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

February 19, 2014

Ms. Mary G. Korsnick
Chief Nuclear Officer
Constellation Energy Nuclear Group, LLC
100 Constellation Way, Suite 200C
Baltimore, MD 21202

SUBJECT: R. E. GINNA NUCLEAR POWER PLANT- INTERIM STAFF EVALUATION RELATING TO OVERALL INTEGRATED PLAN IN RESPONSE TO ORDER EA-12-049 (MITIGATION STRATEGIES) (TAC NO. MF1152)

Dear Ms. Korsnick:

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 March 8, 2013 (ADAMS Accession No. ML13074A056), Constellation Energy Group, LLC (CENG), acting for R.E. Ginna Nuclear Power Plant, LLC (the licensee), submitted the Overall Integrated Plan for R.E. Ginna Nuclear Power Plant in response to Order EA-12-049. By letter dated August 27, 2013 (ADAMS Accession No. ML13254A278), CENG submitted a six-month update to the Overall Integrated Plan.

Based on a review of CENG's plan, including the six-month update dated August 27, 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 R.E. Ginna Nuclear Power Plant. 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.

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

If you have any questions, please contact John Boska at 301-415-2901.

Sincerely,

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

Docket No. 50-244

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

cc w/encl:

Mr. Joseph E. Pacher
Vice President
R.E. Ginna Nuclear Power Plant
R.E. Ginna Nuclear Power Plant, LLC
1503 Lake Road
Ontario, NY 14519

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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

R. E. GINNA NUCLEAR POWER PLANT, LLC

R. E. GINNA NUCLEAR POWER PLANT

DOCKET NO. 50-244

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 (BDBEEs). 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 BDBEE.

By letter dated March 8, 2013 [Reference 2], R.E. Ginna, LLC (the licensee or Ginna LLC) submitted its Overall Integrated Plan (hereafter referred to as the Integrated Plan) for the R.E. Ginna Nuclear Power Plant (Ginna) in response to Order EA-12-049. By letter dated August 28, 2013 [Reference 3], Ginna LLC submitted a six-month update to the Integrated Plan.

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

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

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 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 BDBEE 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 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 this 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 Ginna, submitted by letter dated March 8, 2013, as supplemented. NRC and MTS staff have reviewed the submitted information and held clarifying discussions with Ginna LLC in evaluating the licensee's plans for addressing BDBEE and its progress towards implementing those plans.

A simplified description of the Ginna Integrated Plan to mitigate the postulated extended loss of ac power (ELAP) event is that the licensee will initially remove the core decay heat by adding water to the two steam generators (SGs) and releasing steam from the SGs to the atmosphere. The water could initially be added by the turbine-driven auxiliary feedwater (TDAFW) pump, taking suction from the condensate storage tank (CST). However, that equipment is not robust considering the potential external events. Therefore, if the TDAFW pump or CST is not available, the licensee's primary strategy is to utilize the two existing standby auxiliary feedwater (SAFW) pumps, with suction from a new SAFW CST, which is being constructed to meet the definition of robust equipment given in NEI 12-06. The SAFW pumps are powered by electric motors, and if offsite power is lost the power is supplied from the plant's emergency diesel generators (EDGs). However, under the conditions of Order EA-12-049, the EDGs may not be available. Therefore, the licensee will install a FLEX SAFW DG with a capacity of about 1 megawatt (MW), which will be designed to meet the definition of robust equipment given in NEI 12-06, and use it to power an SAFW pump. The licensee plans to demonstrate the ability to recognize the ELAP event, start the SAFW DG, align the SAFW pump suction to the SAFW CST, start an SAFW pump, and start feeding the SGs before the lowering water level in the SGs causes adverse consequences for the reactor coolant system (RCS). This system will be designed to provide water to the SGs for about 24 hours without needing any additional water or fuel.

The operators will cool the RCS to about 410 degrees Fahrenheit (°F) in the cold legs by releasing steam from the SGs, which will reduce the RCS and SG pressures. In order to ensure a method of adding borated water to the RCS, the licensee has proposed installing a FLEX charging pump in the SAFW building, powered from the FLEX SAFW DG, with a discharge line routed through the Auxiliary Building (AB) and connected to the existing charging line to the RCS. The licensee proposes to convert the 10,000 gallon SAFW test tank located in the SAFW building to a FLEX boric acid storage tank (FBAST), which would be the suction source for the FLEX charging pump. When the FBAST runs low, the licensee proposes to refill it by blending boron powder and water from the best available source, which initially would be the SAFW CST. The SAFW CST would be refilled from the ultimate heat sink (UHS), Lake Ontario, using a FLEX diesel-driven pump. The licensee would have an alternate method of adding borated water to the RCS using a portable diesel-driven pump.

FLEX generators will be used to reenergize the installed battery chargers to keep the necessary direct current (dc) buses energized, which will then keep the 120 volt ac instrument buses energized. The licensee stated that they will utilize the industry Regional Response Centers (RRCs) for supplies of phase 3 equipment, which will supplement the Phase 2 equipment stored onsite.

Ginna has a large dry containment building, which contains the RCS. Currently Ginna does not plan to use low-leakage seals on the reactor coolant pumps (RCPs), but plans to cool down the RCS to reduce the leakage from the RCP seals. Analysis at Ginna for the previous station blackout (SBO) response, and generic industry analysis for an ELAP, indicates that it is unlikely that the containment pressure and temperature limits will be exceeded in the first 24 hours. The licensee is performing analyses on the long-term response of the containment and is developing methods for cooling the containment building if necessary.

In the postulated ELAP event, the SFP will initially heat up due to the unavailability of the normal cooling system. A FLEX pump will be aligned and used to add water to the SFP to maintain at least the minimum analyzed 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.

The licensee followed the NEI 12-06 guidance in most areas, and as noted above the NRC has endorsed that guidance. However, there is a significant area in which the licensee has proposed an alternative to the NEI 12-06 guidance. NEI 12-06, section 3.2.1.3, "Initial Conditions," conditions (2) and (6) state that:

(2) All installed sources of emergency on-site ac power and SBO [station blackout] alternate ac power sources are assumed to be not available and not imminently recoverable.

(6) Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles, are available.

The licensee has proposed the use of a permanently installed SAFW DG as noted above. Condition (2) above could be interpreted as assuming that this DG is not available. However, the SAFW DG is robust as described in condition (6) above, and the licensee has stated that the new DG will not be connected to the internal power distribution system, thereby alleviating the potential vulnerability of reliance on a common supporting system. The NRC staff considered the design features of the SAFW DG, especially its independence from other plant systems and structures, and finds that crediting the SAFW DG is an acceptable alternative to the NEI 12-06 guidance. The NRC staff also notes that the licensee has an alternate Phase 2 strategy for feeding the SGs for decay heat removal. This strategy utilizes a diesel driven portable FLEX pump, aligned to take a suction from the new CST, with the capacity to maintain the required level in the SGs with the SGs at the target pressure of 260 psig, which corresponds to about 410 degrees Fahrenheit (°F) in the cold legs of the RCS. This alternate strategy does not use the SAFW DG or the SAFW pumps.

The NRC staff also considered if the licensee would need a relaxation from Order EA-12-049 to credit the use of the SAFW DG. The order states, in part, that:

> 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 and have adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities at all units on a site subject to this Order.

The NRC staff finds that the licensee's proposed strategies could demonstrate compliance with the order (assuming satisfactory resolution of the confirmatory items below), and therefore that no relaxation to the order is required in order to credit the use of the SAFW DG.

By letter dated February 9, 2014 [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:

> 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.

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. Minor editorial changes were made by the NRC staff to some items. 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. The NRC staff notes that for Confirmatory Item 3.2.1.8.A on boric acid mixing, the staff has now endorsed the August 2013, Pressurized-Water Reactor Owners Group (PWROG) position paper, with several clarifications, which the licensee will need to address. The NRC endorsement letter is dated January 8, 2014, and is publicly available (ADAMS Accession No. ML13276A183).

In the tables below, the NRC staff made the following change compared to the original summary tables in the TER:

1. Open Item 3.2.4.8.B on the need for additional information on the SAFW DG was deleted, as the NRC staff determined that we had sufficient information to make a determination on this alternative approach.

4.1 OPEN ITEMS

NONE

4.2 CONFIRMATORY ITEMS

3.1.1.A	Confirm that the licensee addresses the results of the seismic and flooding re-evaluations pursuant to the NRC's 50.54(f) letter of March 12, 2012.	
3.1.1.1.A	Protection, seismic – confirm that large portable FLEX equipment such as pumps and power supplies would be secured as appropriate to protect them during a seismic event and that stored equipment and structures would be evaluated and protected from seismic interactions to ensure that unsecured and/or non-seismic components do not damage the equipment.	
3.1.1.3.A	Procedural Interfaces – seismic – confirm that a reference source for the plant operators is provided that provides approaches to obtaining necessary instrument readings to support the implementation of the coping strategies.	
3.1.4.2.A	Snow, ice and extreme cold – confirm that potential loss of access to the UHS and flow path due to extreme low temperatures, e.g., due to ice blockage or formation of frazil ice, is assessed and resolved.	
3.2.1.A	Confirm resolution of open item to develop and implement procedures to close SI accumulator injection valves or vent the SI accumulators prior to nitrogen injection into the RCS.	
3.2.1.B	Confirm evaluation of the recommendation to consider the prioritization of staging portable equipment that may be required to isolate/vent the accumulators when certain cooldown maneuvers are necessitated.	
3.2.1.1.A	Confirm completion of timelines used in conjunction with the thermal hydraulic analysis to document the duration of each phase for each critical function, and the basis for the duration.	
3.2.1.2.A	RCP seals – Confirm that, if RCP seals are changed to non-Westinghouse seals, the acceptability of the use of non-Westinghouse seals is addressed, and the RCP seal leakage rates for use in the ELAP analysis are provided with acceptable justification.	
3.2.1.2.B	High temperature RCP seal concern - If applicable, confirm justification that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate of 21 gpm/seal used in the ELAP is adequate and acceptable.	

3.2.1.8.A	The licensee informed the NRC staff of its intent to abide by the generic approach described in the PWROG August 15, 2013 position paper related to modeling the timing and uniformity of boric acid mixing within the RCS under natural circulation conditions potentially involving two-phase flow. Confirm that the additional conditions discussed in the NRC endorsement letter are satisfied, and that boration requirements are met.	
3.2.1.9.A	Confirm design information and supporting analysis developed for portable equipment that provides the inputs, assumptions, and documented analyses that the mitigation strategy and support equipment will perform as intended.	
3.2.3.A	Containment analysis - Confirm completion of containment analysis and incorporation of results into mitigation strategies.	
3.2.4.2.A	Ventilation – confirm completion of GOTHIC calculations and incorporation of results into mitigation strategies.	
3.2.4.4.A	Emergency lighting – confirm development of lighting strategies.	
3.2.4.4.B	Communications – confirm completion of upgrades.	
3.2.4.5.A	Protected Area Access- confirm that strategies are in place to allow access to protected areas as needed to execute mitigation strategies.	
3.2.4.8.A	Confirm that the final electrical design has the necessary electrical isolations and protections.	
3.3.1.A	Confirm sufficient quantities of FLEX equipment to meet N+1.	

Based on a review of Ginna LLC's plan, including the six-month update dated August 27, 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 at Ginna. This conclusion is based on the assumption that the licensee will implement the plan as described, including the satisfactory resolution of the confirmatory items.

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 BDBEE. 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 BDBEEs 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 BDBEE that impacts the availability of ac power and the UHS. 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 (ADAMS Accession No. ML12054A736)

2. Letter from Constellation Energy Nuclear Group, LLC to NRC, "Supplement to Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 8, 2013 (ADAMS Accession No. ML13074A056)

3. Letter from Constellation Energy Nuclear Group, LLC to NRC, "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 (Order Number EA-12-049)," dated August 27, 2013 (ADAMS Accession No. ML13254A278)

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

14. NEI document NEI 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. NEI comments to draft JLD-ISG-2012-01 and document 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision C, July 3, 2012 (ADAMS Accession No. ML121910390)

18. NEI 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 John Bowen, MegaTech Services, LLC, to Eric Bowman, NRC, submitting "Technical Evaluation Reports Related to Order Modifying Licenses with Regard to

Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, EA 12-049," dated February 9, 2014 (ADAMS Accession No. ML14041A225)

Principal Contributors: E. Bowman
B. Lee
V. Goel
J. Gall
M. Levine
J. Boska

Date: February 19, 2014

Enclosure 2

Technical Evaluation Report

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

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R.E. Ginna Nuclear Power Plant, LLC
R.E. Ginna Nuclear Power Plant
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Prepared by:

Mega-Tech Services, LLC
11118 Manor View Drive
Mechanicsville, Virginia 23116

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R.E. Ginna Nuclear Power Plant
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. 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 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 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 March 8, 2013, (ADAMS Accession No. ML13074A056), and as supplemented by the first six-month status report in letter dated August 27, 2013 (ADAMS Accession No. ML13254A278), R.E. Ginna Nuclear Power Plant, LLC (the licensee or Ginna LLC) provided the R.E. Ginna Nuclear Power Plant's (Ginna) Integrated Plan for compliance with Order EA-12-049. The Integrated Plan describes the strategies and guidance under development for implementation by Ginna LLC 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 NRC staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the 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.

