from the Near-Term Task Force Report," September 9, 2011 (ADAMS Accession No. ML11245A158)

6. SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," October 3, 2011 (ADAMS Accession No. ML11272A111)

7. SRM-SECY-11-0093, "Staff Requirements – SECY-11-0093 – Near-Term Report and Recommendations for Agency Actions following the Events in Japan," August 19, 2011 (ADAMS Accession No. ML112310021)

8. SRM-SECY-11-0124, "Staff Requirements – SECY-11-0124 – Recommended Actions to be Take without Delay from the Near-Term Task Force Report," October 18, 2011 (ADAMS Accession No. ML112911571)

9. SRM-SECY-11-0137, "Staff Requirements – SECY-11-0137- Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," December 15, 2011 (ADAMS Accession No. ML113490055)

10. Letter from Adrian Heymer (NEI) to David L. Skeen (NRC), "An Integrated, Safety-Focused Approach to Expediting Implementation of Fukushima Dai-ichi Lessons Learned," December 16, 2011 (ADAMS Accession No. ML11353A008)

11. SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," February 17, 2012 (ADAMS Accession No. ML12039A103)

12. SRM-SECY-12-0025, "Staff Requirements – SECY-12-0025 - Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," March 9, 2012 (ADAMS Accession No. ML120690347)

13. Nuclear Energy Institute document 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision B, May 4, 2012 (ADAMS Accession No. ML12144A419)

14. Nuclear Energy Institute document 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision B1, May 13, 2012 (ADAMS Accession No. ML12143A232)

15. Draft 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," May 31, 2012 (ADAMS Accession No. ML12146A014)

16. NRC Response to Public Comments, JLD-ISG-2012-01 (Docket ID NRC-2012-0068), August 29, 2012 (ADAMS Accession No. ML12229A253)

17. Nuclear Energy Institute, Comments from Adrian P. Heymer on Draft Interim Staff Guidance 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,", July 3, 2012 (ADAMS Accession No. ML121910390)

18. Nuclear Energy Institute document 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, August 21, 2012 (ADAMS Accession No. ML12242A378)

19. Final Interim Staff Guidance 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," August 29, 2012 (ADAMS Accession No. ML12229A174)

20. Letter from Jack R. Davis (NRC) to All Operating Reactor Licensees and Holders of Construction Permits, "Nuclear Regulatory Commission Audits of Licensee Responses to Mitigation Strategies Order EA-12-049," August 28, 2013 (ADAMS Accession No. ML13234A503)

21. Letter from J. Bowen, MegaTech Services, LLC, to E. Bowman, NRC, "First Batch SED Final – 7 Sites," dated November 20, 2013 (ADAMS Accession No. ML13324B140), submitting the Technical Evaluation Report for the Peach Bottom Atomic Power Station, Units 2 and 3.

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Date: November 22, 2013

Enclosure 2

Technical Evaluation Report

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Mega-Tech Services, LLC

Technical Evaluation Report Related to Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, EA-12-049

Revision 1

November 20, 2013

Exelon Generation Company, LLC
Peach Bottom Atomic Power Station, Units 2 and 3
Docket Nos. 50-277 and 50-278

Prepared for:

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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Technical Evaluation Report

Peach Bottom Atomic Power Station, Units 2 and 3
Order EA-12-049 Evaluation

1.0 BACKGROUND

Following the events at the Fukushima Dai-ichi nuclear power plant on March 11, 2011, the U.S. Nuclear Regulatory Commission (NRC) established a senior-level agency task force referred to as the Near-Term Task Force (NTTF). The NTTF was tasked with conducting a systematic, methodical review of NRC regulations and processes to determine if the agency should make additional improvements to these programs in light of the events at Fukushima Dai-ichi. As a result of this review, the NTTF developed a comprehensive set of recommendations, documented in SECY-11-0093, "Near-Term Report and Recommendations for Agency Actions Following the Events in Japan," dated July 12, 2011. These recommendations were enhanced by the NRC staff following interactions with stakeholders. Documentation of the staff's efforts is contained in SECY-11-0124, "Recommended Actions to be Taken without Delay from the Near-Term Task Force Report," dated September 9, 2011, and SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," dated October 3, 2011.

As directed by the Commission's staff requirement memorandum (SRM) for SECY-11-0093, the NRC staff reviewed the NTTF recommendations within the context of the NRC's existing regulatory framework and considered the various regulatory vehicles available to the NRC to implement the recommendations. SECY-11-0124 and SECY-11-0137 established the staff's prioritization of the recommendations.

After receiving the Commission's direction in SRM-SECY-11-0124 and SRM-SECY-11-0137, the NRC staff conducted public meetings to discuss enhanced mitigation strategies intended to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities following beyond-design-basis external events (BDBEEs). At these meetings, the industry described its proposal for a Diverse and Flexible Mitigation Capability (FLEX), as documented in Nuclear Energy Institute's (NEI) letter, dated December 16, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11353A008). FLEX was proposed as a strategy to fulfill the key safety functions of core cooling, containment integrity, and spent fuel cooling. Stakeholder input influenced the NRC staff to pursue a more performance-based approach to improve the safety of operating power reactors relative to the approach that was envisioned in NTTF Recommendation 4.2, SECY-11-0124, and SECY-11-0137.

On February 17, 2012, the NRC staff provided SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," to the Commission, including the proposed order to implement the enhanced mitigation strategies. As directed by SRM-SECY-12-0025, the NRC staff issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events."

Guidance and strategies required by the Order would be available if a loss of power, motive force and normal access to the ultimate heat sink needed to prevent fuel damage in the reactor and SFP affected all units at a site simultaneously. The Order requires a three-phase approach for mitigating BDBEEs. The initial phase requires the use of installed equipment and resources to maintain or restore key safety functions including core cooling, containment, and SFP cooling. The transition phase requires providing sufficient portable onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from offsite. The final phase requires obtaining sufficient offsite resources to sustain those functions indefinitely.

NEI submitted its document NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" in August 2012 (ADAMS Accession No. ML12242A378) to provide specifications for an industry-developed methodology for the development, implementation, and maintenance of guidance and strategies in response to Order EA-12-049. The guidance and strategies described in NEI 12-06 expand on those that industry developed and implemented to address the limited set of BDBEEs that involve the loss of a large area of the plant due to explosions and fire required pursuant to paragraph (hh)(2) of 10 CFR 50.54, "Conditions of licenses."

As described in 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," the NRC staff considers that the development, implementation, and maintenance of guidance and strategies in conformance with the guidelines provided in NEI 12-06, Revision 0, subject to the clarifications in Attachment 1 of the ISG are an acceptable means of meeting the requirements of Order EA-12-049.

In response to Order EA-12-049, licensees submitted Overall Integrated Plans (hereafter, the Integrated Plan) describing their course of action for mitigation strategies that are to conform with the guidance of NEI 12-06, or provide an acceptable alternative to demonstrate compliance with the requirements of Order EA-12-049.

2.0 EVALUATION PROCESS

In accordance with the provisions of Contract NRC-HQ-13-C-03-0039, Task Order No. NRC-HQ-13-T-03-0001, Mega-Tech Services, LLC (MTS) performed an evaluation of each licensee's Integrated Plan. As part of the evaluation, MTS, in parallel with the NRC staff, reviewed the original Integrated Plan and the first 6-month status update, and conducted an audit of the licensee documents. The staff and MTS also reviewed the licensee's answers to the NRC staff's and MTS's questions as part of the audit process. The objective of the evaluation was to assess whether the proposed mitigation strategies conformed to the guidance in NEI 12-06, as endorsed by the positions stated in JLD-ISG-2012-01, or an acceptable alternative had been proposed that would satisfy the requirements of Order EA-12-049. The audit plan that describes the audit process was provided to all licensees in a letter dated August 29, 2013 from Jack R. Davis, Director, Mitigating Strategies Directorate (ADAMS Accession No. ML13234A503).

The review and evaluation of the licensee's Integrated Plan was performed in the following areas consistent with NEI 12-06 and the regulatory guidance of JLD-ISG-2012-01:

- Evaluation of External Hazards
- Phased Approach
    - Initial Response Phase
    - Transition Phase
    - Final Phase
- Core Cooling Strategies

- SFP Cooling Strategies
- Containment Function Strategies
- Programmatic Controls
  - Equipment Protection, Storage, and Deployment
  - Equipment Quality

The technical evaluation (TE) in Section 3.0 documents the results of the MTS evaluation and audit results. Section 4.0 summarizes Confirmatory Items and Open Items that require further evaluation before a conclusion can be reached that the Integrated Plan is consistent with the guidance in NEI 12-06 or an acceptable alternative has been proposed that would satisfy the requirements of Order EA-12-049. For the purpose of this evaluation, the following definitions are used for Confirmatory Item and Open Item.

> Confirmatory Item – an item that is considered conceptually acceptable, but for which resolution may be incomplete. These items are expected to be acceptable, but are expected to require some minimal follow up review or audit prior to the licensee's compliance with Order EA-12-049.
>
> Open Item – an item for which the licensee has not presented a sufficient basis to determine that the issue is on a path to resolution. The intent behind designating an issue as an Open Item is to document items that need resolution during the review process, rather than being verified after the compliance date through the inspection process.

Additionally, for the purpose of this evaluation and the NRC staff's interim staff evaluation (ISE), licensee statements, commitments, and references to existing programs that are subject to routine NRC oversight (Updated Final Safety Analysis Report (UFSAR) program, procedure program, quality assurance program, modification configuration control program, etc.) will generally be accepted. For example, references to existing UFSAR information that supports the licensee's overall mitigating strategies plan, will be assumed to be correct, unless there is a specific reason to question its accuracy. Likewise, if a licensee states that they will generate a procedure to implement a specific mitigating strategy, assuming that the procedure would otherwise support the licensee's plan, this evaluation accepts that a proper procedure will be prepared. This philosophy for this evaluation and the ISE does not imply that there are any limits in this area to future NRC inspection activities.

3.0 TECHNICAL EVALUATION

By letter dated February 28, 2013, (ADAMS Accession No. ML13059A305), and as supplemented by the first six-month status report in letter dated August 28, 2013 (ADAMS Accession No. ML13246A412), Exelon Generation Company, LLC (the licensee or Exelon) provided Peach Bottom Atomic Power Station's (PBAPS) Integrated Plan for Compliance with Order EA-12-049. The Integrated Plan describes the strategies and guidance under development for implementation by the licensee for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the NRC staff in its review, leading to the issuance of an interim staff evaluation and audit report. The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the Order.

3.1 EVALUATION OF EXTERNAL HAZARDS

Sections 4 through 9 of NEI 12-06 provide the NRC-endorsed methodology for the determination of applicable extreme external hazards in order to identify potential complicating factors for the protection and deployment of equipment needed for mitigation of BDBEEs leading to an extended loss of all alternating current (ac) power (ELAP) and loss of normal access to the ultimate heat sink (UHS). These hazards are broadly grouped into the categories discussed below in Sections 3.1.1 through 3.1.5 of this evaluation. Characterization of the applicable hazards for a specific site includes the identification of realistic timelines for the hazard; characterization of the functional threats due to the hazard; development of a strategy for responding to events with warning; and development of a strategy for responding to events without warning.

3.1.1 Seismic Events.

NEI 12-06, Section 5.2 states:

> All sites will address BDB [beyond design basis] seismic considerations in the implementation of FLEX strategies, as described below. The basis for this is that, while some sites are in areas with lower seismic activity, their design basis generally reflects that lower activity. There are large, and unavoidable, uncertainties in the seismic hazard for all U.S. plants. In order to provide an increased level of safety, the FLEX deployment strategy will address seismic hazards at all sites.
>
> These considerations will be treated in four primary areas: protection of FLEX equipment, deployment of FLEX equipment, procedural interfaces, and considerations in utilizing off-site resources.

A review was made of the licensee's screening process for the seismic hazard. The licensee confirmed on page 1 of the Integrated Plan that seismic hazards are applicable to PBAPS and that the seismic design information considers a maximum horizontal ground acceleration of 0.05g, and the maximum credible earthquake considers a horizontal ground acceleration of 0.12g. The licensee has stated on page 2 of the Integrated Plan that they have not completed the seismic re-evaluation pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 and therefore was not assumed in their Integrated Plan.

The licensee's screening for seismic hazards as presented in their Integrated Plan has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the portable equipment.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to screening for seismic hazards if these requirements are implemented as described.

3.1.1.1 Protection of FLEX Equipment – Seismic Hazard

NEI 12-06, Section 5.3.1 states:

1. FLEX equipment should be stored in one or more of following three configurations:

   a. In a structure that meets the plant's design basis for the Safe Shutdown Earthquake (SSE)(e.g., existing safety-related structure).

   b. In a structure designed to or evaluated equivalent to [American Society of Civil Engineers] ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures.*

   c. Outside a structure and evaluated for seismic interactions to ensure equipment is not damaged by non-seismically robust components or structures.

2. Large portable FLEX equipment such as pumps and power supplies should be secured as appropriate to protect them during a seismic event (i.e., Safe Shutdown Earthquake (SSE) level).

3. Stored equipment and structures should be evaluated and protected from seismic interactions to ensure that unsecured and/or non-seismic components do not damage the equipment.

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the seismic hazard. On page 16 in the section of the Integrated Plan discussing maintaining core cooling during the transition phase (Phase 2), the licensee stated that protection of associated portable equipment from seismic hazards would be provided by constructing structures that meet the specifications of NEI 12-06 Section 11. Section 11 provides general storage design guidance but does not provide the details for protection during a seismic hazard as delineated in NEI 12-06, Section 5.3.1 above.

This comment is generic. Each section of the integrated plan describing protection of equipment from the BDBEE hazards makes reference to NEI 12-06, Section 11 rather than to the protection specifications described in NEI 12-06 for the applicable hazard; that is 6.2.3.1 for floods, 7.3.1 for severe storms with high wind, 8.3.1 for snow, ice and extreme cold and 9.3.1 for high temperatures. Statements similar to that made on page 16 were made on pages 25, 34, and 42 in discussions of coping strategies for maintaining containment and SFP cooling and safety function support.

Although the licensee has indicated PBAPS procedures and programs are being developed to address storage structure requirements, the licensee has not identified the configuration selected for the protection of portable/FLEX equipment during a seismic hazard as specified in NEI 12-06, Section 5.3.1.1. Additionally, there was no discussion of securing large portable equipment to protect the equipment during a seismic event and no discussion of actions or procedures to ensure unsecured and/or non-seismic components do not damage the equipment as is specified in NEI 12-06, Section 5.3.1, items 2 and 3. Therefore, the information available, at this time, is not sufficient to conclude that these procedures and programs will provide for securing large portable equipment to protect them during a seismic event or to ensure unsecured and/or non-seismic components do not damage the equipment as is specified in NEI 12-06 Section 5.3.1, items 1, 2 and 3. This has been identified as Confirmatory Item 3.1.1.1.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to storage and protection of portable equipment during a seismic hazard if these requirements are implemented as described.

3.1.1.2 Deployment of FLEX Equipment - Seismic Hazard

NEI 12-06, Section 5.3.2 states:

> The baseline capability requirements already address loss of non-seismically robust equipment and tanks as well as loss of all AC. So, these seismic considerations are implicitly addressed.
>
> There are five considerations for the deployment of FLEX equipment following a seismic event:
>
> 1. If the equipment needs to be moved from a storage location to a different point for deployment, the route to be traveled should be reviewed for potential soil liquefaction that could impede movement following a severe seismic event.
>
> 2. At least one connection point for the FLEX equipment will only require access through seismically robust structures. This includes both the connection point and any areas that plant operators will have to access to deploy or control the capability.
>
> 3. If the plant FLEX strategy relies on a water source that is not seismically robust, e.g., a downstream dam, the deployment of FLEX coping capabilities should address how water will be accessed. Most sites with this configuration have an underwater berm that retains a needed volume of water. However, accessing this water may require new or different equipment.
>
> 4. If power is required to move or deploy the equipment (e.g., to open the door from a storage location), then power supplies should be provided as part of the FLEX deployment.
>
> 5. A means to move FLEX equipment should be provided that is also reasonably protected from the event.

A review was made of the licensee's plans for implementation of the strategies to deploy portable/FLEX equipment during a seismic hazard, protection of connection points, water sources and the means and power requirements to deploy portable/FLEX equipment. The licensee discussed deployment of portable/FLEX equipment on page 6 of the Integrated Plan. The licensee specified that programs and procedures, including administrative controls, will be employed to ensure that deployment of the portable/FLEX equipment remains possible in all modes but are still under development. The licensee has not discussed the deployment of portable/FLEX equipment, the potential soil liquefaction, debris removal from deployment paths and that deployment routes would be through seismically robust (Class 1) structures. Therefore, the information available, at this time, is not sufficient to conclude that the deployment considerations 1 and 2 of NEI 12-06, Section 5.3.2 will be met. This has been identified as Confirmatory Item 3.1.1.2.A.in Section 4.2.