On page 4 of its Integrated Plan, the licensee stated that the seismic hazard is an extreme external hazard applicable to Ginna.

The licensee did not acknowledge that the reevaluation of the seismic hazard, pursuant to the 10 CFR 50.54(f) letter of March 12, 2012, has not yet been completed. This is identified as Confirmatory Item 3.1.1.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 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.

On pages 6 and 7 of its Integrated Plan, the licensee described that Phase 2 FLEX components will be stored at the site and will be protected against external events either by design or location. At the time of submittal of the Integrated Plan, FLEX equipment storage location(s) had not been selected. In several other sections of the Integrated Plan the licensee described that structures to provide protection of the FLEX equipment would be constructed to meet the requirements identified in NEI 12-06, Section 11. The schedule to construct the structures is still to be determined.

During the audit, the licensee provided additional information describing that the FLEX equipment necessary to all functions on site (or "N," as discussed in NEI 12-06, Section 3.2.2, page 23) will be located in a fully protected (robust) structure(s). This equipment will be able to withstand the Ginna Safe Shutdown Earthquake (SSE). The spare (or "N+1") equipment will be housed in New York Sate (NYS) Building Code commercial structures designed for seismic conditions in the Ginna region. Support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by a seismic event or be located in an outside location.

During the audit, the licensee was requested to clarify whether the structures designed to the NYS Building Code can be evaluated equivalent to those designed to ASCE 7-10. The licensee provided additional information confirming that for purposes of considering seismic hazards, the NYS Building Code bounds ASCE 7-10.

Other than describing that all the "N" equipment would be able to withstand the Ginna SSE, the licensee did not describe how large portable FLEX equipment such as pumps and power supplies would be secured as appropriate to protect them during a seismic event nor specify that stored equipment and structures would be evaluated and protected from seismic interactions to ensure that unsecured and/or non-seismic components do not damage the equipment. This is 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 protection of FLEX equipment considering seismic hazards, 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.

On page 6 of its Integrated Plan, the licensee described that deployment strategies and deployment routes will be assessed for hazards impact.

On page 12 of its Integrated Plan, the licensee described that deployment routes will be established once the storage locations for FLEX equipment are defined and connection points established. The identified paths and deployment areas will be accessible during all modes of operation, i.e. operating or refueling.

On page 4 of its Integrated Plan, the licensee described two on site slopes that may be unstable based on analyses performed by the NRC staff during the Systematic Evaluation Program (SEP). During the audit, the licensee reiterated that liquefaction will not affect existing structures, systems, or components (SSCs) and development and evaluation of deployment paths for FLEX equipment are still underway. The licensee described that it expects the originally discussed slopes and adjoining roadways will be part of the FLEX deployment path to access the UHS and it has engaged a geotechnical consultant to evaluate the site's overall geotechnical profile for potential liquefaction hazards and re-quantify the NRC identified slope stability issues using updated soil parameters and analysis methods.

During the audit the licensee described that all FLEX connections will be located in seismically robust structures. Further, any areas that plant operators will require access to deploy or operate FLEX equipment will be located in, or on the exterior of, seismically robust structures.

Lake Ontario is the UHS for Ginna. During the audit the licensee described that Lake Ontario water levels are regulated by the Moses-Saunders power dam. Levels range from 245.0 feet to 246.7 feet. Prior to dam construction, the water levels ranged from 242.6 feet to 249.3 feet. Thus, failure of this dam would not have an adverse effect on the Ginna UHS.

No specific information was presented in the Integrated Plan pertaining to ensuring that 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. During the audit the licensee described that there is currently no planned movement or deployment of equipment that specifically requires electrical power, such that consideration for a power supply strategy is needed. Any such movement of gates, doors, fences, etc. will and can be performed by manual action.

As noted above in section 3.1.1.1, during the audit the licensee described that support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by a seismic event, or be located in an outside location.

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 deployment of FLEX equipment considering seismic hazards, 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 beyond-design-basis 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. 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 equipment for those plants that could be impacted by failure of a not seismically robust downstream dam.

In several sections of its Integrated Plan, the licensee lists control room and field instruments that can be relied upon for the various analyzed hazards. The only field instruments listed are pressurizer pressure and level, PI-430 and LI-427, respectively.

No information was otherwise presented in the Integrated Plan regarding a reference source for the plant operators that provides approaches to obtaining necessary instrument readings to support the implementation of the coping strategies. This is identified as Confirmatory Item 3.1.1.3.A in Section 4.2.

Regarding internal flooding sources, during the audit the licensee described that internal flooding was evaluated by the SEP topic IX-3 and was reevaluated during the Individual Plant Examination of External Events (IPEEE) reviews. Failure of non-seismically qualified tanks in the Auxiliary Building (AB) could cause flooding in the subbasement where the Residual Heat Removal (RHR) pumps are located. If a seismic event occurs while in lower modes, then RHR will be implemented in Phase 2. In that case, water would be pumped from the subbasement to gain access to the RHR FLEX connections. The licensee described that adequate resources and time are allotted for this activity.

As described above in Section 3.1.1.2, Ginna would not be impacted by the failure of a not seismically robust downstream dam.

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 considering the 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.

On pages 13 and 14 of its Integrated Plan, the licensee described that Constellation Energy Nuclear Group (CENG) has signed contracts and issued purchase orders to Pooled Inventory Management (PIM) for Ginna for participation in the establishment and support of two Regional Response Centers (RRCs) through the Strategic Alliance for FLEX Emergency Response (SAFER). Each RRC will hold five sets of equipment, four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle.

The licensee further described that each site will develop a playbook which will provide the detail necessary to ensure the successful delivery of the portable FLEX equipment from the RRC to the local staging area and from the local staging area to the site.

During the audit the licensee provided additional information describing that the SAFER site-specific response plan will contain information on the specifics of generic and site specific equipment obtained from the RRC. It will also contain the logistics for transportation of the equipment, staging area set up, and other needs for ensuring the equipment and commodities sustain the site's coping strategies. Routes will be evaluated for post-event conditions, and provisions for alternative transportation, such as airlifting, will be considered in the plans.

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 considerations in using offsite resources, seismic hazard, 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.

On page 4 of its Integrated Plan, the licensee described that the flooding hazard is applicable to Ginna. The licensee described that Ginna is a "wet" site, which means that portions of the plant are below the design basis flood level. The source of the event that leads to the design basis flood level of elevation 273.8' is regional precipitation resulting in a probable maximum flood (PMF). Per Table 6-1 of NEI 12-06, the warning time would be days and the persistence of the event could be many hours to days.

The potential for surge flooding from Lake Ontario is not considered limiting and is not discussed in the integrated plan. This potential was originally analyzed for the site and is discussed in UFSAR Section 2.4.4. The conclusion that adequate protection exists from surge flooding was based on the presence of a revetment fronting the plant that was last inspected in 1981, according to Section 2.4.4 of the UFSAR. The licensee did not acknowledge in the Integrated Plan that the reevaluation of the flooding hazard, as required by the 10 CFR 50.54(f) letter of March 12, 2012, has yet to be completed. This is combined with Confirmatory Item 3.1.1.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 screening 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.

On pages 6 and 7 of its Integrated Plan, the licensee described that Phase 2 FLEX components will be stored at the site and will be protected against external events either by design or location. At the time of submittal of the Integrated Plan, FLEX equipment storage location(s) had not been selected. In several other sections of the Integrated Plan the licensee described that structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.

During the audit, the licensee provided additional information describing that all the "N" FLEX equipment will be located in a fully protected (robust) structure(s). This equipment will be protected from the Ginna PMF. The "N+1" equipment will be housed in NYS Building Code commercial structures. Flood Protection for the "N+1" equipment will be procedurally accomplished using flood barriers or relocation to higher ground.

Support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by a seismic event or historically extreme wind forces, or be located in an outside location with comparable extreme weather protection.

Protection of support equipment mentioned above from flooding was not specifically addressed. But during the audit, the licensee described that procedural guidance will direct operators to pre-stage equipment prior to an impending flood. The reviewer concluded that support equipment reasonably would be included and some equipment, like tow vehicles, would likely be utilized during the pre-staging.

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 protection of FLEX equipment considering the 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 [reactor coolant system], isolating accumulators, isolating RCP [reactor coolant pump] 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.

On page 4 of its Integrated Plan, the licensee described that per Table 6-1 of NEI 12-06, the warning time of the PMF would be days and the persistence of the event could be many hours to days. During the audit the licensee provided additional information describing that the PMF at Ginna is caused by an extreme regional precipitation event. Flood modeling has been performed showing an eight to ten hour timeframe for flood recession. Thus, the applicable flooding hazard has warning time and is of short persistence.

During the audit, the licensee described that procedural guidance will direct operators to pre-stage equipment prior to an impending flood. Equipment to be pre-staged includes a portable diesel generator. Details regarding equipment and plant configuration prior to a flood will be developed within the Ginna detailed timeline analysis.

As noted above in section 3.1.2.1, during the audit the licensee described that support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by a seismic event or historically extreme wind forces, or be located in an outside location with comparable extreme weather protection.

Protection of support equipment mentioned above from flooding was not specifically addressed. But during the audit, the licensee described that procedural guidance will direct operators to pre-stage equipment prior to an impending flood. The reviewer concluded that support equipment reasonably would be included and some equipment, like tow vehicles, would likely be utilized during the pre-staging.

Regarding flooding effects on the UHS, during the audit the licensee provided additional information describing that the primary means to access the UHS is via the installed drafting station, with the secondary means via utilization of hard suction hoses with installed strainers placed over the edge of the discharge canal wall. The strainers will remove larger debris. More than fifteen hours are available before requiring utilization of either of these methods.

During the audit the licensee described that it plans to evaluate the use of its fuel oil storage tanks located within the owner controlled area, as well as fuel trailers. All Phase 1 and Phase 2 mitigation equipment contains at least six hours of diesel fuel. As detailed equipment usage is determined, fuel consumption will be fully evaluated. Travel paths for fuel handling equipment will utilize the same routes as the portable equipment, and as such will be appropriately evaluated.

On page 6 of its Integrated Plan, the licensee stated, in part:

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

These statements are not specific to a flooding event, and represent assumptions, but they indicate the licensee is considering access and egress.

On several pages of its Integrated Plan, the licensee made a general statement that connection points for FLEX equipment connections will be located in a structure protected against flooding. New FLEX connections will be installed to meet station and FLEX protection requirements.

During the audit the licensee provided additional information describing that the PMF has substantial warning time. The Ginna battery charger connections, reactor coolant system (RCS) connections, and auxiliary feedwater (AFW) connections will be protected from the design basis flood. Service water connections to the containment recirculation fan coolers (CRFCs) are located below the flood level. A calculation is being performed to determine when the CRFCs would be needed following an ELAP event. Ginna will take procedural action to connect hoses to the CRFC connections prior to an impending flood if cooling to the CRFCs is required prior to recession of the floodwater.

The potential for surge flooding from Lake Ontario is not considered limiting and is not discussed in the integrated plan.

No information was presented in the Integrated Plan to indicate whether water extraction or temporary flood barriers are being considered.

As noted above, during the audit the licensee provided additional information describing that most of the FLEX connection points are protected from inundation during a design basis flood. During the audit the licensee further described that flood barriers used on site are stored immediately adjacent to the openings in which they are to be installed. The installation of these barriers is performed on an annual frequency for testing and Ginna has validated they can be installed rapidly during a reasonable simulation performed per Recommendation 2.3 of the March 12, 2012 10 CFR 50.54(f) letter.

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 deployment of FLEX equipment considering the 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.

The Integrated Plan contains numerous descriptions of general procedural guidance being developed that are reasonably applicable to mitigation of damage from all analyzed hazards:

In several sections of its Integrated Plan the licensee states:

> ECA-0.0, *Loss of All AC Power,* provides actions to respond to a loss of all AC power.
>
> *E-0, Reactor Trip or Safety Injection,* provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of a reactor trip or safety injection and to assess plant conditions, and identify the appropriate recovery procedure.

> AP-ELEC.3, *Loss of 12A and/or 12B Transformer (Below 350°F),* provides actions to respond to a loss of 12A or 12B SS Transformer when RCS temperature is less than 350 F.
>
> ECA-0.0, E-0, and AP-ELEC.3 will remain the entry points for ELAP/LUHS events. FLEX Support Guidelines (FSGs) are being developed and will be entered from ECA-0.0 and, if appropriate, other procedures.

Additionally, in several sections of its Integrated Plan, the licensee described that Ginna will utilize the industry developed guidance from the Pressurized Water Reactor Owners Group (PWROG), Electric Power Research Institute (EPRI) and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current Emergency Operating Procedures (EOPs).

The reviewer concluded that generally, it is reasonable to expect that actions necessary to support the deployment considerations with regard to applicable hazards events will be incorporated into plant procedures.

As noted above in section 3.1.2.2, on several pages of its Integrated Plan, the licensee made a general statement that connection points for FLEX equipment connections will be located in a structure protected against flooding. New FLEX connections will be installed to meet station and FLEX protection requirements.

During the audit the licensee provided additional information describing that service water connections to the CRFCs are located below the flood level. A calculation is being performed to determine when the CRFCs would be needed following an ELAP event. Ginna will take procedural action to connect hoses to the CRFC connections prior to an impending flood if cooling to the CRFCs is required prior to recession of the floodwater.

As noted above in section 3.1.2.2, during the audit the licensee described that flood barriers used on site are stored immediately adjacent to the openings in which they are to be installed. The installation of these barriers is performed on an annual frequency for testing and Ginna has validated they can be installed rapidly during a reasonable simulation performed per Recommendation 2.3 of the March 12, 2012 10 CFR 50.54(f) letter.

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 considering 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.

The discussion in section 3.1.1.4, above, Considerations in Using Offsite Resources – Seismic Hazard, is applicable for consideration 1.

As described in section 3.1.2.2, above, Deployment of FLEX Equipment – Flooding Hazard, the applicable flooding hazard has warning time and is of short 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 provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to considerations in using offsite resources considering the flooding hazard, 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.

On page 5 of its Integrated Plan, the licensee described that in accordance with Figure 7-1 of NEI 12-06, Ginna has a 1 in 1 million chance per year of a hurricane induced peak gust wind speed exceeding 120 miles per hour (mph). The licensee described that as a result, the site does not need to assess the impact of extreme straight winds. The reviewer noted that the purpose of this Figure is to screen for the applicability of the hurricane hazard, not the straight wind hazard, which NEI 12-06, Section 7 addresses as follows in the prefatory matter: "While extreme straight winds can present a challenge to off-site power supplies, these conditions are not judged to be significant factors in contributing to a simultaneous ELAP and LUHS and will not be further considered in [the guidance of NEI 12-06]."

In accordance with Figure 7-2 of NEI 12-06, Ginna has a 1 in 1 million chance of tornado wind speeds of 169 mph. As this is greater than the threshold of 130 mph, the site will assess tornadoes and tornado missiles impact.

The screening for the high winds hazards to Ginna was appropriately assessed by comparing the site location to NEI 12-06, Figures 7-1 and 7-2.

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 provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to screening for the 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.

On pages 6 and 7 of its Integrated Plan, the licensee described that Phase 2 FLEX components will be stored at the site and will be protected against external events either by design or location. At the time of submittal of the Integrated Plan, FLEX equipment storage location(s) had not been selected. In several other sections of the Integrated Plan the licensee described that structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.

During the audit, the licensee provided additional information describing that all the "N" FLEX equipment will be located in a fully protected (robust) structure(s). This equipment will be protected from the effects of a tornado and missile spectrum consistent with Regulatory Guide 1.76, Rev. 1. The "N+1" equipment will be housed in NYS Building Code commercial structures designed for wind, and other natural elements consistent with historical extreme weather conditions in the Ginna region. Support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by historically extreme wind forces, or be located in an outside location with comparable extreme weather protection.

The reviewer concluded that because at least N sets of equipment is protected in robust structures, storage of the N+1 set of equipment within "evaluated storage locations" conforms to NEI 12-06 Section 7.3.1.

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 provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to protection of FLEX equipment considering the high winds hazard, if these requirements are implemented as described.

3.1.3.2 Deployment of FLEX Equipment - High Winds 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.

Regarding considerations 1, 2, and 5, Ginna is not susceptible to hurricane conditions based on its hazard assessment.

As noted above in section 3.1.3.1, during the audit the licensee described that support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by historically extreme wind forces, or be located in an outside location with comparable extreme weather protection.

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 deployment of FLEX equipment considering high winds hazards, if these requirements are implemented as described.

3.1.3.3 Procedural Interfaces - High Winds 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.

The Integrated Plan contains numerous descriptions of general procedural guidance being developed that are reasonably applicable to mitigation of damage from all analyzed hazards:

In several sections of its Integrated Plan the licensee states:

> ECA-0.0, *Loss of All AC Power,* provides actions to respond to a loss of all AC power.
>
> *E-0, Reactor Trip or Safety Injection,* provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of a reactor trip or safety injection and to assess plant conditions, and identify the appropriate recovery procedure.
>
> AP-ELEC.3, *Loss of 12A and/or 12B Transformer (Below 350°F),* provides actions to respond to a loss of 12A or 12B SS Transformer when RCS temperature is less than 350 F.
>
> ECA-0.0, E-0, and AP-ELEC.3 will remain the entry points for ELAP/LUHS events. FLEX Support Guidelines (FSGs) are being developed and will be entered from ECA-0.0 and, if appropriate, other procedures.

Additionally, in several sections of its Integrated Plan, the licensee described that Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

The reviewer concluded that generally, it is reasonable to expect that actions necessary to support the deployment considerations with regard to applicable hazards events will be incorporated into plant procedures.

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 considering high winds hazards, if these requirements are implemented as described.

3.1.3.4 Considerations in Using Offsite Resources – High Winds 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.

Regarding consideration 1, Ginna is not susceptible to hurricane conditions based on its hazard assessment.

The discussion in section 3.1.1.4, above, Considerations in Using Offsite Resources – Seismic Hazard, is applicable for consideration 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 provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to considerations in using offsite resources considering the high winds hazard, if these requirements are implemented as described.

3.1.4 Snow, Ice and Extreme Cold

As discussed in part 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.

On page 5 of its Integrated Plan, the licensee described that Ginna is located above the 35th parallel; thus, the capability to address hindrances caused by extreme snowfall with snow removal equipment will be provided. The licensee also described that the lowest recorded temperature for the site region is -16 degrees F and Ginna is located within the region characterized by EPRI as ice severity level 5.

Thus, Ginna screens in for assessing snow, ice, and extreme cold.

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 of snow, ice and extreme cold hazards, if these requirements are implemented as described.

3.1.4.1 Protection 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.).

On pages 6 and 7 of its Integrated Plan the licensee described that Phase 2 FLEX components will be stored at the site and will be protected against external events either by design or location. At the time of submittal of the Integrated Plan, FLEX equipment storage location(s) had not been selected. In several other sections of the Integrated Plan the licensee described that structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.

During the audit, the licensee provided additional information describing that all the "N" FLEX equipment will be located in a fully protected (robust) structure(s). The "N+1" equipment will be housed in NYS Building Code commercial structures designed for snow, and other natural elements consistent with historical extreme weather conditions for the Ginna region. Support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by a seismic event or historically extreme wind forces, or be located in an outside location with comparable extreme weather protection.

The reviewer concluded that because at least N sets of equipment is protected in robust structures, storage of the N+1 set of equipment within "evaluated storage locations" conforms to NEI 12-06 Section 8.3.1.

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 provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to protection of FLEX equipment considering snow, ice and extreme cold hazards, 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.

On page 6 of its Integrated Plan, the licensee described that portable FLEX components will be procured commercially.

No other information was presented in the Integrated Plan regarding equipment quality, function, or procurement standards.

No information was presented in the Integrated Plan regarding consideration of any manual operations required by plant personnel in extreme conditions.

During the audit, the licensee provided additional information describing that equipment will be commercial grade, transportable and inherently rugged. "Power Prime Pumps" (FLEX pumps) are currently in use at hydraulic fracturing (frac) sites and oil fields worldwide and subject to extreme conditions. All Ginna FLEX designated diesel engines have battery conditioners and block heaters. One "N" designated FLEX pump will be stationed in an environmentally controlled building to allow for immediate use. "N+1" equipment will be stored in a structure that will protect the equipment from weather hazards. The combination of the two (building and heaters) will ensure reliable starting of equipment under any extreme weather conditions. Personnel will have to tow the equipment to the designated staging areas, hook up hoses, run cables and make connections depending on strategy requirements. The tow vehicle will have snow and debris removal capability to allow operator access to connection points/staging area. A large debris remover will also be available should it become necessary. Operation of portable equipment under extreme conditions will be assessed and updated in a future six-month update.

Regarding snow and ice removal, as noted above in section 3.1.1.1, during the audit the licensee described that support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by a seismic event or historically extreme wind forces, or be located in an outside location with comparable extreme weather protection.

On page 77 of its Integrated Plan, the licensee described that it will implement a design change to install a protected primary and secondary means of accessing the UHS for all BDBEEs, and install necessary modifications to meet required deployment times. The licensee further described that this must also address how debris in the UHS or other raw water sources will be filtered / strained and whether the resulting debris will affect core cooling.

During the audit, the licensee provided additional information describing that the primary means to access the UHS is via the installed drafting station, with the secondary means via utilization of hard suction hoses with installed strainers placed over the edge of the discharge canal wall. The strainers will remove larger debris. More than fifteen hours are available before requiring utilization of either of these methods.

No further information was presented in the Integrated Plan or during the audit addressing loss of access to the UHS and flow path due to extreme low temperatures, e.g., due to ice blockage or formation of frazil ice. This is 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 FLEX equipment considering snow, ice and extreme cold hazards, 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.

As noted above in section 3.1.1.1, during the audit the licensee described that support equipment, such as debris removers, tow vehicles or fuel trailers, will either be housed in commercial structures, evaluated to not be damaged by a seismic event or historically extreme wind forces, or be located in an outside location with comparable extreme weather protection. These vehicles include capabilities for snow and ice removal.

As discussed in Section 3.1.2.3 above, the Integrated Plan contains numerous descriptions of general procedural guidance being developed that are reasonably applicable to mitigation of damage from all analyzed hazards. In addition, the licensee described that Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06.

The reviewer concluded that generally, it is reasonable to expect that actions necessary to support the deployment considerations with regard to applicable hazards events will be incorporated into plant procedures.

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 considering snow, ice and extreme cold hazards, 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 materials and equipment.

The discussion in section 3.1.1.4, above, Considerations in Using Offsite Resources – Seismic Hazard, is applicable for the snow, ice and extreme cold hazards.

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 considerations in using offsite resources considering snow, ice and extreme cold hazards, if these requirements are implemented as described.

3.1.5 High Temperatures

NEI 12-06, Section 9.2 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.

On page 5 of its Integrated Plan, the licensee described that the maximum temperature observed for the site region has been 100 degrees F. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

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 of 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.

On page 5 of its Integrated Plan, the licensee described that the maximum temperature observed for the site region has been 100 degrees F. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

During the audit the licensee provided additional information describing that equipment will be commercial grade, transportable and inherently rugged. "Power Prime Pumps" (FLEX pumps) are currently in use at "frac" sites and oil fields worldwide and subject to extreme conditions. One "N" designated FLEX pump will be stored in an environmentally controlled building to allow for immediate use. The spare "N+1" equipment will be stored in a structure that will protect the equipment from weather hazards. Operation of portable equipment under extreme conditions will be assessed and updated in a future six-month update.

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 protection of FLEX equipment considering 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.

During the audit the licensee provided additional information describing that equipment will be commercial grade, transportable and inherently rugged. "Power Prime Pumps" (FLEX pumps) are currently in use at "frac" sites and oil fields worldwide and subject to extreme conditions. One "N" designated FLEX pump will be stationed in an environmentally controlled building to allow for immediate use. "N+1" equipment will be stored in a structure that will protect the equipment from weather hazards. Operation of portable equipment under extreme conditions will be assessed and updated in a future six-month update.