The licensee's discussion of protection and accessibility of the connection points on pages 15 and 17 of the Integrated Plan imply, but do not state that the connection points will be missile protected and enclosed within a Seismic Category 1 structure which will inherently protect it from local hazards such as vehicle impact. The licensee had not discussed the access to connection points to verify that those deployment paths would be through seismically robust structures. Updated information provided by the licensee as part of the EA-12-049 Mitigation Audit response addresses this issue by stating that additional information will be provided as part of the 6-month update process. The licensee provided clarifying information describing the protection provided to connection points and access to connection points through seismically robust structures.

On page 47 the licensee identified "Heavy Duty Truck(s)" for transport of portable equipment but omitted discussion of the protection to be afforded these vehicles from seismic hazards. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 5.3.2 consideration 5, regarding the protection of transportation vehicles will be met. This has been identified as Confirmatory Item 3.1.1.2.C. in Section 4.2.

The licensee provided clarification during a mitigating strategies audit that consideration 4 regarding electrical power was not needed to operate doors during the deployment of portable/FLEX equipment.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of portable equipment during a seismic hazard if these requirements are implemented as described.

3.1.1.3 Procedural Interfaces – Seismic Hazard

NEI 12-06, Section 5.3.3 states:

> There are four procedural interface considerations that should be addressed.
>
> 1. Seismic studies have shown that even seismically qualified electrical equipment can be affected by BDB seismic events. In order to address these considerations, each plant should compile a reference source for the plant operators that provides approaches to obtaining necessary instrument readings to support the implementation of the coping strategy (see Section 3.2.1.10). This reference source should include control room and non-control room readouts and should also provide guidance on how and where to measure key instrument readings at containment penetrations, where applicable, using a portable instrument (e.g., a Fluke meter). Such a resource could be provided as an attachment to the plant procedures/guidance. Guidance should include critical actions to perform until alternate indications can be connected and on how to control critical equipment without associated control power.

2. Consideration should be given to the impacts from large internal flooding sources that are not seismically robust and do not require ac power (e.g., gravity drainage from lake or cooling basins for non-safety-related cooling water systems).

3. For sites that use ac power to mitigate ground water in critical locations, a strategy to remove this water will be required.

4. Additional guidance may be required to address the deployment of FLEX for those plants that could be impacted by failure of a not seismically robust downstream dam.

A review was made of the licensee's plans for the development of the mitigating strategies. The licensee has described the framework for their administrative program for FLEX on pages 6 and 7 of the Integrated Plan. The licensee has also identified instrumentation necessary to support implementation of coping strategies for core, containment and SFP cooling during all phases on pages 12, 15, 18, 21, 22, 28, 31 and 36 of the integrated plan. However, there is no discussion in Integrated Plan to support the implementation of the mitigating strategies in the event that seismically qualified electrical equipment is affected by beyond-design-basis seismic events. Therefore, the information available, at this time, is not sufficient to conclude that the recommendations of NEI 12-06 Section 5.3.3 consideration 1 will be included in the PBAPS mitigating strategies. This has been identified as Confirmatory Item 3.1.1.3.A. in Section 4.2.

In their discussion of the seismic hazard analysis on page 1 of the Integrated Plan, the licensee stated that they have considered a remote possibility exists that a seismic event could affect availability of the ultimate heat sink, the Conowingo pond impoundment, due to reliance on a non-seismically robust downstream dam. In their discussions of coping strategies on pages 13, 14, 23 and 32 of the Integrated Plan for maintaining core, containment and SFP cooling, the licensee identified the portable/FLEX pump suction source as either the ultimate heat sink or the emergency cooling tower and provided a discussion of strategies to supply water to the Reactor Pressure Vessel (RPV), torus suppression pool and SFP through flexible hoses, the High Pressure Service Water (HPSW) and Residual Heat Removal (RHR) systems.
The licensee has established alternate methods in the mitigating strategies to draw water from either the Ultimate Heat Sink or from the Emergency Cooling Tower and therefore has addressed the possible failure of non-seismically robust downstream dams.

However, there is no discussion in Integrated Plan to support the implementation of the mitigating strategies with respect to the procedural interface considerations for seismic hazards associated with large internal flooding sources that are not seismically robust and do not require ac power and the use of ac power to mitigate ground water in critical locations. Therefore, the information available, at this time, is not sufficient to conclude that the recommendations of NEI 12-06 Section 5.3.3 considerations 2 and 3 will be included in the PBAPS mitigating strategies. This has been identified as Confirmatory Item 3.1.1.3.B. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural interfaces for coping with a seismic hazard if these requirements are implemented as described.

3.1.1.4 Considerations in Using Offsite Resources – Seismic Hazard

NEI 12-06, Section 5.3.4 states:

> Severe seismic events can have far-reaching effects on the infrastructure in and around a plant. While nuclear power plants are designed for large seismic events, many parts of the Owner Controlled Area and surrounding infrastructure (e.g., roads, bridges, dams, etc.) may be designed to lesser standards. Obtaining off-site resources may require use of alternative transportation (such as air-lift capability) that can overcome or circumvent damage to the existing local infrastructure.
>
> 1. The FLEX strategies will need to assess the best means to obtain resources from off-site following a seismic event.

A review was made of the licensee's plans for the use of offsite resources. The licensee stated that PBAPS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER) on page 8 of the Integrated Plan. However, the licensee has not discussed the local staging area and the method to be used to deliver the FLEX equipment to the site. Therefore, the information available, at this time, is not sufficient to conclude that there is reasonable assurance that the use of offsite resources will conform to the specifications of NEI 12-06 Section 5.3.4. This has been identified as Confirmatory Item 3.1.1.4.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to use of off-site resources if these requirements are implemented as described.

3.1.2 Flooding

NEI 12-06, Section 6.2 states:

> The evaluation of external flood-induced challenges has three parts. The first part is determining whether the site is susceptible to external flooding. The second part is the characterization of the applicable external flooding threat. The third part is the application of the flooding characterization to the protection and deployment of FLEX strategies.

NEI 12-06, Section 6.2.1 states in part:

> Susceptibility to external flooding is based on whether the site is a "dry" site, i.e., the plant is built above the design basis flood level (DBFL). For sites that are not "dry", water intrusion is prevented by barriers and there could be a potential for those barriers to be exceeded or compromised. Such sites would include those that are kept "dry" by permanently installed barriers, e.g., seawall, levees, etc., and those that install temporary barriers or rely on watertight doors to keep the design basis flood from impacting safe shutdown equipment.

A review was made of the licensee's screening process for the flood hazard. The licensee has identified regional precipitation, probable maximum flood (PMF) as the Design Basis flood hazard on page 1 of the Integrated Plan. Critical equipment, systems, and structures essential to a safe shutdown of the reactor are flood protected to the 135 foot elevation, against the most severe combination of the PMF, failure of the upstream dam, and wind-generated waves. The licensee assumes that a long lead time exists before flood levels will reach plant grade elevation. The licensee also stated on page 2 that the flooding re-evaluation pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 had not been completed and therefore was not assumed in their Integrated Plan.

The licensee's screening for external flooding hazards as presented in their Integrated Plan has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the portable equipment.

The licensee has identified the limiting source of external flooding as being regional precipitation, which NEI 12-06 characterizes in Table 6-1 as having warning time in days and persistence in months. Failing to apply the longer warning time in the development of the strategies would not enable a licensee to make use of the allowances of NEI 12-06, Section 6.2.3.2, consideration 1 for pre-event preparations, which would be conservative to a set of strategies making use of that consideration. However, failing to characterize the persistence of an external flooding hazard prevents concluding that NEI 12-06, Section 6.2.3.2, consideration 2 on the ability to move equipment and restock supplies during a flood with long persistence has been appropriately addressed. The lack of characterization of the applicable flooding hazard in terms of warning time and persistence has been identified as Confirmatory Item 3.1.2.A. in Section 4.2, and is discussed further in Section 3.1.2.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to evaluation of the flooding hazard if these requirements are implemented as described.

3.1.2.1 Protection of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.1 states:

> These considerations apply to the protection of FLEX equipment from external flood hazards:
>
> 1. The equipment should be stored in one or more of the following configurations:
>
>   a. Stored above the flood elevation from the most recent site flood analysis. The evaluation to determine the elevation for storage should be informed by flood analysis applicable to the site from early site permits, combined license applications, and/or contiguous licensed sites.
>
>   b. Stored in a structure designed to protect the equipment from the flood.
>
>   c. FLEX equipment can be stored below flood level if time is available and plant procedures/guidance address the needed actions to relocate the equipment. Based on the timing of the limiting flood scenario(s), the FLEX equipment can be relocated [footnote 2 omitted] to a position that is

protected from the flood, either by barriers or by elevation, prior to the arrival of the potentially damaging flood levels. This should also consider the conditions on-site during the increasing flood levels and whether movement of the FLEX equipment will be possible before potential inundation occurs, not just the ultimate flood height.

2. Storage areas that are potentially impacted by a rapid rise of water should be avoided.

A review was made of the licensee's plans for protecting portable/FLEX equipment during the flooding hazard. The licensee stated on page 2 of the Integrated Plan that storage locations for portable/FLEX equipment have not yet been selected. The licensee also stated on page 16 of the Integrated Plan that portable/FLEX equipment can be stored below flood level at PBAPS since sufficient warning time is available to relocate and/or deploy the equipment. The licensee explained that portable/FLEX equipment will be relocated to a position that is protected from the flood, either by barriers or by elevation, prior to the arrival of the potentially damaging flood levels. However, the actual location and design of the storage facility and its elevation was not discussed.

Additionally, the licensee stated that electrical and at least one mechanical FLEX connection will be protected from external flooding and that the fuel oil storage tanks will be protected from flood conditions.

The licensee has not yet discussed their plans for protection and storage of portable/FLEX equipment from external hazards including the flooding hazard. There is no discussion of the location and elevation of the primary and alternate storage locations relative to flood levels. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the flooding hazard as is specified in NEI 12-06, Section 6.2.3.1. This is identified as Confirmatory Item 3.1.2.1.A in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2013-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to storage and protection of portable equipment during a flooding hazard if these requirements are implemented as described.

3.1.2.2 Deployment of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.2 states:

There are a number of considerations which apply to the deployment of FLEX equipment for external flood hazards:

1. For external floods with warning time, the plant may not be at power. In fact, the plant may have been shut down for a considerable time and the plant configuration could be established to optimize FLEX deployment. For example, the portable pump could be connected, tested, and readied for use prior to the arrival of the critical flood level. Further, protective actions can be taken to reduce the potential for flooding impacts, including cooldown, borating the RCS, isolating accumulators, isolating RCP seal leak off, obtaining dewatering pumps, creating temporary flood barriers, etc. These

factors can be credited in considering how the baseline capability is deployed.

2. The ability to move equipment and restock supplies may be hampered during a flood, especially a flood with long persistence. Accommodations along these lines may be necessary to support successful long-term FLEX deployment.

3. Depending on plant layout, the ultimate heat sink may be one of the first functions affected by a flooding condition. Consequently, the deployment of the FLEX equipment should address the effects of LUHS, as well as ELAP.

4. Portable pumps and power supplies will require fuel that would normally be obtained from fuel oil storage tanks that could be inundated by the flood or above ground tanks that could be damaged by the flood. Steps should be considered to protect or provide alternate sources of fuel oil for flood conditions. Potential flooding impacts on access and egress should also be considered.

5. Connection points for portable equipment should be reviewed to ensure that they remain viable for the flooded condition.

6. For plants that are limited by storm-driven flooding, such as Probable Maximum Surge or Probable Maximum Hurricane (PMH), expected storm conditions should be considered in evaluating the adequacy of the baseline deployment strategies.

7. Since installed sump pumps will not be available for dewatering due to the ELAP, plants should consider the need to provide water extraction pumps capable of operating in an ELAP and hoses for rejecting accumulated water for structures required for deployment of FLEX strategies.

8. Plants relying on temporary flood barriers should assure that the storage location for barriers and related material provides reasonable assurance that the barriers could be deployed to provide the required protection.

9. A means to move FLEX equipment should be provided that is also reasonably protected from the event.

A review was made of the licensee's plans for implementation of the strategies to deploy portable/FLEX equipment during the flood hazard. The licensee discussed deployment of portable/FLEX equipment on page 6 of the Integrated Plan. As stated on page 2 in the Integrated Plan, the licensee has not yet defined deployment routes for portable/FLEX equipment. Also, as discussed in Section 3.1.2, above, the licensee has not provided a characterization of the persistence of the external flooding hazard. There was no discussion of the considerations for movement of equipment and restocking of supplies per consideration 2 in the context of a flood with long persistence. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 6.2.3.2 will be met concerning the deployment of portable/FLEX equipment during the flooding hazard. This is documented as Confirmatory Item 3.1.2.2.A. in Section 4.2.

On page 47 of the Integrated Plan, in the section listing BWR Portable Equipment for Phase 2, the licensee identified that one or more heavy duty trucks would be committed for refueling, transport of portable equipment and debris clearing but omitted discussion of the protection to be afforded these vehicles from external flooding per consideration 9. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 6.2.3.2 will be met concerning the protection of transportation equipment during the flooding hazard. The item tracking this issue has been combined with Confirmatory Item 3.1.1.2.C. on protection of vehicles from seismic hazards in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of portable equipment during a flooding hazard if these requirements are implemented as described.

3.1.2.3 Procedural Interfaces – Flooding Hazard

NEI 12-06, Section 6.2.3.3 states:

> The following procedural interface considerations should be addressed.
>
> 1. Many sites have external flooding procedures. The actions necessary to support the deployment considerations identified above should be incorporated into those procedures.
>
> 2. Additional guidance may be required to address the deployment of FLEX for flooded conditions (i.e., connection points may be different for flooded vs. non-flooded conditions).
>
> 3. FLEX guidance should describe the deployment of temporary flood barriers and extraction pumps necessary to support FLEX deployment.

A review was made of the licensee's plans for the development of the mitigating strategies. The licensee has described the framework for their administrative program for FLEX on pages 6 and 7 of the Integrated Plan. However, there was no discussion of the deployment of portable/FLEX equipment during the flood hazard and no discussion of the need for and deployment of temporary flood barriers. Therefore, the information available, at this time, is not sufficient to conclude that procedural interfaces for the flood hazard will conform to the specifications of NEI 12-06, Section 6.2.3.3. This issue has been combined with Confirmatory Item 3.1.2.2.A regarding characterization of the flooding hazard with respect to persistence.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural interfaces coping with the flooding hazard if these requirements are implemented as described.

3.1.2.4 Considerations in Using Offsite Resources – Flooding Hazard

NEI 12-06, Section 6.2.3.4 states:

Extreme external floods can have regional impacts that could have a significant impact on the transportation of off-site resources.

1. Sites should review site access routes to determine the best means to obtain resources from off-site following a flood.

2. Sites impacted by persistent floods should consider where equipment delivered from off-site could be staged for use on-site.

A review was made of the licensee's plans for use of offsite resources from the Regional Response Center (RRC) during the flood hazard. The licensee stated that PBAPS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER) on page 8 of the Integrated Plan. However, the licensee has not discussed the local staging area and the method to be used to deliver the FLEX equipment to the site. There is no discussion of access routes and staging areas. There is no discussion of the impact of persistent floods on the routes and staging areas. Therefore, the information available, at this time, is not sufficient to conclude that there is reasonable assurance that the use of offsite resources will conform to the specifications of NEI 12-06 Section 6.2.3.4. The item tracking this issue has been combined with Confirmatory Item 3.1.1.4.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to use of off-site resources if these requirements are implemented as described.

3.1.3 High Winds

NEI 12-06, Section 7, provides the NRC-endorsed screening process for evaluation of high wind hazards. This screening process considers the hazard due to hurricanes and tornadoes. The first part of the evaluation of high wind challenges is determining whether the site is potentially susceptible to different high wind conditions to allow characterization of the applicable high wind hazard.

The screening for high wind hazards associated with hurricanes should be accomplished by comparing the site location to NEI 12-06, Figure 7-1 (Figure 3-1 of U.S. NRC, "Technical Basis for Regulatory Guidance on Design Basis Hurricane Wind Speeds for Nuclear Power Plants," NUREG/CR-7005, December, 2009); if the resulting frequency of recurrence of hurricanes with wind speeds in excess of 130 mph exceeds 10^{-6} per year, the site should address hazards due to extreme high winds associated with hurricanes.