On page 5 of its Integrated Plan, the licensee described that the maximum temperature observed for the site region has been 100 degrees F. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

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 deployment of FLEX equipment considering the high temperature hazard, if these requirements are implemented as described.

3.1.5.3 Procedural Interfaces: As discussed in NEI 12-06, Section 9.3.3:

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

During the audit the licensee provided additional information describing that equipment will be commercial grade, transportable and inherently rugged. "Power Prime Pumps" (FLEX pumps) are currently in use at "frac" sites and oil fields worldwide and subject to extreme conditions. One "N" designated FLEX pump will be stationed in an environmentally controlled building to allow for immediate use. "N+1" equipment will be stored in a structure that will protect the equipment from weather hazards. Operation of portable equipment under extreme conditions will be assessed and updated in a future six-month update.

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 considering the high temperature hazard, 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 discussed in NEI 12-06, Section 1.3, plant specific analysis will determine the duration of each phase.

3.2.1 RCS Cooling and Heat Removal, and RCS Inventory Control Strategies

NEI 12-06, Table 3-2 and Appendix D summarize one acceptable approach for the reactor core cooling strategies. This approach uses the installed AFW/emergency feedwater (EFW) system to provide steam generator (SG) makeup sufficient to maintain or restore SG level in order to continue to provide core cooling for the initial phase. This approach relies on depressurization of the SGs for makeup with a portable injection source in order to provide core cooling for the transition and final phases. This approach accomplishes reactor coolant system (RCS) inventory control and maintenance of long-term subcriticality through the use of low leakage reactor coolant pump seals and/or borated high pressure RCS makeup with a letdown path. In mode 5 (cold shutdown) and mode 6 (refueling) with SGs not available, this approach relies on an on-site pump for RCS makeup and diverse makeup connections to the RCS for long-term RCS makeup with borated water and residual heat removal from the vented RCS.

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 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 3.2.1.4 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) prevention of recriticality as discussed in Appendix D, Table D-1.

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).

Section 3.1 of WCAP-17601-P discusses the PWROG's recommendations that cover the following subjects for consideration in developing FLEX mitigation strategies: (1) initiation of cooldown, (2) development of inventory copying time, (3) instrumentation required for attaining core cooling, (4) sub-criticality study, (5) maintaining adequate shutdown margin by various sources, (6) the use of safe shutdown (SSD) low -leakage seals, (7) feedwater interruption times, (8) feeding a single SG, (9) prevention of nitrogen injection from accumulators, and (10) cooldown limits on SGs.

During the audit, the licensee was requested to discuss their position on each of the Section 3.1 recommendations for developing the FLEX mitigation strategies. Specifics of the request included listing the recommendations that are applicable to the plant, providing rationale for the applicability, addressing how the applicable recommendations are considered in the ELAP coping analysis, discussing the plan to implement the recommendations, and providing the rationale for each of the recommendations that are determined to be not applicable to the plant.

In response to the NRC request the licensee provided additional information addressing the above items.

The recommendation to evaluate the strategy for accumulator makeup capability and isolation/venting to prevent gas injection is applicable to Ginna. Licensee actions to develop and implement procedures to close Safety Injection (SI) Accumulator injection valves or vent the SI Accumulator prior to nitrogen injection into the RCS is still open. The licensee stated this will be addressed in the August 2014 Integrated Plan update. The licensee also described that boration requirements still need to be determined and will be provided in the August 2014 six-month update. This is identified as Confirmatory Item 3.2.1.A in Section 4.2.

The recommendation to consider the prioritization of staging portable equipment that may be required to isolate/vent the accumulators when certain cooldown maneuvers are necessitated is applicable to Ginna. The licensee describe that this recommendation will be evaluated and included in the August 2014 six-month update. This is identified as Confirmatory Item 3.2.1.B in Section 4.2.

3.2.1.1 Computer Code Used for the 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 off site.

On pages 10 and 11 of its Integrated Plan, the licensee described that WCAP-17601-P and PA-PSC-0965, *PWROG Core Cooling Position Paper,* were reviewed and their guidance utilized to assist with development of the Ginna Integrated Plan.

WCAP-17601-P utilizes the NOTRUMP code in the ELAP analysis and provides the reference case for Westinghouse Nuclear Steam Supply System (NSSS) designed plants. It assumes standard RCP seal packages to determine the minimum adequate core cooling time with respect to RCS inventory control (i.e., core uncovery). The reference case models a Westinghouse 4 loop plant, which showed adequate core cooling for 55 hours. Hand calculations were performed for other Westinghouse plant types considering RCS volume, number of loops and RCP model differences. All the cases assume 21 gallons per minute (gpm) seal leakage per pump at normal operating pressure and temperature. In some cases, NOTRUMP was executed as an informal check of the results.

During the audit the licensee provided additional information describing that Ginna is in the process of developing detailed timelines for the worst case accident during all modes of operation. These timelines will be used in conjunction with the thermal hydraulic analysis to document the duration of each phase for each critical function, and the basis for the duration. The timelines are expected to be completed by June 2014. The Integrated Plan will be updated following completion of the timelines. Ginna is relying on current licensing basis analysis and, where necessary, performing additional thermal hydraulic calculations using RELAP5 Modification 3.3 and GOTHIC versions 7.2 and 8.0. This is identified as Confirmatory Item 3.2.1.1.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 the computer codes used to perform ELAP analysis, if these requirements are implemented as planned.

3.2.1.2 RCP Seal Leakage Rates

NEI 12-06, Section 1.3 states:

> 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.

During an ELAP event, cooling to the RCPs seal packages will be lost and water at high temperatures may degrade seal materials, leading to excess seal leakage from the RCS. Without ac power available to the emergency core cooling system, inadequate core cooling may eventually result from the leakage out of the seals. The ELAP analysis credits operator actions to align the high pressure RCS makeup sources and replenish the RCS in order to ensure the core is covered with water, thus precluding inadequate core cooling. The amount of high pressure RCS makeup needed is mainly determined by the seal leakage rate, therefore the seal leakage rate is of primary importance in an ELAP analysis as greater values of the seal leakage rates will result in a shorter time period for the operator to align the high pressure RCS makeup water sources.

During the audit process the licensee described that installation of low-leakage RCP seals was evaluated by Ginna, but will not be implemented due to the 10 CFR Part 21 issue identified by Westinghouse for their low-leakage seals. Therefore, the WCAP-17601-P Section 5.7.1 discussion of Westinghouse Generic Case Results with safe shutdown/low-leakage seals is no longer applicable. Ginna is currently working on its revised strategy that will account for the need for additional RCS borated makeup for RCS inventory control and to maintain subcriticality. The revised strategy will provide the basis for the assumed RCP seal leakage for the Model 93 RCPs, which are installed at Ginna. Ginna expects to have the revised strategies determined for the August 2014 update.

The licensee is developing a Sequence of Events (SOE) in their Integrated Plan, which will include the time constraints and the technical basis for their site. The SOE is based on an analysis using specific RCP seal leakage rates. The issue of RCP seal leakage rates was identified as a Generic Concern and was addressed by NEI in the following submittals:

- WCAP-17601-P, Revision 1, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs" dated January 2013 (ADAMS Accession No. ML13042A011 and ML13042A013 (Non-Publicly Available)).

- A position paper dated August 16, 2013, entitled "Westinghouse Response to NRC Generic Request for Additional Information (RAI) on Reactor Coolant Pump (RCP) Seal Leakage in Support of the Pressurized Water Reactor Owners Group (PWROG)" (ADAMS Accession No. ML13235A151 (Non-Publicly Available)).

After review of these submittals, the NRC staff has placed certain limitations for Westinghouse designed plants. Those limitations and their corresponding Confirmatory Item numbers for this TER are provided as follows:

(1) For the plants using Westinghouse RCPs and seals that are not the SHIELD shutdown seals, the RCP seal initial maximum leakage rate should be greater than or equal to the upper bound expectation for the seal leakage rate for the ELAP event (21 gpm/seal) discussed in the PWROG position paper addressing the RCP seal leakage for Westinghouse plants (Reference 2). If the RCP seal leakage rates used in the plant-specific ELAP analyses are less than the upper bound expectation for the seal leakage rate discussed in the position paper, justification should be provided. If the seals are changed to non-Westinghouse seals, the acceptability of the use of non-Westinghouse seals should be addressed, and the RCP seal leakage rates for use in the ELAP analysis should be provided with acceptable justification. This is identified as Confirmatory Item 3.2.1.2.A.

(2) In some plant designs, such as those with 1200 to 1300 psia SG design pressures and no accumulator backing of the main steam system power-operated relief valve (PORV) actuators, the cold legs could experience temperatures as high as 580 ^{0}F before cooldown commences. This is beyond the qualification temperature (550 ^{0}F)

of the O-rings used in the RCP seals. For those Westinghouse designs, a discussion of the information (including the applicable analysis and relevant seal leakage testing data) should be provided to justify that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate of 21 gpm/seal used in the ELAP is adequate and acceptable. This is identified as Confirmatory Item 3.2.1.2.B.

(3) Some Westinghouse plants have installed or will install the SHIELD shutdown seals, or other types of low leakage seals, and have credited or will credit a low seal leakage rate (e.g., 1 gpm/seal) in the ELAP analyses for the RCS response. For those plants, information should be provided to address the impacts of the Westinghouse 10 CFR Part 21 report, "Notification of the Potential Existence of Defects Pursuant to 10 CFR Part 21," dated July 26, 2013 (ADAMS No. ML13211A168) on the use of the low seal leakage rate in the ELAP analysis. (This limitation is not applicable to Ginna.)

(4) If the seals are changed to the newly designed Generation 3 SHIELD seals, or non-Westinghouse seals, the acceptability of the use of the newly designed Generation 3 SHIELD seals, or non-Westinghouse seals should be addressed, and the RCP seal leakages rates for use in the ELAP analysis should be provided with acceptable justification. Because Ginna plans to keep the currently installed seals, this limitation is not applicable to Ginna.

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 reactor coolant pump seal leakages rates, if these requirements are implemented as planned.

3.2.1.3 Decay Heat

NEI 12-06, Section 3.2.1.2 under initial plant conditions states in part:

> The initial plant conditions are assumed to be the following:
>
> Prior to the event the reactor has been operating at 100 percent rated thermal power for at least 100 days or has just been shut down from such a power history as required by plant procedures in advance of the impending event.

On pages 33 and 97 of its Integrated Plan, the licensee describes that the plant is assumed to be at 100% power at time 0 (SOE) and refers to a 100% power history. The reviewer assumed this equates to 100% power for at least 100 days, which is typical for decay heat analyses.

The licensee's Integrated Plan provided insufficient detail to provide reasonable assurance that the plan conforms to NEI 12-06 with regards to the thermal hydraulic analyses developed to support plant- specific decision-making and the justification for the duration of each phase. Specifically, assumption 4 on page 4-13 of WCAP-17601 states that decay heat is per ANS 5.1-1979 + 2 sigma, or equivalent.

During the audit the licensee was requested to address the applicability of this assumption 4 to Ginna. If the ANS 5.1-1979 + 2 sigma model is used in the Ginna ELAP analysis, address the adequacy of the use of the decay heat model in terms of the plant-specific values of the following key parameters: (1) initial power level, (2) fuel enrichment, (3) fuel burnup, (4) effective full power operating days per fuel cycle, (5) number of fuel cycles, if hybrid fuels are used in the core, and (6) fuel characteristics (addressing whether they are based on the beginning of the cycle, middle of the cycle, or end of the cycle). If a different decay heat model is used, describe the specific model and address the adequacy of the model and the analytical results.

In the response to these questions, the licensee indicated that the decay heat model in UFSAR Chapter 6 will be used. The model in UFSAR Chapter 6 is ANS Standard 5.1 with an included 2 sigma uncertainty band.

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 decay heat, if these requirements are implemented as described.

3.2.1.4 Initial Values for Key Plant Parameters and Assumptions

NEI 12-06, Section 3.2 provides a series of assumptions to which initial key plant parameters (core power, RCS temperature and pressure, etc.) should conform. When considering the code used by the licensee and its use in supporting the required event times for the SOE, it is important to ensure that the initial key plant parameters not only conform to the assumptions provided in NEI 12-06, Section 3.2, but that they also represent the starting conditions of the code used in the analyses and that they are included within the code's range of applicability.

On pages 33 and 97 of its Integrated Plan, the licensee describes that the plant is assumed to be at 100% power at time 0 (SOE) and refers to a 100% power history. The reviewer assumed this equates to 100% power for at least 100 days, which is typical for decay heat analyses.