The screening for high wind hazard associated with tornadoes should be accomplished by comparing the site location to NEI 12-06, Figure 7-2, from U.S. NRC, "Tornado Climatology of the Contiguous United States," NUREG/CR-4461, Rev. 2, February 2007; if the recommended tornado design wind speed for a 10^{-6}/year probability exceeds 130 mph, the site should address hazards due to extreme high winds associated with tornadoes.

The licensee stated their screening for the high wind hazard on page 1 on the Integrated Plan and screened in for both the hurricane and tornado winds with a peak wind speed of 165 mph.

A review was made of the licensee's screening process for the severe storm with high wind hazard and it was determined that the licensee has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the portable equipment for high winds from both hurricanes and tornadoes.

The licensee's screening for severe storms with high winds hazard as presented in their Integrated Plan has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the portable equipment.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to screening for the severe storms with high winds hazard if these requirements are implemented as described.

3.1.3.1 Protection of FLEX Equipment - High Winds Hazard

NEI 12-06, Section 7.3.1 states:

> These considerations apply to the protection of FLEX equipment from high wind hazards:
>
> 1. For plants exposed to high wind hazards, FLEX equipment should be stored in one of the following configurations:
>
>   a. In a structure that meets the plant's design basis for high wind hazards (e.g., existing safety-related structure).
>
>   b. In storage locations designed to or evaluated equivalent to ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures* given the limiting tornado wind speeds from Regulatory Guide 1.76 or design basis hurricane wind speeds for the site.
>
>   - Given the FLEX basis limiting tornado or hurricane wind speeds, building loads would be computed in accordance with requirements of ASCE 7-10. Acceptance criteria would be based on building serviceability requirements not strict compliance with stress or capacity limits. This would allow for some minor plastic deformation, yet assure that the building would remain functional.
>
>   - Tornado missiles and hurricane missiles will be accounted for in that the FLEX equipment will be stored in diverse locations to provide reasonable assurance that N sets of FLEX equipment will remain deployable following the high wind event. This will consider locations adjacent to existing robust structures or in lower sections of buildings that minimizes the probability that missiles will damage all mitigation equipment required from a single event by protection from adjacent buildings and limiting pathways for missiles to damage equipment.
>
>   - The axis of separation should consider the predominant path of tornados in the geographical location. In general, tornadoes travel from the West or West Southwesterly direction, diverse locations should be aligned in the North-South arrangement, where possible.

Additionally, in selecting diverse FLEX storage locations, consideration should be given to the location of the diesel generators and switchyard such that the path of a single tornado would not impact all locations.

- Stored mitigation equipment exposed to the wind should be adequately tied down. Loose equipment should be in protective boxes that are adequately tied down to foundations or slabs to prevent protected equipment from being damaged or becoming airborne. (During a tornado, high winds may blow away metal siding and metal deck roof, subjecting the equipment to high wind forces.)

c. In evaluated storage locations separated by a sufficient distance that minimizes the probability that a single event would damage all FLEX mitigation equipment such that at least N sets of FLEX equipment would remain deployable following the high wind event. (This option is not applicable for hurricane conditions).

  - Consistent with configuration b., the axis of separation should consider the predominant path of tornados in the geographical location.

  - Consistent with configuration b., stored mitigation equipment should be adequately tied down.

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the severe storm with high winds hazard. Statements on page 16 of the Integrated Plan indicated that the licensee plans on storing portable/FLEX equipment in a structure constructed to the criteria of NEI 12-06, Section 11. However, the licensee did not discuss the protection criteria stated in NEI 12-06, Section 7.3.1 that addresses protection of portable/FLEX equipment during storms with high winds hazard. There was no discussion of the design criteria selected for the storage facility, the design specifications of the structure or the number of sets of equipment. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the severe storm with high winds hazard will meet the specifications of NEI 12-06, Section 7.3.1. The item tracking this issue has been combined with Confirmatory Item 3.1.1.1.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to protection and storage of portable equipment during the severe storm with high wind hazard if these requirements are implemented as described.

3.1.3.2 Deployment of FLEX Equipment – High Wind Hazard

NEI 12-06, Section 7.3.2 states:

There are a number of considerations which apply to the deployment of FLEX equipment for high wind hazards:

1. For hurricane plants, the plant may not be at power prior to the simultaneous

ELAP and LUHS condition. In fact, the plant may have been shut down and the plant configuration could be established to optimize FLEX deployment. For example, the portable pumps could be connected, tested, and readied for use prior to the arrival of the hurricane. Further, protective actions can be taken to reduce the potential for wind impacts. These factors can be credited in considering how the baseline capability is deployed.

2. The ultimate heat sink may be one of the first functions affected by a hurricane due to debris and storm surge considerations. Consequently, the evaluation should address the effects of ELAP/LUHS, along with any other equipment that would be damaged by the postulated storm.

3. Deployment of FLEX following a hurricane or tornado may involve the need to remove debris. Consequently, the capability to remove debris caused by these extreme wind storms should be included.

4. A means to move FLEX equipment should be provided that is also reasonably protected from the event.

5. The ability to move equipment and restock supplies may be hampered during a hurricane and should be considered in plans for deployment of FLEX equipment.

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during a severe storm with high wind hazard. The licensee discussed equipment deployment on page 6 of the Integrated Plan; however there is no discussion of debris removal and debris removal equipment is not listed in the table of transition phase equipment on pages 47 and 48 of the Integrated Plan.

The licensee discussed the limiting station battery coping time with load shedding of approximately 5.5 hours on pages 4 and 54. The time expected to install a portable/FLEX electrical generator and to begin a battery charge is 5 hours. There is no discussion of the removal of storm debris and its impact on deployment times. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 7.3.2 concerning equipment deployment and debris removal during the severe storm with high wind hazard will be met. This has been identified as Confirmatory Item 3.1.3.2.A. in Section 4.2.

On page 47 of 59, in the section listing BWR Portable Equipment for Phase 2, the licensee identified one or more heavy duty trucks for refueling and transport of portable equipment and debris clearing, but omitted discussion of the protection to be afforded these vehicles from high winds. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 7.3.2, the deployment of portable/FLEX equipment during the high winds hazard will be met. The item tracking this issue has been combined with Confirmatory Item 3.1.1.2.C. on protection of vehicles from seismic hazards in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of portable equipment during a severe storm high winds hazard if these requirements are implemented as described.

3.1.3.3 Procedural Interfaces – High Wind Hazard

NEI 12-06, Section 7.3.3, states:

> The overall plant response strategy should be enveloped by the baseline capabilities, but procedural interfaces may need to be considered. For example, many sites have hurricane procedures. The actions necessary to support the deployment considerations identified above should be incorporated into those procedures.

A review was made of the licensee's plans for the development of procedures and programs regarding the deployment of portable equipment during severe storms with high wind hazard. The licensee discussed deployment considerations on page 6 of the Integrated Plan. There was no specific discussion of procedural interfaces for portable/FLEX equipment deployment and hurricane, tornado and severe weather procedures. The licensee's plan to incorporate deployment considerations into procedures was also reviewed in Section 3.1.3.2, above. The items tracking the findings are Confirmatory Items 3.1.3.2.A, and 3.1.1.2.C, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural interfaces for coping with the severe storm with high wind hazard if these requirements are implemented as described.

3.1.3.4 Considerations in Using Offsite Resources – High Wind Hazard

NEI 12-06, Section 7.3.4 states:

> Extreme storms with high winds can have regional impacts that could have a significant impact on the transportation of off-site resources.
>
> 1. Sites should review site access routes to determine the best means to obtain resources from off-site following a hurricane.
>
> 2. Sites impacted by storms with high winds should consider where equipment delivered from off-site could be staged for use on-site.

A review was made of the licensee's plans for the use of offsite resources during the severe storm with high wind hazard. The licensee stated that PBAPS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER) on page 8 of the Integrated Plan. However, there is no discussion of routes to be used for delivery of RRC FLEX equipment and of local staging areas. There is no discussion of their review site access routes to determine the best means to obtain resources from off-site following a hurricane. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 7.3.4 concerning considerations in using off-site resources during high wind hazard will be met. The item tracking this issue has been combined with Confirmatory Item 3.1.1.4.A. in Section 4.2.

The current understanding of the licensee's approach, as described above, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the use of offsite resources during a severe storm with high winds hazard if these requirements are implemented as described.

3.1.4 Snow, Ice and Extreme Cold

As discussed in NEI 12-06, Section 8.2.1:

All sites should consider the temperature ranges and weather conditions for their site in storing and deploying their FLEX equipment consistent with normal design practices. All sites outside of Southern California, Arizona, the Gulf Coast and Florida are expected to address deployment for conditions of snow, ice, and extreme cold. All sites located North of the 35^{th} Parallel should provide the capability to address extreme snowfall with snow removal equipment. Finally, all sites except for those within Level 1 and 2 of the maximum ice storm severity map contained in Figure 8-2 should address the impact of ice storms.

A review was made of the licensee's screening process for snow, ice, and extreme cold hazard. The licensee discussed their screening of the hazard on page 1 of the Integrated Plan. They stated that PBAPS was subject to snow and ice and that the PBAPS UFSAR, Section 2.3.4.1, characterizes site temperature conditions as a few winter temperatures in the 5 degree to 10 degree Fahrenheit range, and also that there is a high probability of severe ice storms in Pennsylvania. A severe ice storm can be expected every three years.

The licensee has appropriately screened in for snow, ice, and extreme cold hazard and has identified the hazard levels for reasonable protection of the portable equipment.

A review was made of the licensee's screening process for the snow, ice, and extreme cold hazard and it was determined that the licensee has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the portable equipment.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to screening the snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.4.1 Protection of FLEX Equipment – Snow, Ice and Extreme Cold Hazard

NEI 12-06, Section 8.3.1 states:

> These considerations apply to the protection of FLEX equipment from snow, ice, and extreme cold hazards:
>
> 1. For sites subject to significant snowfall and ice storms, portable FLEX equipment should be stored in one of the two configurations.
>
>   a. In a structure that meets the plant's design basis for the snow, ice and cold conditions (e.g., existing safety-related structure).

b. In a structure designed to or evaluated equivalent to ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures* for the snow, ice, and cold conditions from the site's design basis.

c. Provided the N sets of equipment are located as described in a. or b. above, the N+1 equipment may be stored in an evaluated storage location capable of withstanding historical extreme weather conditions such that the equipment is deployable.

2. Storage of FLEX equipment should account for the fact that the equipment will need to function in a timely manner. The equipment should be maintained at a temperature within a range to ensure its likely function when called upon. For example, by storage in a heated enclosure or by direct heating (e.g., jacket water, battery, engine block heater, etc.).

A review was made of the licensee's plans for the storage and protection of portable equipment from snow, ice, and extreme cold. Statements on page 16 of the Integrated Plan indicated that the licensee plans on storing portable/FLEX equipment in a structure constructed to the criteria of NEI 12-06, Section 11. However, the licensee did not discuss the protection criteria stated in NEI 12-06, Section 8.3.1 that addresses protection of portable/FLEX equipment during snow, ice and extreme cold hazard. There was no discussion of the design criteria selected for the storage facility, the design specifications of the structure or the number of sets of equipment. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the high wind hazard will meet the specifications of NEI 12-06, Section 8.3.1. The item tracking this issue has been combined with Confirmatory Item 3.1.1.1.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to storage and protection of equipment from snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.4.2 Deployment of FLEX Equipment – Snow, Ice and Extreme Cold Hazard

NEI 12-06, Section 8.3.2 states:

There are a number of considerations that apply to the deployment of FLEX equipment for snow, ice, and extreme cold hazards:

1. The FLEX equipment should be procured to function in the extreme conditions applicable to the site. Normal safety-related design limits for outside conditions may be used, but consideration should also be made for any manual operations required by plant personnel in such conditions.

2. For sites exposed to extreme snowfall and ice storms, provisions should be made for snow/ice removal, as needed to obtain and transport FLEX equipment from storage to its location for deployment.

3. For some sites, the ultimate heat sink and flow path may be affected by extreme low temperatures due to ice blockage or formation of frazil ice. Consequently, the evaluation should address the effects of such a loss of UHS on the deployment of FLEX equipment. For example, if UHS water is to be used as a makeup source, some additional measures may need to be taken to assure that the FLEX equipment can utilize the water.

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during a snow, ice, and extreme cold hazard. On page 7 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that portable/FLEX equipment will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.

The licensee discussed equipment deployment on page 6 of the Integrated Plan; however there is not any discussion of snow and ice removal per consideration 2 and snow and ice removal equipment is not listed in the table of transition phase equipment on pages 47 and 48 of the Integrated Plan. The licensee discussed the limiting station battery coping time with load shedding of approximately 5.5 hours on pages 4 and 54. The time expected to install a portable/FLEX electrical generator and to begin a battery charge is 5 hours. There is no discussion of the removal of snow and ice and its impact on deployment times and the time to energize station battery chargers.

Additionally, regarding consideration 3, there was no discussion in the Integrated Plan regarding potential of surface icing existing on sources of makeup water on which FLEX pumps will take suction. Neither was there discussion on the potential for freezing of water in exposed equipment during an extreme cold event (e.g., installed piping, instrument lines, and tanks, FLEX piping and hoses.)

Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 8.3.2 concerning equipment deployment and the administrative program elements to ensure the pathways are clear will include snow or ice removal are sufficient and the potential for FLEX pump suctions being impacted by ice blockage or formation of frazil ice. This has been identified as Confirmatory Item 3.1.4.2.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of portable equipment during a snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.4.3 Procedural Interfaces – Snow, Ice and Extreme Cold Hazard

NEI 12-06, Section 8.3.3, states:

> The only procedural enhancements that would be expected to apply involve addressing the effects of snow and ice on transport the FLEX equipment. This includes both access to the transport path, e.g., snow removal, and appropriately equipped vehicles for moving the equipment.

A review was made of the licensee's plans for procedural enhancements that address the effects of snow and ice on transportation equipment. As discussed in Section 3.1.4.2, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 8.3.2 concerning equipment deployment and the administrative program elements to ensure the pathways are clear will include snow or ice removal are sufficient. The item tracking this issue has been combined with Confirmatory Item 3.1.4.2.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural enhancements that address the effects of snow and ice on transport equipment, including snow and ice removal during a snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.4.4 Considerations in Using Offsite Resources – Snow, Ice and Extreme Cold Hazard

NEI 12-06, Section 8.3.4, states:

> Severe snow and ice storms can affect site access and can impact staging areas for receipt of off-site material and equipment.

A review was made of the licensee's plans for the use of offsite resources during the snow, ice and extreme cold hazard. The licensee stated that PBAPS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER) on page 8 of the Integrated Plan. However, there is no discussion of potential impact on site access and staging areas for receipt of offsite materials and equipment. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 8.3.4 concerning considerations in using off-site resources during high wind hazard will be met. The item tracking this issue has been combined with Confirmatory Item 3.1.1.4.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to using offsite resources during a snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.5 High Temperatures

NEI 12-06, Section 9 states:

> All sites will address high temperatures. Virtually every state in the lower 48 contiguous United States has experienced temperatures in excess of 110˚F. Many states have experienced temperatures in excess of 120˚F.
>
> In this case, sites should consider the impacts of these conditions on deployment of the FLEX equipment.

A review was made of the licensee's screening process for the high temperature hazard that was discussed on page 1 of the Integrated Plan. The licensee stated that they will consider the high temperature hazard and that according to the PBAPS UFSAR Section 2.3.4.1 that there are occasional readings above 90 degrees Fahrenheit in the summer.

The licensee has appropriately screened in for high temperature hazard and has identified the hazard levels for reasonable protection of the portable equipment.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to screening for the high temperature hazard if these requirements are implemented as described.

3.1.5.1 Protection of FLEX Equipment – High Temperature Hazard

NEI 12-06, Section 9.3.1, states:

> The equipment should be maintained at a temperature within a range to ensure its likely function when called upon.

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the high temperature hazard. Statements on page 16 of the Integrated Plan indicated that the licensee plans on storing portable/FLEX equipment in a structure constructed to the criteria of NEI 12-06, Section 11. However, the licensee did not discuss the protection criteria stated in NEI 12-06, Section 9.3.1 that addresses protection of portable/FLEX equipment during the high temperature hazard. There was no discussion of the design criteria selected for the storage facility that will maintain the portable/FLEX equipment at a temperature within a range to ensure its likely function when called upon. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the high temperature hazard will meet the specifications of NEI 12-06, Section 9.3.1. The item tracking this issue has been combined with Confirmatory Item 3.1.1.1.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to protection and storage of portable equipment during the high temperature hazard if these requirements are implemented as described.

3.1.5.2 Deployment of FLEX Equipment – High Temperature Hazard

NEI 12-06, Section 9.3.2 states:

> The FLEX equipment should be procured to function, including the need to move the equipment, in the extreme conditions applicable to the site. The potential impact of high temperatures on the storage of equipment should also be considered, e.g., expansion of sheet metal, swollen door seals, etc. Normal safety-related design limits for outside conditions may be used, but consideration should also be made for any manual operations required by plant personnel in such conditions.

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during a high temperature hazard. The licensee discussed equipment deployment on page 6 of the Integrated Plan but did not discuss the impact of high temperatures on the deployment strategies. In their screening of the high temperature hazard, the licensee stated that the temperature at the PBAPS occasionally exceeds 90 degrees Fahrenheit. It appears that normal work practices will support deployment of portable/FLEX equipment in this temperature range and that normal maintenance actions will support correcting issues that delay the deployment. Also, during the audit process, the licensee the locations for deployed portable/FLEX pumps and electrical generators. All are to be deployed and operated outside of plant buildings and structures.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 9.3.2 regarding deployment of equipment during a high temperature hazard during an ELAP.

The current understanding of the licensee's approach, as described above, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of equipment during a high temperature hazard if these requirements are implemented as described.

3.1.5.3 Procedural Interfaces – High Temperature Hazard

NEI 12-06, Section 9.3.3 states:

> The only procedural enhancements that would be expected to apply involve addressing the effects of high temperatures on the FLEX equipment.

A review was made of the licensee's plans for procedural enhancements that address the effects of a high temperature hazard on portable/FLEX equipment. The effect of high temperatures on the protection and storage of the equipment was addressed in Section 3.1.5.1 above. The licensee discussed access and habitability of several facility locations including the RCIC room on page 5 of the Integrated Plan where the preliminary analysis indicates that RCIC Room temperature reaches 165 degrees Fahrenheit in approximately twenty hours event time. However, there is no discussion of the potential effects of high temperatures at the location where the portable equipment would actually operate in the event of high temperatures. Updated information provided by the licensee as part of the EA-12-049 Mitigation Audit response addresses this issue by stating that portable/FLEX equipment would be operated outdoors or in the Reactor Building truck bay.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 9.3.3 regarding procedural interfaces that address the effects of high temperature on portable/FLEX equipment during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural interfaces that address the effects of high temperature on portable/FLEX equipment if these requirements are implemented as described.

3.2 PHASED APPROACH

Attachment (2) to Order EA-12-049 describes the three-phase approach required for mitigating BDBEEs in order to maintain or restore core cooling, containment and SFP cooling capabilities.

The phases consist of an initial phase using installed equipment and resources, followed by a transition phase using portable onsite equipment and consumables and a final phase using offsite resources.

To meet these EA-12-049 requirements, Licensees will establish a baseline coping capability to prevent fuel damage in the reactor core or SFP and to maintain containment capabilities in the context of a BDBEE that results in the loss of all ac power, with the exception of buses supplied by safety-related batteries through inverters, and loss of normal access to the UHS. As described in NEI 12-06, Section 1.3, "[p]lant-specific analyses will determine the duration of each phase." This baseline coping capability is supplemented by the ability to use portable pumps to provide reactor pressure vessel (RPV)/reactor makeup in order to restore core or SFP capabilities as described in NEI 12-06, Section 3.2.2, Guideline (13). This approach is endorsed in NEI 12-06, Section 3, by JLD-ISG-2012-01.

3.2.1 Reactor Core Cooling, Heat Removal, and Inventory Control Strategies

NEI 12-06, Table 3-1 and Appendix C summarize one acceptable approach for the reactor core cooling strategies. This approach uses the installed reactor core isolation cooling (RCIC) system, or the high pressure coolant injection (HPCI) system to provide core cooling with installed equipment for the initial phase. This approach relies on depressurization of the RPV for injection with a portable injection source with diverse injection points established to inject through separate divisions/trains for the transition and final phases. This approach also provides for manual initiation of RCIC/HPCI/IC as a contingency for further degradation of installed SSCs as a result of the beyond-design-basis initiating event.

As described in NEI 12-06, Section 3.2.1.7 and JLD-ISG-2012-01, Section 2.1, strategies that have a time constraint to be successful should be identified and a basis provided that the time can be reasonably met. NEI 12-06, Section 3 provides the performance attributes, general criteria, and baseline assumptions to be used in developing the technical basis for the time constraints. Since the event is a beyond-design-basis event, the analysis used to provide the technical basis for time constraints for the mitigation strategies may use nominal initial values (without uncertainties) for plant parameters, and best-estimate physics data. All equipment used for consequence mitigation may be assumed to operate at nominal setpoints and capacities. NEI 12-06, Section 3.2.1.2 describes the initial plant conditions for the at-power mode of operation; Section 3.2.1.3 describes the initial conditions; and Section 3.2.1.4 describes boundary conditions for the reactor transient.

Acceptance criteria for the analyses serving as the technical basis for establishing the time constraints for the baseline coping capabilities described in NEI 12-06, which provide an acceptable approach, as endorsed by JLD-ISG-2012-01, to meeting the requirements of EA-12-049 for maintaining core cooling are 1) the preclusion of core damage as discussed in NEI 12-06, Section 1.3 as the purpose of FLEX; and 2) the performance attributes as discussed in Appendix C.

As described in NEI 12-06, Section 1.3, plant-specific analyses determine the duration of the phases for the mitigation strategies. In support of its mitigation strategies, the licensee should perform a thermal-hydraulic analysis for an event with a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink for an extended period (the ELAP event).

3.2.1.1. Computer Code Used for ELAP Analysis.

NEI 12-06, Section 1.3 states in part:

> To the extent practical, generic thermal hydraulic analyses will be developed to support plant specific decision-making. Justification for the duration of each phase will address the on-site availability of equipment, the resources necessary to deploy the equipment consistent with the required timeline, anticipated site conditions following the beyond-design-basis external event, and the ability of the local infrastructure to enable delivery of equipment and resources from offsite.

The licensee provided a Sequence of Events (SOE) on pages 52 through 59 of their Integrated Plan, which included the time constraints and the technical basis for the site. The SOE is based on an analysis using the industry-developed Modular Accident Analysis Program (MAAP) Version 4 computer code. MAAP4 was written to simulate the response of both current and advanced light water reactors to LOCA and non-LOCA transients for probabilistic risk analyses as well as severe accident sequences. The code has been used to evaluate a wide range of severe accident phenomena, such as hydrogen generation and combustion, steam formation, and containment heating and pressurization.

The licensee has decided to use the MAAP4 computer code for simulating the Extended Loss of ac Power (ELAP) transient. While the NRC staff does acknowledge that MAAP4 has been used many times over the years and in a variety of forums for severe and beyond design basis analysis, MAAP4 is not an NRC approved code, and the NRC staff has not examined its technical adequacy for performing thermal hydraulic analyses. Therefore, during the review of the Integrated Plan, the issue of using MAAP4 was raised as a Generic Concern and was addressed by the Nuclear Energy Institute (NEI) in their position paper dated June 2013, entitled "Use of Modular Accident Analysis Program (MAAP4) in Support of Post-Fukushima Applications" (ADAMS Accession No. ML13190A201). After review of this position paper, the NRC staff endorsed a resolution through letter dated October 3, 2013 (ADAMS Accession No. ML13275A318). This endorsement contained five limitations on the MAAP4 computer code's use for simulating the ELAP event for Boiling Water Rectors (BWRs). Those limitations and their corresponding Confirmatory Item numbers for this TER are provided as follows:

(1) From the June 2013 position paper, benchmarks must be identified and discussed which demonstrate that MAAP4 is an appropriate code for the simulation of an ELAP event at your facility. This has been identified as Confirmatory Item 3.2.1.1.A, in Section 4.2.

(2) The collapsed level must remain above Top of Active Fuel (TAF) and the cool down rate must be within technical specification limits. This has been identified as Confirmatory Item 3.2.1.1.B, in Section 4.2.

(3) MAAP4 must be used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper. This has been identified as Confirmatory Item 3.2.1.1.C, in Section 4.2.

(4) In using MAAP4, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (Electric Power Research Institute Report 1020236). This should include response at a plant-specific level regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant.

Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included.

a. Nodalization
b. General two-phase flow modeling
c. Modeling of heat transfer and losses
d. Choked flow
e. Vent line pressure losses
f. Decay heat (fission products / actinides / etc.)

This has been identified as Confirmatory Item 3.2.1.1.D, in Section 4.2.

(5) The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan must be identified and should be available on the e-Portal for NRC staff to view. Alternately, a comparable level of information may be included in the supplemental response. In either case, the analysis should include a plot of the collapsed vessel level to confirm that TAF is not reached (the elevation of the TAF should be provided) and a plot of the temperature cool down to confirm that the cool down is within tech spec limits. This has been identified as Confirmatory Item 3.2.1.1.E, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01 and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the computer code used for ELAP analysis if these requirements are implemented as described.

3.2.1.2 Recirculation Pump Seal Leakage Models

Conformance with the guidance of NEI 12-06, Section 3.2.1.5, Paragraph (4) includes consideration of recirculation pump seal leakage. When determining time constraints and the ability to maintain core cooling, it is important to consider losses to the RCS inventory as this can have a significant impact on the SOE. Special attention is paid to the recirculation pump seals because these can fail in a SBO event and contribute to beyond normal system leakage.

A review was made of the PBAPS Integrated Plan to verify that the recirculation pump seal leakage models specified by NEI 12-06, Sections 3.2.1.5 had been adopted by the licensee in their analysis. The licensee had not discussed their assumptions for inventory loss in the ELAP analysis in the Integrated Plan.

The licensee had not provided a discussion of reactor coolant inventory loss including normal system leakage and losses due to recirculation pump seal leakage that is included in the ELAP analysis in the Integrated Plan. The licensee did not Identify or provide justification for the assumptions made regarding system leakage from the recirculation pump seals and other sources, that addresses the following items:

1. The assumed leakage rate and its predicted pressure dependence relative to test data.
2. Clarification of whether the leakage was determined or assumed to be single-phase liquid, two-phase mixture, or steam at the donor cell.

3. Comparison of design-specific seal leakage testing conditions to code-predicted thermal hydraulic conditions (temperature, void fraction) during an ELAP and justification if predicted conditions are not bounded by testing.
4. Discussion of how mixing of the leakage flow with the drywell atmosphere is modeled.

In Attachment 3 to their six-month update, dated August 28, 2013, that provided a comparison of the PBAPS analysis to the NEDC-33771P baseline analysis, the licensee stated that the assumed primary system leakage rate was 42 gpm and that the MAAP model was configured with recirculation pump leakage of 18 gpm per pump, 5 gpm unidentified leakage and 1 gpm identified leakage. However, questions still remain unanswered regarding pressure dependence of the assumed leakage rates, assumed leakage phase, i.e. single phase liquid, two phase, or steam, and other questions presented in the audit. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 3.2.1.5 concerning recirculation pump seal leakage models and reactor coolant inventory loss in the ELAP analysis will be met. This is identified as Confirmatory Item 3.2.1.2.A in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to recirculation pump seal leakage models and reactor coolant inventory loss in the ELAP analysis if these requirements are implemented as described.

3.2.1.3 Sequence of Events

NEI 12-06 discusses an event timeline and time constraints in several sections of the document, for example Section 1.3, Section 3.2.1.7 principle (4) and (6), Section 3.2.2 Guideline (1) and Section 12.1.

NEI 12-06, Section 3.2.2 addresses the minimum baseline capabilities:

> Each site should establish the minimum coping capabilities consistent with unit-specific evaluation of the potential impacts and responses to an ELAP and LUHS. In general, this coping can be thought of as occurring in three phases:
>
> - Phase 1: Cope relying on installed plant equipment.
> - Phase 2: Transition from installed plant equipment to on-site FLEX equipment.
> - Phase 3: Obtain additional capability and redundancy from off-site equipment until power, water, and coolant injection systems are restored or commissioned.

In order to support the objective of an indefinite coping capability, each plant will be expected to establish capabilities consistent with Table 3-1 (BWRs). Additional explanation of these functions and capabilities are provided in NEI 12-06 Appendix C, "Approach to BWR Functions."

A review was made of the sequence of events and the discussion of time constraints identified in the sequence of events. The sequence of events, Attachment 1A, Sequence of Events Timeline, was included on pages 52 through 55 by the licensee in the Integrated Plan.

Additionally the sequence of events timeline and time constraints are discussed on pages 3 through 6 and the coping strategies for maintaining core cooling during the initial, transition and final phases are discussed on pages 9 through 11, 13, 14, 17 and 18 of the Integrated Plan. The licensee included NEDC-33771P, Revision 1, "GEH Evaluation of FLEX Implementation Guidelines" as technical basis supporting information and provided the reconciliation between their analysis and the NEDC-33771P, Revision 1 analysis in Attachment 3 to the six-month update dated August 28, 2013.

The RCIC system is proposed as the primary means by which the licensee will remove decay heat during an ELAP event. The RCIC system consists of a steam-driven turbine pump unit and associated valves and piping capable of delivering makeup water to the reactor vessel. The steam supply to the turbine comes from the reactor vessel. The steam exhaust from the turbine dumps to the suppression pool. The pump can take suction from the demineralized water in the condensate storage tank or from the suppression pool. Following any reactor shutdown, steam generation continues due to heat produced by the radioactive decay of fission products. The steam normally flows to the main condenser through the turbine bypass or if the condenser is isolated, through the relief valves to the suppression pool. The RCIC system turbine pump unit either starts automatically upon a receipt of a reactor vessel low-low water level signal or is started by the operator from the Control Room by remote manual controls. The RCIC system delivers its design flow within 30 seconds after actuation. To limit the amount of fluid leaving the reactor vessel, the reactor vessel low-low water level signal also actuates the closure of the main steam isolation valves. The RCIC system has a makeup capacity sufficient to prevent the reactor vessel water level from decreasing to the level where the core is uncovered without the use of core standby cooling systems.

In addition to the turbine steam supply, RCIC operation is dependent on direct current (dc) power for control, instrument and motor operated valve power. The licensee clarified the plant design during the Mitigation Plan Audit explaining that the switchover of the RCIC pump suction from the condensate storage tank (CST) to the suppression pool is dependent on dc power only and that the components are located within seismically qualified structures. This includes the instrumentation, logic and motor operated valves.

Action Item 15 of Attachment 1A states that at 5 hours the 480 volt electrical buss will be energized using a portable/FLEX 480 VAC DG to supply power to the safety related battery chargers. The discussion of time constraints identified in the sequence of events timeline on page 4 of the Integrated Plan states for Action Items number 8 and 15 that the coping time for the station battery supporting the RCIC system is approximately 5.5 hours, which includes the completion of dc load shedding in accordance with current station procedures.

Reactor pressure control is accomplished by operating the main steam safety relief valves (SRVs). In addition to steam pressure, the safety relief valves require dc power and a pneumatic supply to operate. The licensee stated that the coping time for the station battery supporting SRV operation is approximately 7 hours on page 10 in the section of the Integrated Plan discussing the coping strategies for maintaining core cooling during the initial phase. The supply for the pneumatic operating system is discussed in Section 3.2.1.6.

The load shedding that supports the increase in station battery coping time is expected to be completed at approximately 60 minutes event time. The estimates for the completion of load shedding and for installation of the portable/FLEX electrical generator were derived during operations department table top discussions.

The licensee provided a six-month update to their PBAPS Integrated Plan dated August 28, 2013 (ADAMS Number ML13246A412). On pages 3 through 8 of the attachment to that document, the licensee discussed changes to the Integrated Plan coping strategies. The licensee has modified the primary and alternate coping strategies to power portions of the 480 Vac electrical distribution system with a portable/FLEX electrical generator. The current strategy will provide two diverse connection points at each reactor unit (Units 2 and 3) and will power a smaller portion of the electrical distribution system. The electrical Division 2 "B" RHR MO-2(3)-25B valve for vessel injection and the MO-2(3)-39B and MO-2(3)-34B valves for Torus makeup will not have power and will be unavailable for operation from the Control Room. The Division 2 "B" RHR MO-2(3)-25B valve for vessel injection and the MO-2(3)-39B and MO-2(3)-34B valves for Torus makeup are not required for compliance with Order EA-12-049.