The reviewer did not identify any initial conditions or assumptions applied in the Integrated Plan contrary to those stated in NEI 12-06, Sections 3.2.1.2 and 3.2.1.3.

On pages 10 and 11 of its Integrated Plan, the licensee described that WCAP-17601-P and PA-PSC-0965, *PWROG Core Cooling Position Paper,* were reviewed and their guidance utilized to assist with development of the Ginna Integrated Plan.

During the audit the licensee provided additional information describing that Ginna is in the process of developing detailed timelines for the worst case accident during all modes of operation. These timelines will be used in conjunction with the thermal hydraulic analysis to document the duration of each phase for each critical function, and the basis for the duration. The timelines are expected to be completed by June 2014. The Integrated Plan will be updated following completion of the timelines. Ginna is relying on current licensing basis analysis and, where necessary, performing additional thermal hydraulic calculations using RELAP5 Modification 3.3 and GOTHIC versions 7.2 and 8.0. This was previously identified as Confirmatory Item 3.2.1.1.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 initial values for key plant parameters and assumptions, if these requirements are implemented as planned.

3.2.1.5 Monitoring Instrumentation and Controls

NEI 12-06, Section 3.2.1.10 states in part:

> 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:
>
> - SG Level
> - SG Pressure
> - RCS Pressure
> - RCS Temperature
> - Containment Pressure
> - 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.

On pages 20, 21, 25, 46, 47, 51, 57 and 58 of its Integrated Plan, regarding Key Reactor/Containment Parameters for the various safety functions during Phase 1 and Phase 2, the licensee listed the key parameters necessary to support strategy implementation for the various hazards. The following is a comprehensive list for all hazards for all safety functions except maintain SFP cooling:

BATT Volts	EI/PG	DC BUS A VOLTMETER 125V
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V
AFW Flow	FT-2015	TDAFW PUMP DISCH FLOW FI-2031
CST Level	LI-2022A	CST A LVL
CST Level	LI-2022B	CST B LVL
S/G Level	LI-505	S/G A WIDE RANGE LEVEL
S/G Level	LI-507	S/G B WIDE RANGE LEVEL
S/G Press	PI-468	S/G A PRESS
S/G Press	PI-478	S/G B PRESS
RCS Press	PI-420	RCS LO RANGE PRESS
RCS Press	PI-429	PRZR PRESS
RCS Press	PI-430	PRZR PRESS
RCS Press	PI-431	PRZR PRESS
PZR Level	LI-426	PRZR LVL
PZR Level	LI-427	PRZR LVL
PZR Level	LI-428	PRZR LVL
PZR Level	LI-433A	PRZR LVL COLD CAL (SS)
RCS Temp	TI-410A-1	WIDE RANGE THOT
RCS Temp	TI-410B-1	WIDE RANGE TCOLD
RCS Temp	CETA	CORE EXIT THERMOCOUPLE
RCS Temp	CETB	CORE EXIT THERMOCOUPLE
CNMT Press	PI-945	CNMT PRESS (0-60 psig)
CNMT Press	PI-947	CNMT PRESS (0-60 psig)

CNMT Press	NONE QUALIFIED (Transmitters and/or Cables Not Protected) (Tornado missile event)

On page 47 of its Integrated Plan, the licensee identified an open item (#20 according to the August 2013 update) to identify instrumentation and develop procedures to take field readings of necessary parameters, including PI-430 (RCS pressure), and LI-427 (Pressurizer level). On page 57 of its Integrated Plan, the licensee identified an open item (#51 according to the August 2013 update) to implement a design change/strategy to quality containment pressure instrumentation for a Tornado Missile event.

On page 67 of its Integrated Plan, the licensee described that the wide range SFP level instrumentation to satisfy the NRC Order EA-12-051, is not yet identified. SFP water level instrument numbers will be provided upon detailed design completion. The licensee identified this as an open item (#58 according to the August 2013 update).

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 and controls, if these requirements are implemented as described.

3.2.1.6 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, in part, 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 3-2 (PWRs). Additional explanation of these functions and capabilities are provided in NEI 12-06 Appendix D, "Approach to PWR Functions."

In its Integrated Plan, the licensee provided the SOE timeline as a tabulation of strategies in Attachments 1A and 1B, pages 92 - 98. Attachment 1A is the SOE Timeline (TDAFW Available) for ELAP/LUHS for events due to Snow, Ice, or High Temperature hazards. Attachment 1B is the SOE Timeline (TDAFW Not Available) for ELAP/LUHS for events due to Tornado Missile, Seismic or Flooding hazards. The difference is due to the fact that the TDAFW system is not hazard protected from Tornado Missile, Seismic or Flooding hazards.

On pages 7 - 10 of its Integrated Plan the licensee provided further details of the SOE and lists the strategies from Attachments 1A and 1B that have new time constraints required for success. At the time of submittal of the Integrated Plan, seventeen items were listed having new time constraints. Inasmuch as several of these have licensee identified Open Items associated with them, and numerous other licensee identified Open Items are characterized elsewhere throughout the Integrated Plan, it is clear that the Ginna overall FLEX strategy is evolving.

During the audit the licensee provided additional information describing that Ginna is developing detailed timelines for the worst case event for each mode of operation. The detailed timeline describes the operator action time required, equipment deployment times, equipment operation times, and is resource loaded showing the number of resources used for each task. These detailed timelines contain a basis for the duration of each event. The timelines themselves will then serve as a basis for the FLEX strategy. The timelines are expected to be completed by June 2014. This includes addressing the unresolved issue regarding the RCP seal leakage rates. Upon completion of the timelines, the Integrated Plan will be updated accordingly. This was previously identified as Confirmatory Item 3.2.1.1.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 the Sequence of Events.

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.

The NRC staff reviewed the licensee's Integrated Plan and determined 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 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. During the audit process, Ginna informed the NRC staff of their plan to abide by this generic resolution. The NRC staff will evaluate the licensee's resulting program through the audit and inspection processes.

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 Core Sub-Criticality

NEI 12-06 Table 3-2 states in part:

> All plants provide means to provide borated RCS makeup.

On pages 33 and 34 of its Integrated Plan, the licensee described that according to WCAP-17601-P Section 5.8, Re-Criticality with Lowered RCS Temperatures, Ginna will need to borate to maintain Keff less than 0.99 throughout the entire Cycle 36. The limiting time to start boration is end-of-life when boration must start within 14 hours of Reactor Trip. Because it is necessary to place some constraints on this scenario, WCAP-17601-P recommends that the low end of RCS temperatures be limited to no less than hot shutdown, i.e., 350 degrees F.

The licensee further described that PA-PSC-0965, *PWROG Core Cooling Position Paper,* states: "If xenon greater than equilibrium is required to maintain reactor subcritical at 350°F, then initiate boration prior to peak xenon of 8 hours post trip. Otherwise, initiate boration prior to xenon decay to level that may cause re-criticality at 350°F."

The licensee further described that boration to the RCS will be necessary to prevent re-criticality as xenon decay will otherwise result in net 220 percent millirho (pcm) positive core reactivity at end of life (EOL). CALC-2011-0009, *Cycle 36 Reactor Engineering Calculations,* Attachment 3 shows the maximum equilibrium xenon concentration as -2885 pcm at EOL. CALC-2011-0009, Section 8.12, calculates the available shutdown margin at EOL as -2665 pcm after the reactor trip and assuming all rods insert consistent with the Station Blackout (SBO) Program and NEI 12-06 assumptions. To maintain Keff < 0.99 per WCAP-17601-P, RCS boron concentration will need to be increased by 172 parts per million (ppm). (1220 pcm / -7.1 pcm/ppm boron worth at EOL).

The licensee further described that the rate of boric acid injection must be sufficient to offset the maximum addition of positive reactivity from decay of peak xenon associated with 100% power history. UFSAR Section 3.1.1.5.4, "Reactivity Hold-Down Capability," states "Sufficient boric acid from the RWST [refueling water storage tank] can also be injected to compensate for xenon decay beyond the equilibrium level, with one charging pump operating at its minimum speed, and thereby delivering in excess of the required minimum flow of approximately 9 gpm into the reactor coolant system." This required flow rate is checked on a cycle specific basis. Recent calculation CALC-2011-0009, Section 8.17, Minimum Charging Flow Required from RWST, documents that one charging pump, delivering a minimum of 9 gpm into the RCS, can keep up with xenon decay. Nine gpm is based on a charging pump delivery rate of 17 gpm; minus a maximum seal leakoff of 8 gpm. The basis for this flow rate (from the Technical Requirements Manual for the R. E. Ginna Nuclear Power Plant and ACB 2009-0005) assumes that boration from the RWST does not start until post-trip xenon equals pre-trip Xenon (19 to 20.5 hours from 100% Pre-Trip Reactor Thermal Power (RTP) from beginning of life (BOL) to EOL per CALC-2011-0009).

The licensee further described that Ginna CALC-2011-0009, Section 8.12, evaluates the maintenance-of-subcriticality during ECA-0.0 cooldown at EOL. ECA-0.0 directs operators to depressurize the SGs to 260 psig to decrease RCS temperature and pressure to cause SI accumulator injection. The "conservative analysis", including taking no credit for xenon addition, shows that a cooldown from 547 degrees F to 410 degrees F, commencing 20 minutes after the reactor trip and taking on the order of 20-30 minutes, will cause the reactor to go critical with

1130 pcm positive reactivity. More realistic conditions (e.g. accurate rod worths, trip from all rods out (ARO) condition, ARO xenon distribution, nominal versus limiting temperatures, post-trip xenon build in) would likely reduce the magnitude of the excess reactivity, but a re-criticality is still a distinct possibility.

The licensee further described that as discussed in the Integrated Plan section for Maintain Core Cooling & Heat Removal (SGs), cooldown is initiated to lower RCS cold leg temperatures for maintaining the integrity of the RCP seals and to inject the SI accumulators for RCS inventory control and long term subcriticality.

The licensee further described that PA-PSC-0965, *PWROG Core Cooling Position Paper,* provides a conservative approach for determining the target SG pressure with regard to preventing nitrogen injection from the SI accumulators when RCS pressure and temperature is being reduced by depressurizing intact SGs. EOP Setpoint H.8, "Minimum pressure that prevents nitrogen injection plus margin," follows the methodology in PA-PSC-0965, *PWROG Core Cooling Position Paper,* and determined the minimum SG pressure for which accumulator nitrogen injection will not occur is 260 psig. The margin discussed in PA-PSC-0965, *PWROG Core Cooling Position Paper,* and EOP Setpoint H.8 is 100 psig.

On pages 36 and 37 of its Integrated Plan, the licensee described that its borated water source for both its Phase 2 primary and alternate strategies will be a new FLEX boric acid storage tank (FBAST). The FBAST will be the former 10,000 gallon Standby Auxiliary Feedwater (SAFW) test tank located in the SAFW building. The SAFW test tank will be modified to hold borated water with the RWST boron concentration of at least 2750 ppm and no more than 3050 ppm and containing a minimum usable volume of 7,000 gallons. Heating of the FBAST is not required. At the maximum boron concentration of 3050 ppm, the FBAST solubility limit is well below 32 degrees F. The existing SAFW building heating system will maintain the FBAST temperature well above 32 degrees F. The SAFW building is a safety-related structure with administrative controls to ensure temperature remains above 60 degrees F.

For the alternate strategy, the licensee described that a portable boric acid blending device will allow refilling the FBAST and provide for inline use with portable pumps to inject borated water directly into the RCS.

Section 4.3.2 of WCAP-17601 indicates that one of the acceptance criteria of the ELAP analysis is to show that the core remains subcritical. During the audit the licensee was requested to:

1. Discuss whether the uniform boron mixing model was used in the ELAP analysis. If the perfect boron mixing model was used, address the compliance with the recommendations discussed in a PWROG whitepaper related to the boron mixing model. If a different model was used, address the adequacy of the use of the boron mixing model in the ELAP analysis with support of an analysis and/or boron mixing test data applicable to the ELAP conditions, where the RCS flow rate is low and the RCS may involve two-phase flow. Also, discuss how the boron concentration in the borated water added to the RCS is considered in the cooldown phase of the ELAP analysis, considering that it needs time for the added borated water to mix with water in the RCS.

2. Discuss the results of the plant specific boration analysis and show that the core will remain sub-critical throughout the ELAP event for the limiting condition with respect to shutdown margin. Note that the limiting conditions with respect to shutdown

margin may be different than for the core cooling analysis (e.g., no seal leakage versus the maximum postulated value).