The licensee also discussed the coping strategies for maintaining torus makeup during the transition phase on pages 13 and 14 of the Integrated Plan. In the primary method, the portable/FLEX pump is planned to take suction on the ultimate heat sink, which is the Conowingo pond impoundment, and discharge through hoses to new valves and quick hose connection on the HPSW System inside the Pump Structure. Water would flow from the FLEX Pump into the HPSW System, and then into the RHR System through the HPSW to RHR crosstie valves. Water can be pumped from the RHR system to the torus. Diversity is inherent in the connection to HPSW Systems, since the Unit 2 and Unit 3 HPSW Systems can be cross connected by opening two manually operated valves. In addition, the RHR Loop Cross-Tie valve allows use of either RHR loop. Direct injection into the depressurized RPV is possible from the RHR system.

The alternate strategy that the licensee has proposed would inject water pumped from the Conowingo pond impoundment or from the Emergency Cooling Tower through hoses and new valves and quick hose connection into the RHR system. Those valves and hose connection would be installed inside the reactor building closed cooling water (RBCCW) room between system valves HV-2(3)-10-57 and HV-2(3)-10-66, the RHR to radioactive waste isolation valves. From the RHR system, water can be supplied to the torus through the normal torus fill or directly to the RPV through the LPCI injection valves. Water could be returned to the torus through an open ADS SRV. The cross tie, injection and fill valves are all installed system valves.

In the event that the Fire Header remains available, a FLEX Pump could be used to pressurize the fire header and then water could be provided to the RHR System from the Fire System inside the plant via hose connections.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 regarding the sequence of events timeline for coping strategies during an ELAP and the time constraints identified in the timeline.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the sequence of events if these requirements are implemented as described.

3.2.1.4 Systems and Components for Consequence Mitigation

NEI 12-06, Section 11 provides details on the equipment quality attributes and design for the implementation of FLEX strategies. It states:

Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in this section [Section 11]. If the equipment is credited for other functions (e.g., fire protection), then the quality attributes of the other functions apply.

And,

Design requirements and supporting analysis should be developed for portable equipment that directly performs a FLEX mitigation strategy for core, containment, and SFP that provides the inputs, assumptions, and documented analysis that the mitigation strategy and support equipment will perform as intended.

NEI 12-06, Section 3.2.1.12 states:

Equipment relied upon to support FLEX implementation does not need to be qualified to all extreme environments that may be posed, but some basis should be provided for the capability of the equipment to continue to function.

A review was made of the mitigation strategies discussed in the Integrated Plan. The transition phase coping strategies include using onsite portable/FLEX equipment to maintain core cooling by reenergizing battery chargers and establishing suppression pool cooling that increases torus inventory.

The licensee proposed maintaining core cooling by filling the torus so that the RCIC system will continue to have a suction source to inject into the RPV. To fill the torus the operators will pump water into the torus with the portable/FLEX pump at 12 hours event time. This pump will take suction from either the ultimate heat sink, which is the Conowingo pond impoundment, or from the Emergency Cooling Tower.

As discussed in Section 3.2.1.3, above, the licensee has proposed two methods for filling the torus with the portable/FLEX pump by pressurizing the RHR system through the HPSW system. From the RHR system, water can be supplied to the torus through the normal torus fill or directly to the RPV through the Low Pressure Coolant Injection (LPCI) injection valves. Water could be returned to the torus through an open ADS SRV.

Although the proposed FLEX pump locations hose routing and connection points are discussed in the Integrated Plan, there is insufficient information presented to confirm the ability of the portable/FLEX pumps to deliver the required flow through the system of flex hoses, couplings, valves, elevation changes, etc. for either the primary or the alternate strategy. The Integrated Plan does not contain supporting information concerning the required flow rates, the portable/FLEX pump characteristics, suction and discharge losses, system backpressure, elevation differences and piping losses to allow verification that this will be a successful strategy. Therefore, the information available, at this time, is not sufficient to conclude that the coping strategies discussed in the Integrated Plan will conform to NEI 12-06, Section 3.2.1.12 and Section 11. This has been identified as Confirmatory Item 3.2.1.4.A, in Section 4.2.

The Integrated Plan identifies the Conowingo pond impoundment and the Emergency Cooling Tower as the water sources for strategies for maintaining adequate core cooling. The licensee has not discussed water quality from these sources. The plan does not discuss the quality of this water (e.g., suspended solids) and provide justification that its use will not result in blockage at the fuel assembly inlets to an extent that would inhibit adequate flow to the core. Because of this water quality concern, there is insufficient information to conclude with reasonable assurance that the plan will conform to the specifications of NEI 12-06, Section 3.2.1.12 and Section 11. Updated information provided by the licensee as part of the EA-12-049 Mitigation Audit response addresses this issue by stating that they have provided procedural guidance addressing the selection of emergency sources of water and verification of flow across fuel assemblies. The licensee has stated that they have identified an action item to resolve the issue. This has been identified as Confirmatory Item 3.2.1.4.D, in Section 4.2

On page 9 of 59, in the Integrated Plan, in the section describing the Reactor Level Control, the licensee states that RCIC pump can take suction from the condensate storage tank or from the suppression pool. The CSTs are qualified for all events with the exception of seismic and tornado / high winds. If the CST is unavailable, suction will be transferred to the torus.

In responding to a Mitigation Strategies Audit question, the licensee provided additional information explaining that the CST to torus suppression pool switchover logic, instrumentation and motor operated valves are dc powered and are located in seismically robust structures and are not sensitive to an ELAP. Also, because the valves are dc powered, operators can perform a manual transfer from the control room if required.

The licensee also provided the details of loads on the electrical buses to be energized by the portable/FLEX electrical generators during the audit process. The information can be used to confirm the sizing calculation for the FLEX 480 V diesel generators to show that they can supply the loads assumed during the transition phase.

There was no discussion of the assumptions used in the calculations for battery coping time and to evaluate the effectiveness of dc load reduction including the basis for the assumed minimum battery voltage. This has not yet been discussed in response to the audit process. Therefore, the information available, at this time, is not sufficient to conclude that the coping strategies discussed in the Integrated Plan will conform to the specifications of NEI Section 3.2.1.12 and Section 11. This is identified as Confirmatory Item 3.2.1.4.B, in Section 4.2.

The licensee's coping strategy includes early venting of the primary containment suppression pool. Early venting is to occur at approximately 4.8 hours event time, which corresponded to a suppression pool temperature of 230 degrees Fahrenheit. However, the licensee has not provided a discussion regarding the criteria that are used to determine whether RCIC operation is possible (e.g., fluid temperature, net positive suction head - NPSH) and justify their adequacy. Additionally, there is no discussion of RCIC pump NPSH margin considering the potential for transient conditions associated with cyclical safety/relief valve discharge (potentially in the vicinity of the RCIC suction line) and containment venting while the suppression pool is saturated or nearly saturated. There is no discussion regarding the methodology used to assure adequate NPSH for the RCIC pump and justify that it is adequate in light of the potential for limited margins and potentially significant transient phenomena. Therefore, the information available, at this time, is not sufficient to conclude that the coping strategies discussed in the Integrated Plan will conform to the specifications of NEI Section 3.2.1.12 and Section 11. This is identified as Confirmatory Item 3.2.1.4.C, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to systems and components for consequence mitigation if these requirements are implemented as described.

3.2.1.5 Monitoring Instrumentation and Controls

NEI 12-06, Section 3.2.1.10 provides information regarding instrumentation and controls necessary for the success of the coping strategies. NEI 12-06 provides the following guidance:

> The parameters selected must be able to demonstrate the success of the strategies at maintaining the key safety functions as well as indicate imminent or actual core damage to facilitate a decision to manage the response to the event within the Emergency Operating Procedures and FLEX Support Guidelines or within the SAMGs. Typically these parameters would include the following:
>
> - RPV Level
> - RPV Pressure
> - Containment Pressure
> - Suppression Pool Level
> - Suppression Pool Temperature
> - SFP Level

The plant-specific evaluation may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance, or to indicate imminent or actual core damage.

A review was made of the identified instrumentation necessary for successful completion of mitigation strategies. On pages 12, 15, 18, 21 and 22 of 59 of the Integrated Plan, the licensee listed the installed instrumentation credited for the coping evaluation for maintaining core cooling and containment during ELAP. The following instrumentation was included: RPV water level, RPV pressure, HPCI steam inlet pressure and RCIC steam inlet pressure, drywell pressure and temperature and torus temperature and water level.

On pages 3 through 8 of 18, in the six-month update dated August 28, 2013 (ADAMS Number ML13246A412) that provided changes to the Integrated Plan coping strategies, the licensee stated that the Torus Wide Range Level Instruments LR/TR-8(9)123A are added to the Key Containment Parameters list of instrumentation.

The reactor and containment parameters discussed in the Integrated Plan as supplemented by the first six-month update appear to provide adequate instrumentation to implement the coping strategies for maintaining core and containment cooling. There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.1.10 regarding monitoring instruments and controls during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to monitoring instrumentation if these requirements are implemented as described.

3.2.1.6 Motive Power, Valve Controls and Motive Air System

NEI 12-06, Section 12.1 provides guidance regarding the scope of equipment that will be needed from off-site resources to support coping strategies. NEI 12-06, Section 12.1 states that:

> Arrangements will need to be established by each site addressing the scope of equipment that will be required for the off-site phase, as well as the maintenance and delivery provisions for such equipment.

And,

> Table 12-1 provides a sample list of the equipment expected to be provided to each site from off-site within 24 hours. The actual list will be specified by each site as part of the site-specific analysis.

Table 12-1 includes "Portable air compressor or nitrogen bottles & regulators (if required by plant strategy).

A review was made of pneumatic systems associated with the mitigation strategies identified by the licensee in the Integrated Plan. The actions for reactor pressure control that are associated with the coping strategies for maintaining core cooling include manual operation of the main steam safety relief valves (SRVs). In addition to system pressure and dc electrical power, the SRVs require pneumatic pressure to operate. The pneumatic pressure is normally supplied by safety related accumulators located in the primary containment drywell. Those accumulators are recharged during normal operation by a drywell compressed gas system that requires ac electric power. The licensee described the long-term, safety grade, pneumatic supply that is part of the PBAPS design on page 10 of the Integrated Plan. The backup compressed gas system utilizes both a series of replaceable, high pressure nitrogen cylinders and also the Safety Grade Instrument Gas (SGIG) system. The SGIG system is tied into a 6000 gallon liquid nitrogen tank that supplies the Containment Atmospheric Dilution (CAD) system. The licensee identified the need to employ an existing fire safe shutdown coping strategy that installs pipe jumpers around ac electrically operated solenoid valves that are necessary to place the backup nitrogen system into service during an ELAP. Updated information provided by the licensee as part of the EA-12-049 Mitigation Audit response addresses this issue by stating that the components of the backup nitrogen system and the interconnecting piping are seismically qualified and are located in a seismically robust structure and that personnel access is through seismically robust structures.

The licensee also discussed the dc control power for the SRVs on page 10 of the Integrated Plan discussing the battery coping time evaluation that indicates that the limiting coping time for manual SRV operation is approximately 7 hours for 125VDC Bus 2BDOO1.

Pages 2 and 3 of the Integrated Plan address Time Constraints. Under Action Item 6, the licensee assumes that battery power and nitrogen for ADS SRV control is available throughout the initial and transition phases of the ELAP by providing a portable/FLEX diesel generator to power the battery chargers at approximately 5 hours.

A discussion of dc load analysis, battery coping times and time constraints to implement strategies to reenergize battery chargers with portable/FLEX equipment is in Section 3.2.1.3, above.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 12.1 regarding motive power, valve controls and motive air systems during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to motive power, valve controls and motive air system if these requirements are implemented as described.

3.2.1.7 Cold Shutdown and Refueling

NEI 12-06, Table 1-1, lists the coping strategy requirements as presented in Order EA-12-049. Item (4) of that list states:

> Licensee or CP holders must be capable of implementing the strategies in all modes.

A review was made of the coping strategies discussed by the licensee on pages 10 and 11 of the Integrated Plan to maintain core cooling during an ELAP with LUHS that occurs when the reactor is in Cold Shutdown or Refueling.

Review of the Integrated Plans for PBAPS revealed that the Generic Concern related to shutdown and refueling requirements is applicable to the plant. This Generic Concern has been resolved generically through the NRC endorsement of Nuclear Energy Institute (NEI) position paper entitled "Shutdown/Refueling Modes" (ADAMS Accession No. ML13273A514); and has been endorsed by the NRC in a letter dated September 30, 2013 (ADAMS Accession No. ML13267A382).

The position paper describes how licensees will, by procedure, maintain equipment available for deployment in shutdown and refueling modes. The NRC staff concluded that the position paper provides an acceptable approach for demonstrating that the licensees are capable of implementing mitigating strategies in all modes of operation.

The licensee informed the NRC of their plans to abide by this generic resolution.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Table 1 – 1 regarding an ELAP during Cold Shutdown or Refueling Modes.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the analysis of an ELAP during Cold Shutdown or Refueling if these requirements are implemented as described.

3.2.1.8 Use of Portable Pumps

NEI 12-06, Section 3.2.2, Guideline (13), states in part:

> Regardless of installed coping capability, all plants will include the ability to use portable pumps to provide RPV/RCS/SG makeup as a means to provide diverse capability beyond installed equipment. The use of portable pumps to provide RPV/RCS/SG makeup requires a transition and interaction with installed

systems. For example, transitioning from RCIC to a portable FLEX pump as the source for RPV makeup requires appropriate controls on the depressurization of the RPV and injection rates to avoid extended core uncovery. Similarly, transition to a portable pump for SG makeup may require cooldown and depressurization of the SGs in advance of using the portable pump connections. Guidance should address both the proactive transition from installed equipment to portable and reactive transitions in the event installed equipment degrades or fails. Preparations for reactive use of portable equipment should not distract site resources from establishing the primary coping strategy. In some cases, in order to meet the time-sensitive required actions of the site-specific strategies, the FLEX equipment may need to be stored in its deployed position.

> The fuel necessary to operate the FLEX equipment needs to be assessed in the plant specific analysis to ensure sufficient quantities are available as well as to address delivery capabilities.

NEI 12-06 Section 11.2 states in part:

> Design requirements and supporting analysis should be developed for portable equipment that directly performs a FLEX mitigation strategy for core, containment, and SFP that provides the inputs, assumptions, and documented analysis that the mitigation strategy and support equipment will perform as intended.

The licensee identified that three portable/FLEX pumps will be used in mitigating strategies during the transition phase on page 47 of the Integrated Plan. There are numerous references in the Integrated Plan regarding the use of pumps, hoses, pipe runs and connection hardware to facilitate the implementation of coping strategies. However, the licensee has not identified performance criteria for the pumps. Therefore, the information available, at this time, is not sufficient to conclude that the guidelines of NEI 12-06 Section 11.2 regarding calculations and analyses to verify adequate flow would be delivered to meet strategy objectives. This was discussed in section 3.2.1.4 above. The item tracking this issue had been identified as Confirmatory Item 3.2.1.4.A in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to portable pumps if these requirements are implemented as described.

3.2.2 Spent Fuel Pool Cooling Strategies

NEI 12-06, Table 3-1 and Appendix C summarize one acceptable approach for the SFP cooling strategies for BWRs. This approach uses a portable injection source to provide 1) makeup via hoses on the refuel deck/floor capable of exceeding the boil-off rate for the design basis heat load; 2) makeup via connection to SFP cooling piping or other alternate location capable of exceeding the boil-off rate for the design basis heat load; and alternatively 3) spray via portable monitor nozzles from the refueling deck/floor capable of providing a minimum of 200 gallons per minute (gpm) per unit (250 gpm to account for overspray). This approach will also provide a vent pathway for steam and condensate from the SFP.

As described in NEI 12-06, Section 3.2.1.7 and JLD-ISG-2012-01, Section 2.1, strategies that a time constraint to be successful should be identified and a basis provided that the time can be reasonably met. NEI 12-06, Section 3 provides the performance attributes, general criteria, and baseline assumptions to be used in developing the technical basis for the time constraints. Since the event is a beyond-design-basis event, the analysis used to provide the technical basis for time constraints for the mitigation strategies may use nominal initial values (without uncertainties) for plant parameters, and best-estimate physics data. All equipment used for consequence mitigation may assume to operate at nominal setpoints and capacities. NEI 12-06, Section 3.2.1.2 describes the initial plant conditions for the at-power mode of operation; Section 3.2.1.3 describes the initial conditions; and Section 3.2.1.6 describes SFP conditions.

NEI 12-06, Section 3.2.1.1 provides the acceptance criterion for the analyses serving as the technical basis for establishing the time constraints for the baseline coping capabilities described in NEI 12-06, which provide an acceptable approach to meeting the requirements of EA-12-049 for maintaining SFP cooling. This criterion is keeping the fuel in the SFP covered.

NEI 12-06, Section 3.2.1.6 provides the initial boundary conditions for SFP cooling.

1. All boundaries of the SFP are intact, including the liner, gates, transfer canals, etc.
2. Although sloshing may occur during a seismic event, the initial loss of SFP inventory does not preclude access to the refueling deck around the pool.
3. SFP cooling system is intact, including attached piping.
4. SFP heat load assumes the maximum design basis heat load for the site.

A review was made of the licensee's Integrated Plan for maintaining SFP cooling. The licensee discussed SFP cooling during the initial phase on page 5 and 30 of the Integrated Plan. The information presented by the licensee discussed the worst case SFP heat load which is during a refueling outage where the heat load is calculated to be 5.8E+7 BTU/hr. Loss of SFP cooling with this heat load and an initial SFP temperature of 150 degrees Fahrenheit results in a time to boil of 2.5 hour. The time to boil off SFP water inventory to the top of active fuel is 33 hours. Because the entire core is in the SFP, resources normally allocated to aligning core cooling along with the Operations outage shift resources will be allocated to aligning SFP makeup water within 8 hours. The licensee plans to deploy portable/FLEX equipment at 8 hours event time.

During reactor operations, the SFP heat load is estimated at 2.18E+7 BTU/hr. Loss of SFP cooling with this heat load and an initial SFP temperature of 150 degrees Fahrenheit results in a time to boil of 7.2 hours. The time to boil off SFP water inventory to the top of active fuel is 95 hours. In this case, the licensee plans to deploy portable/FLEX equipment at 12 hours event time. On page 30 the licensee stated that there are no actions required during the initial phase. The licensee stated that operators will monitor the SFP level during that period.

The licensee also discussed the coping strategies for maintaining SFP cooling during the transition phase on page 32 of the Integrated Plan. Modifications to the strategy were discussed on pages 3 through 8 in the six-month update dated August 28, 2013. Two methods were discussed for filling the SFP with a portable/FLEX pump during the ELAP.

In the primary method, the portable/FLEX pump is planned to take suction on the ultimate heat sink, which is the Conowingo pond impoundment, and discharge through hoses to new valves and quick hose connection on the HPSW System inside the Pump Structure. Water would flow from the FLEX Pump into the HPSW System, and then into the RHR System through the HPSW to RHR crosstie valves. Water can be pumped from the RHR system to the SFP system. The RHR to SFP piping is planned to be modified with quick hose connections to provide the capability for spray of the SFP. Diversity is inherent in the connection to HPSW Systems, since the Unit 2 and Unit 3 HPSW Systems can be cross connected by opening two manually operated valves. In addition, the RHR Loop Cross-Tie valve allows use of either RHR loop.

With the alternate method, the FLEX Pump will take suction on the ultimate heat sink or the Emergency Cooling Tower and discharge through hoses to new valves and quick hose connection on the RHR System inside the RBCCW Rooms. Water would flow from the FLEX Pump directly into the RHR System.

In the event that the Fire Header remains available, a FLEX Pump could be used to pressurize the fire header and then water could be provided to the RHR System from the Fire System inside the plant via hose connections. In addition, pressurization of the fire header would provide for addition or spray makeup to the SFP utilizing the Fire System standpipes located on the Refuel Floor. As another alternative, with the FLEX Pump located west of the Reactor Building, hoses connecting to the pump discharge could be routed up the west Reactor Building stairwell and onto the Refuel Floor to supply water addition or spray makeup to the SFP.

The licensee stated on page 36 of the Integrated Plan that they will employ transition phase coping strategies during the final phase.

However, there was no discussion of the portable/FLEX pump characteristics, required flow, system flow characteristics, elevation changes or the calculations that verify adequate flow. Therefore, the information available, at this time, is not sufficient to conclude that the requirements of NEI 12-06 will be met regarding SFP cooling strategies. The item tracking this issue has been combined with Confirmatory Item 3.2.1.4.A in Section 4.2.

NEI 12-06, Table C-3 specifies that plant specific strategies should be considered for establishing a vent pathway for steam and condensate from the boiling SFP to allow access and prevent equipment problems.

The licensee stated on page 32 of the Integrated Plan that they have not yet completed their evaluation of the SFP area for steam and condensate and that if needed a vent path strategy will be included in a future six-month update. Therefore, the information available, at this time, is not sufficient to conclude that the Integrated Plan will conform to the specifications of NEI 12-06, Table C-3 regarding a vent pathway for SFP steam and condensation. This is identified Confirmatory Item 3.2.2.A, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to SFP cooling strategies if these requirements are implemented as described.

3.2.3 Containment Functions Strategies

NEI 12-06, Table 3-1 and Appendix C provide a description of the safety functions and performance attributes for BWR containments which are to be maintained during an ELAP as defined by Order EA-12-049. The safety function applicable to a BWR with a Mark I containment listed in Table 3-1 is Containment Pressure Control/Heat Removal, and the method cited for accomplishing this safety function is Containment Venting or Alternative Containment Heat Removal. Furthermore, the performance attributes listed in Table C-2 denote the containment's function is to provide a reliable means to assure containment heat removal. JLD-ISG-2012-01, Section 5.1 is aligned with this position stating, in part, that the goal of this strategy is to relieve pressure from the containment.

A review was made of the licensee's plans for maintaining containment during an ELAP. The primary strategy for removing heat from the containment is through the use of a Hardened Containment Vent System (HCVS). The current analysis indicates that containment venting will commence at approximately 4.8 hours to support sustained RCIC operation by preventing the Torus temperature from exceeding 230 degree Fahrenheit.

The licensee discussed the coping strategies for maintaining torus makeup during the transition phase on page 23 of the Integrated Plan. In the primary method, the portable/FLEX pump is planned to take suction on the ultimate heat sink, which is the Conowingo pond impoundment, and discharge through hoses to new valves and quick hose connection on the HPSW System inside the Pump Structure. Water would flow from the FLEX Pump into the HPSW System, and then into the RHR System through the HPSW to RHR crosstie valves. Water can be pumped from the RHR system to the torus. Diversity is inherent in the connection to HPSW Systems, since the Unit 2 and Unit 3 HPSW Systems can be cross connected by opening two manually operated valves. In addition, the RHR Loop Cross-Tie valve allows use of either RHR loop.

With the alternate method, the FLEX Pump will take suction on the ultimate heat sink or the Emergency Cooling Tower and discharge through hoses to new valves and quick hose connection on the RHR System inside the RBCCW Rooms. Water would flow from the FLEX Pump directly into the RHR System.

In the event that the Fire Header remains available, a FLEX Pump could be used to pressurize the fire header and then water could be provided to the RHR System from the Fire System inside the plant via hose connections.

However, there was no discussion of the portable/FLEX pump characteristics, required flow, system flow characteristics, elevation changes or the calculations that verify adequate flow. Therefore, the information available, at this time, is not sufficient to conclude that the requirements of NEI 12-06 will be met regarding containment cooling strategies. The item tracking this issue has been combined with Confirmatory Item 3.2.1.4.A in Section 4.2.

The NRC staff considers the adoption of Revision 3 to the Boiling Water Reactor Owner's Group (BWROG) Emergency Procedures Guidelines (EPG) Severe Accident Guidelines (SAG) by licensees to be a Generic Concern (and thus an Open Item) because the BWROG has not addressed the potential for the revised venting strategy to increase (relative to currently accepted venting strategies) the likelihood of detrimental effects on containment response for events in which the venting strategy is invoked. In particular it has not been shown that the potential for negative pressure transients, hydrogen combustion, or loss of containment overpressure (as needed for pump NPSH) is not significantly different when implementing Revision 3 of the EPG/SAG vs. Revision 2 of the EPG/SAG. Revision 3 provides for earlier venting than previous revisions. The BWR procedures are structured such that the new venting strategy is not limited to use during the BDBEEs that are the subject of EA-12-049, but could also be implemented during a broad range of events. Acceptance of EPG/SAG Revision 3, including any associated plant-specific evaluations, is identified as Open Item 3.2.3.A. in Section 4.1.

The licensee's approach described above, as currently understood, has raised concerns which must be addressed before confirmation can be provided that the approach is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, will be met with respect to venting containment only when no other means of core cooing are available. These questions are identified as Open Item in Section 4.1.

3.2.4 Support Functions

3.2.4.1 Equipment Cooling – Cooling Water

NEI 12-06, Section 3.2.2, Guideline (3) states:

> *Plant procedures/guidance should specify actions necessary to assure that equipment functionality can be maintained (including support systems or alternate method) in an ELAP/LUHS or can perform without ac power or normal access to the UHS.*
>
> Cooling functions provided by such systems as auxiliary building cooling water, service water, or component cooling water may normally be used in order for equipment to perform their function. It may be necessary to provide an alternate means for support systems that require ac power or normal access to the UHS, or provide a technical justification for continued functionality without the support system.

A review was made of coping strategies for cooling portable/FLEX equipment deployed during an ELAP. The licensee made no reference in the Integrated Plan regarding the need for or use of, additional cooling systems necessary to assure that coping strategy functionality can be maintained. Nonetheless, the only coping strategy equipment identified in the Integrated Plan that would require some form of cooling are portable diesel powered pumps and generators. These self-contained commercially available units would not be expected to require an external cooling system nor would they require ac power or normal access to the ultimate heat sink. The reviewer assumes that FLEX equipment will be equipped with self-contained air cooling.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 3.2.2 Guideline (3) regarding equipment cooling during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to equipment cooling if these requirements are implemented as described.

3.2.4.2 Ventilation – Equipment Cooling

NEI 12-06, Section 3.2.2, Guideline (10) states:

> *Plant procedures/guidance should consider loss of ventilation effects on specific energized equipment necessary for shutdown (e.g., those containing internal electrical power supplies or other local heat sources that may be energized or present in an ELAP.*

ELAP procedures/guidance should identify specific actions to be taken to ensure that equipment failure does not occur as a result of a loss of forced ventilation/cooling. Actions should be tied to either the ELAP/LUHS or upon reaching certain temperatures in the plant. Plant areas requiring additional air flow are likely to be locations containing shutdown instrumentation and power supplies, turbine-driven decay heat removal equipment, and in the vicinity of the inverters. These areas include: steam driven [auxiliary feedwater] AFW pump room, HPCI and RCIC pump rooms, the control room, and logic cabinets. Air flow may be accomplished by opening doors to rooms and electronic and relay cabinets, and/or providing supplemental air flow.

Air temperatures may be monitored during an ELAP/LUHS event through operator observation, portable instrumentation, or the use of locally mounted thermometers inside cabinets and in plant areas where cooling may be needed. Alternatively, procedures/guidance may direct the operator to take action to provide for alternate air flow in the event normal cooling is lost. Upon loss of these systems, or indication of temperatures outside the maximum normal range of values, the procedures/guidance should direct supplemental air flow be provided to the affected cabinet or area, and/or designate alternate means for monitoring system functions.

For the limited cooling requirements of a cabinet containing power supplies for instrumentation, simply opening the back doors is effective. For larger cooling loads, such as HPCI, RCIC, and AFW pump rooms, portable engine-driven blowers may be considered during the transient to augment the natural circulation provided by opening doors. The necessary rate of air supply to these rooms may be estimated on the basis of rapidly turning over the room's air volume.

Temperatures in the HPCI pump room and/or steam tunnel for a BWR may reach levels which isolate HPCI or RCIC steam lines. Supplemental air flow or the capability to override the isolation feature may be necessary at some plants. The procedures/guidance should identify the corrective action required, if necessary.

Actuation setpoints for fire protection systems are typically at 165-180°F. It is expected that temperature rises due to loss of ventilation/cooling during an ELAP/LUHS will not be sufficiently high to initiate actuation of fire protection systems. If lower fire protection system setpoints are used or temperatures are expected to exceed these temperatures during an ELAP/LUHS, procedures/guidance should identify actions to avoid such inadvertent actuations or the plant should ensure that actuation does not impact long term operation of the equipment.

A review was made of the PBAPS integrated Plan for discussions of coping strategies addressing the impact on critical equipment and components caused by the loss of ventilation and cooling during an ELAP. In discussions of the RCIC rooms ventilation on pages 5, 38 and 54 of the Integrated Plan the licensee stated that the RCIC room temperature analysis was not yet complete. However, their coping strategies for maintaining RCIC room temperature that were formulated on the basis of their preliminary analysis was to open RCIC room doors within one hour and to deploy portable fans to supply cooling air flow at 14 hours event time. The preliminary analysis indicated that the RCIC rooms would otherwise reach the limiting temperature for RCIC operation of 165 degree Fahrenheit within 20 hours event time. Personnel access and habitability in facility locations with elevated temperature is discussed in Section 3.2.4.6.

Updated information provided by the licensee as part of the EA-12-049 Mitigation Audit response addresses this issue by stating that the RCIC Room temperature profile was under evaluation. Updated information will be provided in a future six month update. Therefore, the information available, at this time, is not sufficient to conclude that the analysis and coping strategies for the loss of RCIC Room ventilation conform to the specifications of NEI 12-06, Section 3.2.2 Guideline (10) relating to the impact on critical equipment. This is Confirmatory Item 3.2.4.2.A. in Section 4.2.

In discussions of the station batteries and the battery emergency switchgear rooms on page 38, the licensee stated that the maximum equilibrium temperature in the emergency switchgear and battery rooms following a design basis accident with a loss of instrument air is 118 degrees Fahrenheit and that all safety-related equipment in the switchgear and battery rooms qualified for this maximum ambient room temperature.

The reviewer noted that the licensee analysis of battery and emergency switchgear room ventilation is preliminary and that the licensee has not addressed the potential hydrogen accumulation.

On pages 3 through 8 in the six month update dated August 28, 2013 (ADAMS Number ML13246A412) the licensee provided changes to the Integrated Plan coping strategies. Those changes to the strategy for supplying 480 Vac power to the station battery chargers may allow energizing some critical ventilation fans. However, there is no discussion of the results of analysis of the ventilation strategy for the station battery rooms to ensure that hydrogen levels will be maintained less than the combustion limit. The licensee has clarified the status of the Battery Room ventilation during the audit process. Additional coping strategies will deploy high pressure nitrogen cylinders to open ventilation dampers. Also, the ventilation fans that will be reenergized by the portable/FLEX electrical generators will provide the normal 16,000 cfm of supply and exhaust flow.

As part of the audit process, the licensee has committed to provide an evaluation of the high and low battery temperatures in a future six-month-update to the Integrated Plan. This has been identified as Confirmatory Item 3.2.4.2.B in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to ventilation support function if these requirements are implemented as described.

3.2.4.3 Heat Tracing.

NEI 12-06, Section 3.2.2, Guideline (12) states:

> *Plant procedures/guidance should consider loss of heat tracing effects for equipment required to cope with an ELAP. Alternate steps, if needed, should be identified to supplement planned action.*

Heat tracing is used at some plants to ensure cold weather conditions do not result in freezing important piping and instrumentation systems with small diameter piping. Procedures/guidance should be reviewed to identify if any heat traced systems are relied upon to cope with an ELAP. For example, additional condensate makeup may be supplied from a system exposed to cold weather where heat tracing is needed to ensure control systems are available. If any such systems are identified, additional backup sources of water not dependent on heat tracing should be identified.

A review was made of the PBAPS Integrated Plan for coping strategies discussing freeze protection. The Integrated Plan does not address heat tracing for freeze protection of piping, instrument lines and equipment. Therefore, the information available, at this time, is not sufficient to conclude that coping strategies for heat tracing and freeze protection will conform to the guidance of NEI 12-06, Section 3.2.2 Guideline (12). This is identified as Open Item 3.2.4.3.A. in Section 4.1.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to heat tracing and freeze protection if these requirements are implemented as described.

3.2.4.4 Accessibility – Lighting and Communications.

NEI 12-06, Section 3.2.2, Guideline (8) states:

> *Plant procedures/guidance should identify the portable lighting (e.g., flashlights or headlamps) and communications systems necessary for ingress and egress to plant areas required for deployment of FLEX strategies.*
>
> Areas requiring access for instrumentation monitoring or equipment operation may require portable lighting as necessary to perform essential functions.
>
> Normal communications may be lost or hampered during an ELAP. Consequently, in some cases, portable communication devices may be required to support interaction between personnel in the plant and those providing overall command and control.