In response, the licensee provided the following information:

Section 4.3.2 of WCAP-17601 states, "There shall be no return to criticality once the loss of all AC power has occurred. To ensure that the plants remain subcritical, a limit of Keff less than 0.99 (subcritical) is set. The exact needed level of subcriticality is somewhat subjective, but 0.99 was chosen because it provides some margin to account for the best estimate of generic reactor physics parameters assumed in this analysis."

1. A uniform mixing model will be assumed in the ELAP analysis. This will be in compliance with the recommendations discussed in the PWROG white paper related to the boron mixing model as discussed under item 3, below. Ginna will take credit for boron mixing during two phase flow. As documented in the Extended Power Uprate Request for Additional Information response, "Supplemental Response to Requests for Additional Information Regarding Topics Described by Letters Dated August 24, 2005 and October 28, 2005" (ML060180262), RCS mass flow rate increases during two-phase flow (Figure 8). Additional details on the two-phase RCS mass flow increase are documented in proprietary Westinghouse Calculation CN-LIS-05-163, "SBLOCA Cooldown Calculation Results for R.E. Ginna (RGE) Extended Power Uprate and 422V+ Fuel Upgrade Program." With a rather large change in mixture density throughout the core/hot leg/SG uphill tube side relative to the downhill side (from SG heat removal), the flow velocity increases. This continues with increasing void fraction until makeup to the RCS and the decline of decay heat allows the RCS to return to a subcooled state. RCS boration to support cooldown will credit the buildup of xenon, and the necessary boration will be completed with at least a one hour margin to the minimum shutdown margin (Keff less than 0.99) to preclude criticality and accounting for the added time necessary for the added borated water to mix with the water in the RCS.

2. The plant specific boron analysis is not complete. The boron analysis is scheduled for completion during the first half of 2014. Mitigation strategies will ensure that the core remains subcritical (Keff less than 0.99) throughout the ELAP event for the limiting condition with respect to shutdown margin, considering no RCP seal leakage and the maximum RCP seal leakage postulated value.

The NRC staff reviewed the licensee's Integrated Plan and determined that a Generic Concern associated with the modeling of the timing and uniformity of the mixing of a liquid boric acid solution injected into the reactor coolant system (RCS) under natural circulation conditions potentially involving two-phase flow is applicable to Ginna.

The PWROG submitted a position paper, dated August 15, 2013 (withheld from public disclosure due to proprietary content), which provides test data regarding boric acid mixing under single-phase natural circulation conditions and outlined applicability conditions intended to ensure that boric acid addition and mixing would occur under conditions similar to those for which boric acid mixing data is available. In an endorsement letter dated January 8, 2014 (ADAMS Accession No. ML13276A183), the NRC staff concluded that the August 15, 2013, position paper constitutes an acceptable approach for addressing boric acid mixing under natural circulation during an ELAP event, provided that the following additional conditions are satisfied:

(1) The required timing for providing borated makeup to the primary system should consider conditions with no reactor coolant system leakage and with the highest applicable leakage rate for the reactor coolant pump seals and unidentified reactor coolant system leakage.

(2) For the condition associated with the highest applicable reactor coolant system leakage rate, two approaches have been identified, either of which is acceptable to the staff:

a. Adequate borated makeup should be provided such that the loop flow rate in two-phase natural circulation does not decrease below the loop flow rate corresponding to single-phase natural circulation.

b. If loop flow during two-phase natural circulation has decreased below the single-phase natural circulation flow rate, then the mixing of any borated primary makeup added to the reactor coolant system is not to be credited until one hour after the flow in all loops has been restored to a flow rate that is greater than or equal to the single-phase natural circulation flow rate.

(3) In all cases, credit for increases in the reactor coolant system boron concentration should be delayed to account for the mixing of the borated primary makeup with the reactor coolant system inventory. Provided that the flow in all loops is greater than or equal to the corresponding single-phase natural circulation flow rate, the staff considers a mixing delay period of one hour following the addition of the targeted quantity of boric acid to the reactor coolant system to be appropriate.

During the audit, the licensee informed the NRC staff of its intent to abide by the generic approach discussed above. As such, the generic concern associated with modeling the timing and uniformity of boric acid mixing within the reactor coolant system (RCS) under natural circulation conditions potentially involving two-phase flow has been adequately addressed for Ginna. Confirmation that the additional conditions discussed above are satisfied is identified as Confirmatory Item 3.2.1.8.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 Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to core sub-criticality if these requirements are implemented as described.

3.2.1.9 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.

On page 23 of the Integrated Plan, the licensee states that the alternate Phase 2 strategy to maintain core cooling is to utilize a diesel-driven high capacity portable pump to supply the SGs with water from the new condensate storage tank (CST) should the SAFW Pump become unavailable. On page 24 of the Integrated Plan, the licensee states that the diesel-driven high capacity portable pump will provide a minimum of 215 gpm to a steam generator at a pressure sufficient to prevent nitrogen injection into the RCS from the SI accumulators.

On page 37 of the Integrated Plan, the licensee states that the alternate strategy for RCS inventory control will be to connect a portable diesel engine powered high pressure injection pump from the FLEX Boric Acid Storage Tank (FBAST) to the charging line to makeup to the RCS.

On pages 88 and 89 of its Integrated Plan, in the enclosure of PWR Portable Equipment Phase 2, the licensee lists eight pumps of varying flow rates and pressure capacities assigned to non-specific core cooling and spent fuel pool makeup uses and diesel fuel transfer needs. Additionally, non-specific hoses and power extension cables are listed with lengths and fittings "as needed".

Design information and supporting analysis developed for portable equipment that provides the inputs, assumptions, and documented analysis that the mitigation strategy and support equipment will perform as intended were not available for review. This is identified as Confirmatory Item 3.2.1.9.A in Section 4.2.

During the audit the licensee described that it plans to evaluate the use of its fuel oil storage tanks located within the owner controlled area, as well as fuel trailers. All Phase 1 and Phase 2 mitigation equipment contains at least six hours of diesel fuel. As detailed equipment usage is determined, fuel consumption will be fully evaluated. Travel paths for fuel handling equipment will utilize the same routes as the portable equipment, and as such will be appropriately evaluated.

Further discussion of diesel fuel necessary to operate the FLEX equipment is discussed below in Section 3.2.4.9, Portable Equipment Fuel.

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 portable pumps, if these requirements are implemented as described.

3.2.2 Spent Fuel Pool Cooling Strategies

NEI 12-06, Table 3-2 and Appendix D summarize one acceptable approach for the SFP cooling strategies. 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 spent fuel pool 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 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 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 initial 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.

On page 64 of its Integrated Plan, the licensee described that the Phase 1 SFP strategy will be to monitor SFP level to ensure coverage. The modification to install a new level indication with integral backup power supply will allow for remote monitoring. Water addition is not required before the end of Phase 1.

On pages 65, 66 and 67 of its Integrated Plan, the licensee described that maintaining the SFP full at all times during the ELAP event is not required; the requirement is to maintain adequate level to protect the stored spent fuel and limit exposure to personnel. Makeup to the SFP will be provided by one of four baseline capabilities:

The primary strategy will be to provide makeup to the SFP that exceeds SFP boil-off and provide a means to supply SFP makeup without accessing the SFP walkway. This will be accomplished by a design change to install a protected makeup connection to the SFP cooling piping so the necessary connecting hoses and/or equipment will work with existing pumps and water sources for filling the SFP.

The licensee further described that for Alternate Strategy 1, Procedure ER-SFP.2, *Diverse SFP Makeup and Spray,* provides multiple strategies for establishing a diverse means of SFP makeup for at least 12 hours without offsite supplies. Equipment and strategies are provided for concurrent makeup capability of 500 GPM via internal SFP makeup using two hose reel stations in the vicinity of the SFP and via use of a Diesel-Driven Portable Pump taking suction from either the City Water Yard Fire Loop or Lake Ontario from the Drafting Station west of the Screen House. ER-SFP.2, Section, *SFP Makeup from Internal Fire Header Water Source,* provides for establishing flow from Auxiliary Building Hose Reel #22 Isolation Valve through a 3 inch hose which is tied down in the Auxiliary building to feed the SFP. The procedure section titled, *SFP Makeup from Yard Loop Using Diesel Driven Portable Pump,* directs taking suction from Hydrant 12 via a 5 inch hose and discharging via a 5 inch hose to two 3 inch hoses connected to a Gated Wye within 50 ft of the SFP. The two 3 inch hoses are tied down in the Auxiliary building at the edge of SFP. If the Yard Loop is not available, the procedure section titled, *Alternate Makeup from Drafting Station (Yard Loop Unavailable),* directs aligning the Diesel Driven Portable Pump to take suction on the Lake Ontario Drafting Station using a 6 inch non-collapsible suction hose. The discharge arrangement is the same.

The licensee further described that for Alternate Strategy 2, SFP spray capability of at least 200 GPM is addressed using the Diesel Driven Portable Pump taking suction from either the Fire Yard Loop or the Lake Ontario Drafting Station west of the Screen House. ER-SFP.2, Sections, *SFP Spray from Yard Loop Using Diesel Driven Portable Pump,* and *Alternate Spray from the Drafting Station (Yard Loop Unavailable),* provide for the same Diesel Driven Portable Pump suction strategies as above. Discharge from the Diesel Driven Portable Pump for both suction options is through a 5 inch hose to two 3 inch hoses with Blitz Fire nozzles located within 75 feet of the SFP (near the RWST).

The licensee further described that for Alternate Strategy 3, Procedure EPIP- 1-18, *Discretionary Actions for Emergency Conditions,* Attachment 6, Emergency Spent Fuel Pool Cooling, provides the following additional SFP Cooling strategies: 1) Fill the SFP via the Skimmer system suction utilizing a fire hose reel; 2) Fill the SFP via the Service Water System using a "Deck Gun;" 3) Fill the SFP via the In House Fire Water System using a "Deck Gun;" 4) Fill the SFP via the City Water Yard Fire Loop using a "Deck Gun;" 5) Fill the SFP utilizing the Standby Heat Exchanger Flexible Piping from Service Water; or 6) Fill the SFP utilizing the Standby Heat Exchanger Flexible Piping from Fire Water.

During the audit the licensee provided additional information describing that Alternate Strategy 1 is now the Primary Strategy, Alternate Strategy 2 becomes Alternate Strategy 1, and the Primary Strategy will now be Alternate Strategy 2.

In its Integrated Plan the licensee also described that an analysis was being performed to determine if a vent pathway from the SFP is needed for steam and condensate to minimize the potential for steam to cause access and equipment problems in the Auxiliary Building.

During the audit, the licensee provided additional information that a draft GOTHIC model has been completed for the AB which includes the SFP area. This calculation evaluates the bounding extreme high and low outside air temperature cases. Results for the high temperature case show that crediting opening all doors to the outside at one hour and opening the tornado back draft dampers at five hours (to be included in the FLEX timeline and procedures as a requirement for high temperature conditions) results in temperatures below 110 degrees F within 10 ft of the floor elevations where operators will be accessing equipment and where the new SFP level transmitters will be located. Results for the low temperature case show that some combination of open and closed doors will be needed to prevent freezing. Analysis is currently in progress to determine action-required times to prevent freezing and assure battery performance. These actions will be incorporated into the FLEX strategy and procedures.

On page 70 of its Integrated Plan, the licensee described that the same strategies employed in Phase 2 can be employed in Phase 3. Additionally, a DG supplied from the RRC can power a SFP Cooling Pump.

During the audit, the licensee provided additional information describing that the Phase 3 SFP cooling strategies will utilize a portable FLEX pump providing cooling flow from Lake Ontario through a heat exchanger. A second pump will be used to circulate SFP water through the heat exchanger.

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 SFP cooling strategies, if these requirements are implemented as described.

3.2.3 Containment Functions Strategies

NEI 12-06, Table 3-2 and Appendix D provide some examples of acceptable approaches for demonstrating the baseline capability of the containment strategies to effectively maintain containment functions during all phases of an ELAP. For example: Containment pressure control/heat removal utilizing containment spray or repowering hydrogen igniters for ice condenser containments.

As indicated in its Integrated Plan, the licensee has not conducted an analysis to determine the containment pressure profile during an ELAP / LUHS event, and to justify that the instrumentation and controls in containment which are relied upon by operators are sufficient to perform their intended functions. This analysis was originally dependent upon which low leakage RCP seal technology is chosen to be installed. As described above in this technical evaluation, the licensee no longer plans to install low leakage RCP seals.