A review was made of the Integrated Plan for coping strategies discussing plant lighting and communications systems during an ELAP that support personnel access for coping strategies that maintaining core, containment and SFP cooling. The licensee has not discussed their coping strategies for portable and emergency lighting necessary to facilitate personnel access into plant locations to implement mitigating strategies. Therefore, the information available, at this time, is not sufficient to conclude that coping strategies for portable and emergency lighting will conform to the guidance of NEI 12-06, Section 3.2.2 consideration (8). This is identified as Open Item 3.2.4.4.A. in Section 4.1.

The NRC staff has reviewed the licensee communications assessment (ADAMS Number ML12306A199) required by in response to the March 12, 2012 50.54(f) request for information letter for PBAPS and, as documented in the staff analysis (ML13114A067) has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. Therefore, there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.2 Guideline (8) regarding communications capabilities during an ELAP. In order to track confirmation of commitment completion, this has been identified as Confirmatory Item 3.2.4.4.B. in Section 4.2 below.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory and Open Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to lighting and communications support for accessibility for operator actions if these requirements are implemented as described.

3.2.4.5 Protected and Internal Locked Area Access

NEI 12-06, Section 3.2.2, Guideline (9) states:

> *Plant procedures/guidance should consider the effects of ac power loss on area access, as well as the need to gain entry to the Protected Area and internal locked areas where remote equipment operation is necessary.*
>
> At some plants, the security system may be adversely affected by the loss of the preferred or Class 1E power supplies in an ELAP. In such cases, manual actions specified in ELAP response procedures/guidance may require additional actions to obtain access.

A review was made of the Integrated Plan for coping strategies discussing personnel access to plant protected and locked areas during an ELAP to support strategies for maintaining core, containment and SFP cooling. The licensee has not discussed their plans for the development of guidance and strategies with regard to the effects of ac power loss on area access. Therefore, the information available, at this time, is not sufficient to conclude that coping strategies for plant access to protected and locked areas will conform to the guidance of NEI 12-06, Section 3.2.2 Guideline (9). This has been identified as Open Item 3.2.4.5.A. in Section 4.1.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to access to protected and locked internal plant areas if these requirements are implemented as described.

3.2.4.6 Personnel Habitability – Elevated Temperature

NEI 12-06, Section 3.2.2, Guideline (11), states:

> *Plant procedures/guidance should consider accessibility requirements at locations where operators will be required to perform local manual operations.*
>
> Due to elevated temperatures and humidity in some locations where local operator actions are required (e.g., manual valve manipulations, equipment

connections, etc.), procedures/guidance should identify the protective clothing or other equipment or actions necessary to protect the operator, as appropriate.

> FLEX strategies must be capable of execution under the adverse conditions (unavailability of installed plant lighting, ventilation, etc.) expected following a BDBE resulting in an ELAP/LUHS. Accessibility of equipment, tooling, connection points, and plant components shall be accounted for in the development of the FLEX strategies. The use of appropriate human performance aids (e.g., component marking, connection schematics, installation sketches, photographs, etc.) shall be included in the FLEX guidance implementing the FLEX strategies.

Section 9.2 of NEI 12-06 states,

> Virtually every state in the lower 48 contiguous United States has experienced temperatures in excess of 110°F. Many states have experienced temperatures in excess of 120°F.

A review was made of the Integrated Plan for coping strategies discussing habitability of plant locations during an ELAP to allow personnel access to support strategies for maintaining core, containment and SFP cooling. The licensee discussed their coping strategies for Main Control Room (MCR) habitability on page 38 of the Integrated Plan. In the event that MCR heating, ventilation and air conditioning (HVAC) were lost, current procedures direct that the control room operator would secure nonessential equipment to reduce the heat generation. The licensee also stated that the equilibrium would be a maximum of 114 degrees Fahrenheit. On page 41 of the Integrated Plan the licensee stated that they would continue to evaluate MCR habitability and provide an updated coping strategy during a future six-month update because they intended to maintain operational command and control function within the MCR. The licensee also stated that MCR doors can be opened and cooled using fans powered by small portable generators. Portable fans are listed with transition phase FLEX equipment on page 48 of the Integrated Plan. The licensee provided additional information during the audit process. Their revised strategy will allow energizing a MCR ventilation fan supplying 3,000 cfm of air from outdoors when the portable/FLEX electrical generators reenergize a portion of the electrical distribution system.

The licensee also stated on page 38 that the maximum equilibrium temperature in the emergency switchgear and battery rooms following a design basis accident with a loss of instrument air is 118 degrees Fahrenheit. Also, on page 41, the licensee stated that Battery Room doors will be opened once the battery chargers are re-energized and that evaluation will be made to determine if actions such as staging portable fans are required for long term ELAP. The results will be included in a six-month update.

The licensee updated their coping strategies on pages 3 through 8 of their six-month update dated August 28, 2013 (ADAMS Number ML13246A412). That update changed the connection points for reenergizing portions of the 480 Vac distribution system using portable/FLEX electrical generators. The licensee stated that with this configuration MCR emergency ventilation supply, Emergency Switchgear and Battery Room supply and Battery Room exhaust fans will be available for operation.

In discussing the RCIC Room ventilation and habitability on pages 5, 38 and 54, the licensee stated that their preliminary analysis indicated that the RCIC Room would reach 165 degrees Fahrenheit within 20 hours. Additionally, in discussing containment venting on page 3 of the six-month update dated August 28, 2013, the licensee stated that venting will occur at 30 psig containment pressure. This is equivalent to a saturation temperature of approximately 278 degrees Fahrenheit of the suppression pool and represents a very large heat source within the reactor building. The licensee's preliminary coping strategies for habitability of the RCIC Rooms was to open the room doors within one hour to slow the temperature rise and to deploy portable fans to supply cooling air to the RCIC Rooms. The licensee stated that their analysis was in progress. The licensee listed industrial blowers and portable fans in the list of transition phase equipment on pages 47 and 48.

The licensee discussed the SFP area habitability on pages 30 and 32 of the Integrated Plan and stated that they had not yet evaluated the SFP area for steam and condensation during an ELAP. The results of this evaluation and the vent path strategy, if needed, will be provided in a future 6-month update. The licensee explained that a steam atmosphere in the area of the Refuel Floor can be mitigated by opening the Refuel Floor Roof Hatch.

The reviewer noted that several plant locations may reach temperatures in excess of the habitability standard of NUMARC 87-00 and MIL-STD-1472C. MIL-STD-1472C concludes that 110 degree Fahrenheit is tolerable for light work for a four hour period while dressed in conventional clothing with a relative humidity of ~30%. Although the licensee has discussed the placement of fans, there is no overall evaluation discussed that provides assurance that personnel will safely gain access to all plant locations necessary to implement the mitigation strategies. Therefore, the information available, at this time, is not sufficient to confirm that the personnel habitability considerations of NEI 12-06, Section 3.2.2, Guideline (11) will be met. This is identified as Confirmatory Item 3.2.4.6.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to accessibility for operator actions if these requirements are implemented as described.

3.2.4.7 Water Sources.

NEI 12-06, Section 3.2.2, Guideline (5) states:

> *Plant procedures/guidance should ensure that a flow path is promptly established for makeup flow to the steam generator/nuclear boiler and identify backup water sources in order of intended use. Additionally, plant procedures/guidance should specify clear criteria for transferring to the next preferred source of water.*
>
> Under certain beyond-design-basis conditions, the integrity of some water sources may be challenged. Coping with an ELAP/LUHS may require water supplies for multiple days. Guidance should address alternate water sources and water delivery systems to support the extended coping duration. Cooling and makeup water inventories contained in systems or structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles are assumed to be available in an ELAP/LUHS at their nominal capacities. Water in robust UHS piping may also be available for use but would need to be evaluated to ensure adequate NPSH can be demonstrated and, for example, that the water does not gravity drain back to the UHS. Alternate water delivery systems can be considered available on a case-by-case

> basis. In general, all CSTs should be used first if available. If the normal source of makeup water (e.g., CST) fails or becomes exhausted as a result of the hazard, then robust demineralized, raw, or borated water tanks may be used as appropriate.
>
> Heated torus water can be relied upon if sufficient [net positive suction head] NPSH can be established. Finally, when all other preferred water sources have been depleted, lower water quality sources may be pumped as makeup flow using available equipment (e.g., a diesel driven fire pump or a portable pump drawing from a raw water source). Procedures/guidance should clearly specify the conditions when the operator is expected to resort to increasingly impure water sources.

A review was made of the Integrated Plan for discussion of water sources used for mitigating strategies for core, containment and SFP cooling. The licensee discussed coping strategies for maintaining core cooling on page 9 of the Integrated Plan. The normal RCIC pump suction source is the CST. The suction path will automatically transfer to drawing from the torus suppression pool on low level in the CST. Makeup to the torus suppression pool will be initiated at approximately 12 hours event time with the portable/FLEX pump. The pump suction source is either the ultimate heat sink, which is the Conowingo pond impoundment or the emergency cooling tower. The portable/FLEX pump will also supply the SFP and direct RPV injection. This is discussed on pages 13, 14, 23 and 32 of the Integrated Plan. However, the licensee has not discussed the minimum quantity of water available in the emergency cooling tower in light of being the only source of water for mitigation strategies for both reactors in the event of a loss of the ultimate heat sink due to the failure of the downstream dam. There is no discussion of any means to replenish the water in the emergency cooling tower indefinitely. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 3.2.2 Guideline (5) will be met. This is identified as Confirmatory Item 3.2.4.7.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to makeup water sources if these requirements are implemented as described.

3.2.4.8 Electrical Power Sources/Isolations and Interactions

NEI 12-06, Section 3.2.2, Guideline (13) states in part:

> The use of portable equipment to charge batteries or locally energize equipment may be needed under ELAP/LUHS conditions. Appropriate electrical isolations and interactions should be addressed in procedures/guidance.

A review was made of the Integrated Plan for coping strategies and discussion of electrical isolations, interactions and protection of station electrical distribution equipment. The licensee discussed deployment of 480 Vac portable/FLEX electrical generators on page 40 of the Integrated Plan and also on pages 3 through 5 of the attachment to the August 28, 2013 six-month supplement. However, the licensee did not provide sufficient information on loading calculations of portable diesel generator(s) or a strategy regarding electrical isolation from installed plant equipment. It was determined that there was insufficient information available to conclude that there is reasonable assurance that the licensee will ensure that portable/FLEX diesel generators are adequately sized and isolated from the Class 1E diesel generators to prevent simultaneously supplying power to the same Class 1E bus. Therefore, the information available, at this time, is not sufficient to confirm that the electrical isolations and interactions specified in NEI 12-06, Section 3.2.2 consideration (13) will be met. This is identified as Confirmatory Item 3.2.4.8.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to electrical isolations and interactions if these requirements are implemented as described.

3.2.4.9 Portable Equipment Fuel.

NEI 12-06, Section 3.2.2, Guideline (13) states in part:

> The fuel necessary to operate the FLEX equipment needs to be assessed in the plant specific analysis to ensure sufficient quantities are available as well as to address delivery capabilities.

NEI 12-06, Section 3.2.1.3, initial condition (5) states:

> Fuel for FLEX equipment stored in structures with designs which are robust with respect to seismic events, floods and high winds and associated missiles, remains available.

A review was made of the Integrated Plan for the coping strategies addressing the fuel supply for portable/FLEX equipment. The licensee discussed the on-site fuel supply on page 41 of the Integrated Plan. The licensee stated that when needed fuel will be pumped from the on-site emergency diesel generator fuel storage tanks by accessing the tanks through the tank access covers or in the event of a flood, at a piping connection near the auxiliary boiler fuel storage tank. The licensee also identified modifications to install a quick disconnect in the fuel oil transfer piping and to allow the fuel oil transfer pump to be reenergized during an ELAP. Fuel for portable/FLEX equipment is to be transported from facility seismic storage tanks to the equipment in the field using truck mounted tanks. For a discussion of seismic protection for vehicles, see Section 3.1.1.2. The item tracking this issue is Confirmatory Item 3.1.1.2.C. in Section 4.2.

The licensee has provided additional details during the audit process of the fuel supply design and the coping strategies for transfer for fuel from the storage tanks to the transportation vehicles used to refuel portable/FLEX equipment. The licensee has not yet discussed how continued operation of this equipment can be maintained indefinitely (i.e., Phase 2 and 3) to maintain core, containment and SFP cooling. The licensee has not discussed how fuel quality will be assured if stored for extended periods of time. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 3.2.1.3 initial condition (5) will be met. This has been identified as Confirmatory Item 3.2.4.9.A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to portable equipment fuel if these requirements are implemented as described.

3.2.4.10 Load Reduction to Conserve DC Power.

NEI 12-06, Section 3.2.2, Guideline (6) states:

> *Plant procedures/guidance should identify loads that need to be stripped from the plant dc buses (both Class 1E and non-Class 1E) for the purpose of conserving dc power.*
>
> DC power is needed in an ELAP for such loads as shutdown system instrumentation, control systems, and dc backed AOVs and MOVs. Emergency lighting may also be powered by safety-related batteries. However, for many plants, this lighting may have been supplemented by Appendix R and security lights, thereby allowing the emergency lighting load to be eliminated. ELAP procedures/guidance should direct operators to conserve dc power during the event by stripping nonessential loads as soon as practical. Early load stripping can significantly extend the availability of the unit's Class 1E batteries. In certain circumstances, AFW/HPCI /RCIC operation may be extended by throttling flow to a constant rate, rather than by stroking valves in open-shut cycles.
>
> Given the beyond-design-basis nature of these conditions, it is acceptable to strip loads down to the minimum equipment necessary and one set of instrument channels for required indications. Credit for load-shedding actions should consider the other concurrent actions that may be required in such a condition.

A review was made of the coping strategies to extend station battery lifetime or coping time by reducing dc bus electrical load. The licensee discussed station battery coping time and DC bus load shedding on pages 4, 9, 10 and 52 of the Integrated Plan. The licensee has established plans and procedures to extend station battery coping times by selectively reducing electrical loads on DC buses during an ELAP or load shedding. In addition to supplying power to instrumentation, dc power also supports the operation of the RCIC system supplying control power and power to some motor operated valves. DC power also provides control power to operate SRVs and automatic depressurization SRVs. The licensee stated that Load shedding will begin at approximately 20 minutes event time and will be completed at approximately 60 minutes. The limiting battery coping time for RCIC operation is approximately 5.5 hours for 125VDC bus 3CD001 and the limiting battery coping time for SRV operation is approximately 7 hours for 125VDC Bus 2BD001. Battery coping time and mitigating strategies to continue RCIC and SRV operation was discussed in Section 3.2.1.3, above.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 3.2.2 Guideline (6) regarding the calculations supporting battery lifetime including dc electrical bus load profile during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to load reduction to conserve power if these requirements are implemented as described.

3.3 PROGRAMMATIC CONTROLS

3.3.1 Equipment Maintenance and Testing.

NEI 12-06, Section 3.2.2, the paragraph following Guideline (15) states in part:

> In order to assure reliability and availability of the FLEX equipment required to meet these capabilities, the site should have sufficient equipment to address all functions at all units on-site, plus one additional spare, i.e., an N+1 capability, where "N" is the number of units on-site. Thus, a two-unit site would nominally have at least three portable pumps, three sets of portable ac/dc power supplies, three sets of hoses & cables, etc. It is also acceptable to have a single resource that is sized to support the required functions for multiple units at a site (e.g., a single pump capable of all water supply functions for a dual unit site). In this case, the N+1 could simply involve a second pump of equivalent capability. In addition, it is also acceptable to have multiple strategies to accomplish a function (e.g., two separate means to repower instrumentation). In this case the equipment associated with each strategy does not require N+1. The existing 50.54(hh)(2) pump and supplies can be counted toward the N+1, provided it meets the functional and storage requirements outlined in this guide. The N+1 capability applies to the portable FLEX equipment described in Tables 3-1 and 3-2 (i.e., that equipment that directly supports maintenance of the key safety functions). Other FLEX support equipment only requires an N capability.

NEI 12-06, Section 11.5 states:

1. FLEX mitigation equipment should be initially tested or other reasonable means used to verify performance conforms to the limiting FLEX requirements. Validation of source manufacturer quality is not required.