In the August 2013 six-month update to the Integrated Plan, the licensee described that the their open item to implement a design change to qualify containment pressure instrumentation for a Tornado Missile event is revised to implement a strategy to determine containment pressure after a Tornado Missile event. All six of the containment pressure channels have transmitter or cable Tornado Missile survivability concerns. However, two of the six containment pressure transmitters are located in an area protected from the external events applicable to Ginna. A strategy will be developed to obtain containment pressure readings at these locations.

During the audit process the licensee described that procedures will be developed for using hand-held instruments to take local readings of containment pressure. These measurements will be taken utilizing containment pressure transmitters located in the Auxiliary Building intermediate level. The structure is Seismic Class 1, flood protected and the intermediate level is protected from the effects of tornado winds and missiles.

During the audit the licensee described that the post-ELAP containment analysis is still in progress and is being performed using GOTHIC version 8.0. It is expected to be completed by June 2014. The analysis will indicate whether containment temperature could be of concern and determine if containment temperature is a parameter needed by the Operators to deal with an ELAP.

The licensee also described that for any needed containment cooling, preference will be given to utilizing CRFCs over Containment Spray, if the completed analysis support this. In the event that the CRFCs are used for heat removal, then the associated potential water hammer effects described in NRC Generic Letter 96-06 will be analyzed and an appropriate strategy will be selected.

Completion of the post-ELAP containment analysis is identified as Confirmatory Item 3.2.3.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 maintaining containment, if these requirements are implemented as described.

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.

In its Integrated Plan, the licensee made no reference regarding the need for, or use of, additional cooling systems necessary to assure that coping strategy equipment functionality can be maintained. Nonetheless, the only portable equipment used for coping strategies 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 UHS.

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 cooling water for 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 in part:

> *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 AFW pump room, ... 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 ... 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.
>
> 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.

On page 6 of its Integrated Plan, the licensee described that maximum environmental room temperatures for habitability or equipment availability are based on Nuclear Management and Resource Council (NUMARC) 87-00.

On pages 73 and 74 of its Integrated Plan, the licensee described that plant specific analyses were performed in August 1990 and December 15, 1993 to determine the maximum expected station blackout temperatures for the battery rooms, relay room, and the control room with the following results:

Area	Temperature	Required Operator Action
Control Room	115.9°F	a. Open doors to turbine deck
		b. Open cabinet doors
		Note: Flow through ceiling tiles have replaced selected solid tiles to eliminate the need for Operators to remove tiles during a blackout
Battery Room 1A	108.2°F	None
Battery Room 1A	106.2°F	None
Relay Room	103°F	None

The licensee further described that a GOTHIC calculation has been performed for both the TDAFWP and the atmospheric relief valves (ARV) areas of the intermediate building (IB) for the Ginna SBO Program. The results of these calculations indicate that with doors S37F, S44F, and SD/55 opened within 30 minutes, the ambient temperature of the TDAFWP area is between 110 degrees F and 115 degrees F. With this result, equipment operability does not appear to be of concern. Calculations utilizing the NUMARC 87-00 methodology performed for the ARV area have yielded a resultant ambient temperature of between 117 degrees F and 122 degrees F with doors S37F, S44F, and SD/55 opened within 30 minutes.

The licensee also described that minimal heat loads would be present in the AB RWST area during a station blackout and that this area was analyzed assuming a Loss-of-Coolant Accident (LOCA) and a simultaneous loss of ventilation. The results demonstrate that the ambient temperature rise in this area is nominal and will not preclude operator habitability or equipment operability. However, the licensee described that with an ELAP event, the loss of SFP cooling can result in SFP boiling and the release of steam into the AB. This scenario is further discussed in Section 3.2.2 of this technical evaluation report.

On page 75 of its Integrated Plan, the licensee identified two open items: (1) (open item #62 according to the August 2013 update) Perform GOTHIC calculations consistent with NUMARC 87-00, *Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors,* to determine the effects of a loss of heating, ventilation, and air conditioning (HVAC) during an ELAP for the following areas: IB, TDAFW Pump and ARV/SV areas, AB, RWST area, battery rooms, relay room, control room and SAFW building; (2) (open item #63 according to the August 2013 update) Perform an analysis to evaluate the Battery Room low temperature for an ELAP event, assuming -16 degrees F to determine if, and when, Battery Room heating is required. In its August 2013 update of its Integrated Plan, the licensee also identified an open item (#70) to develop and implement procedure to establish procedures to establish battery room ventilation within 72 hours of the event to prevent exceeding the unacceptable hydrogen concentration limit of 2%.

During the audit process, the licensee provided additional information describing that Ginna is performing HVAC calculations using the GOTHIC computer code. The results of the calculations will be used to determine the heating and cooling requirements for extreme cold (-16 degrees F outdoor temperature) and extreme heat (110 degrees F outdoor temperature). HVAC calculations are being performed for the control building (includes battery rooms and control room), SAFW building and annex, and the IB (including the TDAFW area). The IB GOTHIC calculation has been completed. All other GOTHIC calculations are expected to be completed by June 2014. The licensee needs to confirm completion of GOTHIC calculations and incorporation of results into its mitigating strategies. This is identified as Confirmatory Item 3.2.4.2.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 equipment cooling, 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.

No discussion of freeze protection, including loss of existing heat tracing due to loss of ac power, was provided in the Integrated Plan.

During the audit, the licensee provided additional information describing that any heating sources (heaters, tracing) for equipment used in ELAP mitigation systems and strategies will be self-contained (i.e., will be provided by Phase 1 and Phase 2 power generation equipment). Low ambient temperature conditions will be considered in determining the sizing of the heaters and/or tracing.

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 heat tracing, 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.

On page 72 in its Integrated Plan, the licensee described that in accordance with the provisions of 10 CFR 50, Appendix R, Section III.J, emergency lighting power units with at least an eight-hour battery power supply are located in plant areas requiring access following a fire. These include access/egress routes and stations requiring operator actions. Ginna Station Fire Protection Program Table 13-1 identifies the locations of Appendix R emergency lights. These areas encompass the areas required to be accessed by operators to respond to the BDBEEs during Phase 1. Various additional portable hand-held lanterns are also available to the operators to supplement the battery-powered wall units.

During the audit process, the licensee provided additional information describing that activities to develop strategies for emergency lighting to support operator actions after a BDBEE are still under evaluation (this item is also identified as open item #68 in the August 2013 update of the Integrated Plan). The licensee needs to confirm the completion of strategies for emergency lighting strategies. This is identified as Confirmatory Item 3.2.4.4.A in Section 4.2.

No information was included in the Integrated Plan regarding potential communications needs.

The licensee provided a communications assessment in its letters dated October 26, 2012, and February 22, 2013 (ADAMS Accession Nos. ML12311A300 and ML13066A710) in response to the NRC March 12, 2012, 50.54(f) request for information letter for Ginna. As documented in the NRC staff analysis provided in letter dated April 30, 2013 (ADAMS Accession No. ML13109A264), the staff 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 (8) regarding communications capabilities during an ELAP. Further review is required to confirm any required communication updates have been completed. This has been identified as Confirmatory Item 3.2.4.4.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 lighting and communications, 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.

On page 6 of its Integrated Plan, the described that exceptions for the site security plan will be communicated in a future six month update following identification.

No other information is provided in the Integrated Plan or in the August 2013 update addressing site or protected area access.

During the audit the licensee described that details regarding plant procedures/guidance for access to protected areas and internal locked areas will be provided in a future update. This has been identified as Confirmatory Item 3.2.4.5.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 protected and internal locked area access, 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.

On page 6 of its Integrated Plan, the licensee described that maximum environmental room temperatures for habitability or equipment availability are based on NUMARC 87-00.

On pages 73 and 74 of its Integrated Plan, the licensee described that plant specific analyses were performed in August 1990 and December 15, 1993 to determine the maximum expected station blackout temperatures for the battery rooms, relay room, and the control room with the following results:

Area	Temperature	Required Operator Action
Control Room	115.9°F	a. Open doors to turbine deck
		b. Open cabinet doors
		Note: Flow through ceiling tiles have replaced selected solid tiles to eliminate the need for Operators to remove tiles during a blackout
Battery Room 1A	108.2°F	None
Battery Room 1A	106.2°F	None
Relay Room	103°F	None

The licensee further described that a GOTHIC calculation has been performed for both the TDAFWP and the atmospheric relief valves (ARV) areas of the intermediate building (IB) for the Ginna SBO Program. The results of these calculations indicate that with doors S37F, S44F, and SD/55 opened within 30 minutes, the ambient temperature of TDAFWP area is between 110 degrees F and 115 degrees F. With this result, equipment operability does not appear to be of concern. Calculations utilizing the NUMARC 87-00 methodology performed for the ARV area have yielded a resultant ambient temperature of between 117 degrees F and 122 degrees F with doors S37F, S44F, and SD/55 opened within 30 minutes.

The licensee also described that minimal heat loads would be present in the AB RWST area during a station blackout and that this area was analyzed assuming a LOCA and a simultaneous loss of ventilation. The results demonstrate that the ambient temperature rise in this area is nominal and will not preclude operator habitability or equipment operability. However, the licensee described that with an ELAP event, the loss of SFP cooling can result in SFP boiling and the release of steam into the AB. This scenario is further discussed in Section 3.2.2.

On page 75 of its Integrated Plan, the licensee identified two open items: (1) (open item #62 according to August 2013 update) Perform GOTHIC calculations consistent with NUMARC 87-00, *Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors,* to determine the effects of a loss of heating, ventilation, and air conditioning (HVAC) during an ELAP for the following areas: IB, TDAFW Pump and ARV/SV areas, AB, RWST area, battery rooms, relay room, control room and SAFW building; (2) (open item #63 according to August 2013 update) Perform an analysis to evaluate the Battery Room low temperature for an ELAP event, assuming -16 degrees F outdoor temperature to determine if, and when, Battery Room heating is required. In its August 2013 update of its Integrated Plan, the licensee also identified an open item (#70) to develop and implement procedure to establish procedures to establish battery room ventilation within 72 hours of the event to prevent exceeding the unacceptable hydrogen concentration limit of 2%.

During the audit process, the licensee provided additional information describing that Ginna is performing HVAC calculations using the GOTHIC computer code. The results of the calculations will be used to determine the heating and cooling requirements for extreme cold (-16 degrees F outdoor temperature) and extreme heat (110 degrees F outdoor temperature). HVAC calculations are being performed for the control building (includes battery rooms and control room), SAFW building and annex, and the IB (including the TDAFW area). The IB GOTHIC calculation has been completed. All other GOTHIC calculations are expected to be completed by June 2014. The licensee needs to confirm completion of GOTHIC calculations and incorporation of results into mitigating strategies. This was previously identified as Confirmatory Item 3.2.4.2.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 equipment cooling, 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 [net positive suction head] 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 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.

On pages 17, 18, and 19 of its Integrated Plan, the licensee described their strategies for feeding SGs for core cooling with SGs available during Phase 1. The portions of the strategies pertaining to water sources are as follows:

Initial heat removal from the RCS is accomplished by supplying feed water from the CST to the SGs using the TDAFW Pump or an SAFW Pump, powered by the new 1 MW SAFW DG, taking suction on the new 160,000 gallon CST. The existing CSTs and/or the new 160,000 gallon CST provide sufficient volume for 24 hours of core cooling and heat removal during Phase 1.

On pages 23 and 24 of its Integrated Plan, the licensee described their strategies for feeding

SGs for core cooling with SGs available during Phase 2. The portions of the strategies pertaining to water sources are as follows:

The primary Phase 2 coping strategy is to resupply the new CST from Lake Ontario, the UHS, using a portable diesel driven pump and hoses. Core cooling and heat removal will be sustained indefinitely, or until long term recovery actions are determined, using a SAFW pump powered by the new 1 megawatt (MW) SAFW DG, with provision for refilling the new CST and SAFW DG fuel tank.

The alternate Phase 2 strategy is to utilize a diesel driven high capacity portable pump to supply the SGs with water from the new CST should the SAFW Pump become unavailable. The new CST will be resupplied from Lake Ontario, the UHS, using an additional portable diesel driven pump and hoses. Core cooling and heat removal will be sustained indefinitely, or until long term recovery actions are determined, using the portable diesel driven pump, with provision for refilling the new CST and portable diesel driven pump fuel tank.

On page 28 of its Integrated Plan, the licensee described their strategies for feeding SGs for core cooling with SGs available during Phase 3. The portions of the strategies pertaining to water sources are as follows:

The Phase 3 strategy is basically the Phase 2 strategy supplemented by equipment available from the RRC. With the initiation of access to off-site equipment, the licensee would obtain DGs capable of supplying 480 volt vital busses. Repowering the 480 Vital Busses would allow both SAFW Pumps to be powered to feed SGs. If the onsite water processing unit cannot be repowered, water processing units capable of providing demineralized water would also be provided by the regional center. Supply to the portable water processing trailer would come from the Town of Ontario city water supply or the UHS.