2. Portable equipment that directly performs a FLEX mitigation strategy for the core, containment, or SFP should be subject to maintenance and testing[1] guidance provided in INPO AP 913, Equipment Reliability Process, to verify proper function. The maintenance program should ensure that the FLEX equipment reliability is being achieved. Standard industry templates (e.g., EPRI) and associated bases will be developed to define specific maintenance and testing including the following:

    a. Periodic testing and frequency should be determined based on equipment type and expected use. Testing should be done to verify design requirements and/or basis. The basis should be documented and deviations from vendor recommendations and applicable standards should be justified.

    b. Preventive maintenance should be determined based on equipment type and expected use. The basis should be documented and deviations from vendor recommendations and applicable standards should be justified.

[1] Testing includes surveillances, inspections, etc.

c. Existing work control processes may be used to control maintenance and testing. (e.g., PM Program, Surveillance Program, Vendor Contracts, and work orders).

3. The unavailability of equipment and applicable connections that directly performs a FLEX mitigation strategy for core, containment, and SFP should be managed such that risk to mitigating strategy capability is minimized.

   a. The unavailability of installed plant equipment is controlled by existing plant processes such as the Technical Specifications. When installed plant equipment which supports FLEX strategies becomes unavailable, then the FLEX strategy affected by this unavailability does not need to be maintained during the unavailability.

   b. Portable equipment may be unavailable for 90 days provided that the site FLEX capability (N) is available.

   c. Connections to permanent equipment required for FLEX strategies can be unavailable for 90 days provided alternate capabilities remain functional.

   d. Portable equipment that is expected to be unavailable for more than 90 days or expected to be unavailable during forecast site specific external events (e.g., hurricane) should be supplemented with alternate suitable equipment.

   e. The short duration of equipment unavailability, discussed above, does not constitute a loss of reasonable protection from a diverse storage location protection strategy perspective.

   f. If portable equipment becomes unavailable such that the site FLEX capability (N) is not maintained, initiate actions within 24 hours to restore the site FLEX capability (N) and implement compensatory measures (e.g., use of alternate suitable equipment or supplemental personnel) within 72 hours.

A review was made of the licensee's plans for development and implementation of a program for equipment maintenance, testing and unavailability control. On page 7 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that PBAPS will implement an administrative program for portable/FLEX equipment to establish responsibilities, and testing & maintenance requirements. This will establish responsibilities, maintenance and testing requirements for all components associated with FLEX. Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11. Standard industry PMs will be developed to establish maintenance and testing frequencies based on type of equipment and will be within EPRI guidelines. Testing procedures will be developed based on the industry PM templates and the licensee standards.

The NRC staff reviewed the Integrated Plan for PBAPS and determined that the Generic Concern related to maintenance and testing of FLEX equipment is applicable to the plant. This

Generic Concern has been resolved generically through the NRC endorsement of the EPRI technical report on preventive maintenance of FLEX equipment, submitted by NEI by letter dated October 3, 2013 (ADAMS Accession No. ML13276A573). The endorsement letter from the NRC staff is dated October 7, 2013 (ADAMS Accession No. ML13276A224).

This Generic Concern involves clarification of how licensees would maintain FLEX equipment such that it would be readily available for use. The technical report provided sufficient basis to resolve this concern by describing a database that licensees could use to develop preventative maintenance programs for FLEX equipment. The database describes maintenance tasks and maintenance intervals that have been evaluated as sufficient to provide for the readiness of the FLEX equipment. The NRC staff has determined that the technical report provides an acceptable approach for maintaining FLEX equipment in a ready-to-use status.

The licensee informed the NRC of their plans to abide by this generic resolution and of the licensee's plans to address potential plant specific issues associated with implementing this resolution.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01 and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to maintenance and testing, if these requirements are implemented as described.

3.3.2 Configuration Control.

NEI 12-06, Section 11.8 provides that:

1. The FLEX strategies and basis will be maintained in an overall program document. This program document will also contain a historical record of previous strategies and the basis for changes. The document will also contain the basis for the ongoing maintenance and testing programs chosen for the FLEX equipment.
2. Existing plant configuration control procedures will be modified to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies.
3. Changes to FLEX strategies may be made without prior NRC approval provided:
   a) The revised FLEX strategy meets the requirements of this guideline.
   b) An engineering basis is documented that ensures that the change in FLEX strategy continues to ensure the key safety functions (core and SFP cooling, containment integrity) are met.

A review was made of the licensee's plans for development and implementation of a program for configuration control. On page 9 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that PBAPS will implement an administrative program for FLEX to establish responsibilities. A plant system designation will be assigned to FLEX equipment which requires configuration controls associated with systems. Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.

The licensee's plans for development and implementation of a configuration control process for the strategies and bases provides reasonable assurance that it will conform to NEI 12-06 guidance for configuration control with respect to the maintenance of an overall program document, including the basis for the ongoing maintenance and testing programs.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 11.8 regarding configuration control of coping strategies and portable/FLEX equipment used for maintaining core, containment and SFP cooling during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to configuration control if these requirements are implemented as described.

3.3.3 Training.

NEI 12-06, Section 11.6 provides that:

1. Programs and controls should be established to assure personnel proficiency in the mitigation of beyond-design-basis events is developed and maintained. These programs and controls should be implemented in accordance with an accepted training process.[2]

2. Periodic training should be provided to site emergency response leaders[3] on beyond design-basis emergency response strategies and implementing guidelines. Operator training for beyond-design-basis event accident mitigation should not be given undue weight in comparison with other training requirements. The testing/evaluation of Operator knowledge and skills in this area should be similarly weighted.

3. Personnel assigned to direct the execution of mitigation strategies for beyond-design basis events will receive necessary training to ensure familiarity with the associated tasks, considering available job aids, instructions, and mitigating strategy time constraints.

4. "ANSI/ANS 3.5, Nuclear Power Plant Simulators for use in Operator Training" certification of simulator fidelity (if used) is considered to be sufficient for the initial stages of the beyond-design-basis external event scenario until the current capability of the simulator model is exceeded. Full scope simulator models will not be upgraded to accommodate FLEX training or drills.

5. 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 is not the intent to connect to or operate permanently installed equipment during these drills and demonstrations.

[2] The Systematic Approach to Training (SAT) is recommended.
[3] Emergency response leaders are those utility emergency roles, as defined by the Emergency Plan, for managing emergency response to design basis and beyond-design-basis plant emergencies.

A review was made of the licensee's plans for development and implementation of a training program addressing FLEX. On page 8 in the section of its Integrated Plan regarding the training plan, the licensee stated that PBAPS will develop training materials for all station staff involved in implementing FLEX strategies and that the Systematic Approach to Training (SAT), will be used to determine training needs. For other station staff, a training overview will be developed per change management plan. The reviewer concluded that use of the licensee's existing proceduralized site training regimen is sufficient to meet the NEI 12-06 guidelines above.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 11.6 regarding training programs for implementation of coping strategies and equipment operation to maintain core, containment and SFP cooling during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to training if these requirements are implemented as described.

3.4 OFF SITE RESOURCES

NEI 12-06, Section 12.2 lists the following minimum capabilities for offsite resources for which each licensee should establish the availability of:

1) A capability to obtain equipment and commodities to sustain and backup the site's coping strategies.
2) Off-site equipment procurement, maintenance, testing, calibration, storage, and control.
3) A provision to inspect and audit the contractual agreements to reasonably assure the capabilities to deploy the FLEX strategies including unannounced random inspections by the Nuclear Regulatory Commission.
4) Provisions to ensure that no single external event will preclude the capability to supply the needed resources to the plant site.
5) Provisions to ensure that the off-site capability can be maintained for the life of the plant.
6) Provisions to revise the required supplied equipment due to changes in the FLEX strategies or plant equipment or equipment obsolescence.
7) The appropriate standard mechanical and electrical connections need to be specified.
8) Provisions to ensure that the periodic maintenance, periodic maintenance schedule, testing, and calibration of off-site equipment are comparable/consistent with that of similar on-site FLEX equipment.
9) Provisions to ensure that equipment determined to be unavailable/non-operational during maintenance or testing is either restored to operational status or replaced with appropriate alternative equipment within 90 days.
10) Provision to ensure that reasonable supplies of spare parts for the off-site equipment are readily available if needed. The intent of this provision is to reduce the likelihood of extended equipment maintenance (requiring in excess of 90 days for returning the equipment to operational status).

A review was made of the licensee's plans for development and implementation RRC that will provide FLEX equipment for the final phase mitigation strategies. On page 8 in the section of its Integrated Plan regarding the RRC, the licensee stated that PBAPS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER) and described the current concept for those centers and for the transportation of RRC equipment. The licensee expects that RRC equipment will be delivered to the site within 24 hours from the initial request. However, there is no discussion of the administrative procedure or control that would trigger the initial request for assistance with offsite resources. Therefore, the information available, at this time, is not sufficient to conclude that the administrative controls for the RRC FLEX equipment will conform to the specifications of NEI 12-06, Section 12.2. This has been identified as Confirmatory Item 3.4.A. in Section 4.2.

The licensee discussed the equipment to be provided by the RRC for coping strategies to maintain core and containment cooling during the final phase on pages 18, 28 and 45. The licensee listed this equipment and commodities on pages 49, 50 and 51. However, there is no discussion for the calculations and considerations used to size the RRC FLEX equipment. Additionally, there is no discussion that assures the compatibility between station equipment configurations and connection points and the equipment that is provided by the RRC. Therefore, the information available, at this time, is not sufficient to conclude that the design and selection of RRC FLEX equipment will conform to the specifications of NEI 12-06, Section 12.2. This has been identified as Confirmatory Item 3.4.B. in Section 4.2.

The licensee stated that RRC FLEX equipment will be moved from an RRC to a local assembly area, established by the SAFER team and the utility, that communications will be established between the affected nuclear site and the SAFER team and that required equipment moved to the site as needed. However, there is no discussion of the logistics to accomplish this during a BDBEE. Therefore, the information available, at this time, is not sufficient to conclude that the administrative controls for the deployment of RRC FLEX equipment to the site will conform to the specifications of NEI 12-06, Section 12.2. This has been combined with Confirmatory Item 3.1.1.4A. in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to offsite resources if these requirements are implemented as described.

4.0 OPEN AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

Item Number	Description	Notes
3.2.3.A	Revision 3 to the BWROG EPG SAG is a Generic Concern because the BWROG has not addressed the potential for the revised venting strategy to increase the likelihood of detrimental effects on containment response for events in which the venting strategy is invoked.	Significant Concern
3.2.4.3.A	Freeze protection has not been discussed in the Integrated Plan or during the audit process.	
3.2.4.4.A	Portable and emergency lighting during an ELAP has not been	

	discussed in the Integrated Plan or during the audit process.	
3.2.4.5.A	Access to protected and internal locked plant areas during an ELAP has not been discussed in the Integrated Plan or during the audit process.	

4.2 CONFIRMATORY ITEMS

Item Number	Description	Notes
3.1.1.1.A	The method selected for protection of equipment during a BDBEE was not discussed in the Integrated plan or during the audit process. There was no discussion of the specifications stated in NEI 12-06, Sections 5.3.1, 6.2.3.1, 7.3.1, 8.3.1, and 9.3.1. Also, there was no discussion of securing large portable equipment for protection during a seismic hazard.	
3.1.1.2.A	Deployment routes have not yet been finalized or reviewed for possible impacts due to debris and potential soil liquefaction.	
3.1.1.2.C	Protection of vehicles used to deploy and re-fuel portable/FLEX equipment during a BDBEE was not discussed in the Integrated plan or during the audit process.	
3.1.1.3.A	Seismic procedural interface consideration NEI 12-06, section 5.3.3, consideration 1, which considers the possible failure of seismically qualified electrical equipment by beyond-design-basis seismic events, was not discussed in the Integrated plan or during the audit process.	
3.1.1.3.B	Seismic procedural interface considerations NEI 12-06, section 5.3.3, 2 and 3, which considers flooding from large internal sources and also mitigation of ground water, was not discussed in the Integrated plan or during the audit process.	
3.1.1.4.A	Utilization of offsite resources, the local staging area was not discussed in the Integrated plan or during the audit process.	
3.1.2.A	Characterization of the external flooding hazard in terms of warning time and persistence was not discussed in the Integrated plan or during the audit process.	
3.1.2.1A	Protection of portable/FLEX equipment during flooding BDBEE was not discussed in the Integrated plan or during the audit process.	
3.1.2.2.A	Movement of equipment and restocking of supplies in the context of a flood with long persistence during a BDBEE was not discussed in the Integrated plan or during the audit process.	
3.1.3.2.A	Availability of debris clearing equipment during a BDBEE was not discussed in the Integrated plan or during the audit process.	
3.1.4.2.A	Snow or ice removal during a BDBEE was not discussed in the Integrated plan or during the audit process. Additionally, no discussion of ice blocking FLEX pump suctions.	
3.2.1.1.A	MAAP benchmarks must be identified and discussed which demonstrate that MAAP4 is an appropriate code for the simulation of an ELAP event.	
3.2.1.1.B	MAAP Analysis - collapsed level must remain above Top of	

	Active Fuel (TAF) and the cool down rate must be within technical specification limits.	
3.2.1.1.C	MAAP4 must be used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper.	
3.2.1.1.D	MAAP modeling parameters. In using MAAP4, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (Electric Power Research Institute Report 1020236).	
3.2.1.1.E	The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan must be identified and should be available for review.	
3.2.1.2.A	There was no discussion of the assumed recirculation system leakage rates including the recirculation pump seal leakage rates that were used in the ELAP analysis. Questions still remain unanswered regarding pressure dependence of the assumed leakage rates, assumed leakage phase, i.e. single phase liquid, two phase, or steam, and other questions presented in the audit.	
3.2.1.4.A	Required flow rates and portable/FLEX pump characteristics were not discussed in the Integrated plan or during the audit process. Likewise, there was no discussion of the required flow for mitigation strategies and no discussion of the calculations that verify adequate flow.	
3.2.1.4.B	There was no discussion of the assumptions used in the calculations for battery coping time and to evaluate the effectiveness of dc load reduction including the basis for the assumed minimum battery voltage.	
3.2.1.4.C	The operability of the RCIC pump at elevated suction temperature was not discussed in the Integrated plan or during the audit process.	
3.2.1.4.D	Water quality issue and guidance on priority of water source usage was not fully addressed in the Integrated plan or during the audit process and requires further analysis by licensee.	
3.2.2.A	Evaluation of the refueling floor SFP area for steam and condensation was not yet completed. Mitigating strategies were not discussed in the Integrated Plan or during the audit process.	
3.2.4.2.A	The impact of high temperature on the operability of RCIC Room electrical and mechanical equipment, including the RCIC turbine speed controller, was not discussed in the Integrated plan or during the audit process.	
3.2.4.2.B	Evaluation of high and low battery temperatures during a future six-month-update.	
3.2.4.4.B	Plant communications during an ELAP was not discussed in the Integrated plan or the audit process. Follow-up of commitments made in the communications assessment (ML12306A199) is required.	
3.2.4.6.A	Initial analysis for accessibility and habitability of critical plant locations as the RCIC Room showed relatively high temperatures. There was no discussion of the effectiveness of	

	ventilation with portable fans. There was no discussion of long term habitability in critical plant locations during an ELAP.	
3.2.4.7.A	Emergency Cooling Tower water volume and replenishment was not discussed in the Integrated plan or during the audit process.	
3.2.4.8.A	The licensee did not provide sufficient information regarding loading/sizing calculations of portable diesel generator(s) and strategy for electrical isolation for FLEX electrical generators from installed plant equipment.	
3.2.4.9.A	Details of portable equipment fuel storage transfer were provided during the audit process. However, the method to insure fuel quality was not yet discussed in the Integrated plan or during the audit process.	
3.4.A	The program or process to request RRC equipment was not discussed in the Integrated plan or during the audit process.	
3.4.B	Sizing calculations of RRC FLEX equipment and the compatibility of RRC equipment to plant connection points was not discussed in the Integrated plan or during the audit process.	

If you have any questions, please contact Mr. Randy Hall, Senior Project Manager in the Mitigating Strategies Directorate, at (301) 415-4032.

Sincerely,

/RA/

Jeremy S. Bowen, Chief
Mitigating Strategies Projects Branch
Mitigating Strategies Directorate
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosures:
1. Interim Staff Evaluation
2. Technical Evaluation Report

cc w/encl: Distribution via Listserv

DISTRIBUTION:
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EBowman, NRR/MSD

ADAMS Accession Nos. Pkg ML13319A122, Letter/ISE ML13220A105, TER ML13317A950 *via e-mail

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DATE	11/15/2013	11/18/2013	11/18/2013	11/20/2013
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DATE	11/21/2013	11/19/2013	11/21/2013	11/22/2013

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