In several sections of its Integrated Plan, the licensee described that Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or FSGs to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs. The reviewer concluded that generally, it is reasonable to expect that actions necessary to implement mitigating strategies, including clear criteria for transferring to the next preferred source of water, will be incorporated into plant procedures.

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 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.

No specific information was provided in the Integrated Plan regarding electrical isolations and interactions for FLEX equipment used for battery charging or locally energizing equipment.

During the audit process, the licensee provided additional information on this topic as follows:

a. Class 1E equipment is protected from faults in portable/FLEX equipment as follows:

   1. The new 1MW DG will power the safety related (SR) SAFW cable pump motors. The normal SR Bus feed power to the SAFW will be isolated by a manual disconnect switch which is mechanically linked to the connection switch feed from the 1 MW DG, preventing any possible backfeed to the SR Bus. The disconnect is rated for fault current and the feed from the new 1MW DG is protected from fault current by overcurrent and overvoltage relay devices in the new switchgear.

   2. The new 1MW DG will power the SR 125 Vdc Battery Chargers. The normal SR Bus feed power to the SAFW will be isolated by a manual disconnect switch rated for fault current. Cables will be run and connected to quick connects installed at the new switchgear and at the Battery Chargers. This will be protected from fault current by overcurrent and overvoltage relay devices in the new switchgear.

   3. The alternate feed to the 125 Vdc Battery Chargers is the 100 KW portable diesel generator. This will be manually isolated and connected to the battery chargers in the same manner as the 1 MW DG. Overcurrent and overvoltage protection will be provided by overcurrent and overvoltage relay devices.

   4. For CRFC power during Phase 3, manual disconnect and connect is required. Fault protection to be via relaying provided with the DG from the RRC, or will be added by Ginna as required.

b. Multiple sources do not attempt to power electrical busses is described as follows:

   1. The SR SAFW cable and pump motors are protected from being connected to multiple sources as noted above by the mechanically linked SR disconnect switch and the new 1MW DG feed connect switch.

   2. The SR 125 Vdc Battery Chargers are protected from being connected to multiple sources by the procedures which will specify manually disconnecting the SR feed and connect the non-SR feed.

   3. The SR CRFC cable and motors are protected from being connected to multiple sources by procedures which will specify manually disconnecting the SR feed and connect the non-SR feed.

c. A summary of the sizing calculation for the FLEX generators and details of loads connected to show that they can supply the loads assumed in Phases 2 and 3 based on a calculation in progress (current information) is as follows:

   1. 1 MW DG – Capacity 480Vac, 1250 KVA; Loads – 1 SAFW pump – 235 KVA, 1 Charging Pump – 90 KVA, 2 Battery Chargers – 67.2 KVA total.

   2. 100 KW DG – Capacity 480 Vac, 125 KVA; Loads - 2 Battery Chargers – 67.2

KVA total.

During the audit process, the licensee also stated that Single Line Diagrams showing proposed connections of Phase 2 and 3 electrical equipment, including protection information (breaker, relay etc.) and rating of the equipment will be provided later (currently in development). The licensee needs to provide Single Line Diagrams to show the necessary electrical isolations and protection information. This is identified as Confirmatory Item 3.2.4.8.A in Section 4.2.

Alternate Approach Using Installed Alternating Current Source

On page 7 of its Integrated Plan, the licensee described a "potential deviation" to the guidelines in JLD-ISG-2012-01 and NEI 12-06. NEI 12-06 initial condition 3.2.1.3 (2) states "All installed sources of emergency on-site ac power and Station Black Out (SBO) Alternate ac power sources are assumed to be not available and not imminently recoverable" and in Section 2.1 that initial approaches to FLEX strategies will take no credit for ac power supplies. The licensee proposed a "to-be-installed" 1 megawatt (MW) (1000 kilowatt (kW)) DG, which will not be connected to, and will not be connectable, to the offsite or onsite emergency ac power systems. This DG will be able to be connected to a standby auxiliary feedwater (SAFW) pump to provide Phase 1 makeup to a steam generator (SG) for RCS cooling and heat removal. These modifications are due to the assumed failure of the turbine driven auxiliary feedwater pump (TDAFWP) and water supply in a BDBEE.

During the audit the licensee was requested to elaborate on their proposed use of the "to-be-installed" 1 MW DG.

In their response, the licensee described that they consider the resulting strategy to be a method of extending Phase 1. The FLEX portion of the strategy includes a combination of the use of existing equipment, the use of newly installed and isolated equipment, and installation of new battery charger capabilities as follows:

1. Use of two existing Standby Auxiliary Feedwater (SAFW) Pumps with a new installed (and isolated) 1000 kW diesel generator and a new installed 160,000 gallon, robustly designed, condensate storage tank (CST), both capable of supplying 24 hours of inventory. The initial installed equipment mitigation strategy is to supply, by manual operator action within 37 minutes, condensate from the tank to the pump(s) to either steam generator. The FLEX portion of the strategy would be to use dedicated FLEX pumps to refill the condensate tank from Lake Ontario, and continue to supply the steam generators via the SAFW pumps. Also, a fuel oil tanker truck would be used to resupply the 1000 kW diesel.

   As an update, the licensee described that they are now planning to resupply the 1000 kW DG using a fuel trailer instead of the tanker truck and refueling will be required within 24 hours. Also the 24 hours of CST inventory is based on not performing a cooldown. While the new DG fuel tank and CST (with the planned cooldown) capabilities will be less than 24 hours, timelines being developed show that adequate response time will be available to refill the tanks during an ELAP event.

2. A new installed (and isolated) charging pump, powered from the diesel generator identified above, taking suction from a dedicated 10,000 gallon borated water tank and discharging to the RCS, will be used. This arrangement would include a discharge line routed through a protected portion of the Auxiliary Building to a newly installed charging line connection. The pump would be manually aligned as required. With the installation of low leakage RCP seals, the timeline to initiate charging is several hours. The FLEX strategy would be to blend boron and condensate to resupply the borated water tank. Another FLEX portion of the strategy is to use a diesel driven portable FLEX charging pump, taking suction from the borated tank or the RWST, connected via high pressure hose, to a staged connection in the charging system. The licensee noted that these details are changing due to the decision not to install the Westinghouse RCP seals due to the 10 CFR Part 21 issue.

Ginna will install a manual transfer switch and alternate power connection for the AC input on the battery chargers. The preferred source of power will be the new diesel generator (same as identified in #1 above). Connection using pre-identified cables would be performed within the 8 hours that the existing batteries are available for continued operation. A second source of input to the station battery charger(s) would be a portable 100 kW FLEX diesel generator. The licensee noted these details may be changing with the decision that the 100 kW FLEX diesel generator becoming the preferred source of power to the battery chargers and the 1000 kW DG as the alternate source.

On page 23 its Integrated Plan, the licensee described their alternate Phase 2 strategy to utilize a diesel driven high capacity portable pump to supply the SGs with water from the new CST should the SAFW Pump become unavailable. The diesel driven high capacity portable pump will be sized to supply adequate feedwater flow to restore and maintain SG level at the target SG pressure to prevent nitrogen injection from the SI Accumulators.

NEI 12-06, Section 3.2.1.3, Initial Condition (2) states that "[a]ll installed sources of emergency on-site ac power and SBO Alternate ac power sources are assumed to be not available and not imminently recoverable." The use of a permanently installed diesel generator is in conflict with this initial condition and constitutes an alternate approach to the endorsed guidance of NEI 12-06. The licensee has stated that the new DG will not be connected to or connectable to the internal power distribution system, thereby alleviating the potential vulnerability of reliance on a common supporting system. In consultation with NRC staff, MTS noted that the use of installed generators rather than conformance to NEI 12-06 places greater reliance on the current state of knowledge of external hazards, which are being re-examined for seismic and flooding hazards pursuant to NTTF Recommendation 2.1 by the 10 CFR 50.54(f) request for information of March 12, 2012. Additionally, Section 402 of Public Law 112-074, "Consolidated Appropriations Act," requires that the NRC require licensees to reevaluate the seismic, tsunami, flooding, and other external hazards at their sites against current applicable Commission requirements and guidance for such licenses as expeditiously as possible, and thereafter when appropriate. New information from those efforts may necessitate changes in the degree of protection afforded the installed generators and associated equipment in order to maintain the strategies required by Order EA 12-049.

The new (to-be) installed diesel generator, in general, meets the guidance of NEI 12-06, Section 3.2.1.3, Initial Condition (6) which states "Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles, are available."

Additional information is needed from the licensee to determine whether the proposed approach provides an equivalent level of flexibility for responding to an undefined event as would be provided through conformance with NEI 12-06. Therefore, this is identified as Open Item 3.2.4.8.B in Section 4.1. Therefore, in order for the NRC staff to accept this as an alternate approach, Ginna will need to document the proposed method as an alternate to NEI 12-06, along with a stronger justification addressing how the approach maintains the flexibility to respond to an undefined event and provide power to the necessary equipment, in a future submittal update.

Based upon the co-location of the proposed DG with the SAFW pumps, the electrical isolation of the DG from the internal power distribution system, and the provision of portable pumps for use as contingency sources of makeup to the SGs and the RCS, MTS recommends that the NRC approve this as an alternate approach to meeting the requirements of Order EA-12-049. Inherent in this recommendation is MTS' conclusion that reliance on a "to-be-installed" 1000 kW DG would create no conflict with NEI 12-06, Section 3.2.1.3, Initial Condition (2), in that "installed sources of emergency on-site power" is reasonably considered a reference to the site's design basis emergency diesel generators. MTS considers the only conflict with NEI 12-06 to be with Section 2.1 that states, "While initial approaches to FLEX strategies will take no credit for installed ac power supplies, longer term strategies may be developed to prolong Phase 1 coping that will allow greater reliance on permanently installed, bunkered or hardened ac power supplies that are adequately protected from external events." Further, MTS considers the proposed installation of the new DG, as described by the licensee, does not rely on SBO Alternate ac power sources as the description of the new DG installation does not meet the definition of "Alternate ac source" as defined in 10 CFR 50.2. MTS also concluded that the licensee's proposal does not conflict with either JLD-ISG-2012-01 or the requirements of Order EA-12-049.

The licensee's approach described above, as currently understood, is an alternate to the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01. Pending acceptance of this alternate approach by the NRC and subject to the successful closure of issues related to the Open and Confirmatory Items, this approach provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to electrical power sources/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.

On page 76 in its Integrated Plan, the licensee described that diesel fuel is available onsite from the protected DG A and DG B fuel oil storage tanks (FOSTs). Normally, a minimum of 10,000 gallons will be available after an ELAP/LUHS event, unless one of the diesel FOSTs is removed from service for required maintenance. For that short duration, a minimum of 5,000 gallons will be available.

The licensee further described that offsite DG FOST A and offsite DG FOST B have 18,000 gallons working capacity in each tank. The minimum storage volume maintained between the two tanks is 19,936 gallons. This volume of offsite diesel fuel oil along with the volume of diesel fuel oil in the DG A & B FOSTs supports 7 days of operation of 1 Emergency DG at rated load of 2000 kW. The licensee will be performing an analysis to provide a basis that the offsite FOSTs are reasonably protected from BDBEEs (licensee identified this as an open item 66, in the August 2013 update of its Integrated Plan).

In its August 2013 update of its Integrated Plan, the licensee also identified additional open items regarding the fuel oil system for the FLEX equipment: (1) (open item 65) Implement a design change to provide for transferring diesel fuel from the DG A and DG B Fuel Oil Storage Tanks to a fuel transfer vehicle; (2) (open item 67) Develop the strategy to transfer fuel from protected fuel storage locations to FLEX equipment.

During the audit process, the licensee described that it plans to evaluate the use of its fuel oil storage tanks located within the owner controlled area, as well as fuel trailers. All Phase 1 and Phase 2 mitigation equipment contains at least six hours of diesel fuel. As detailed equipment usage is determined, fuel consumption will be fully evaluated. Travel paths for fuel handling equipment will utilize the same routes as the portable equipment, and as such will be appropriately evaluated.

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 portable equipment fuel, if these requirements are implemented as described.

3.2.4.10 Load reduction to conserve direct current (dc) power

NEI 12-06, Section 3.2.2, guideline (6) provides that:

> *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.

On pages 8 and 9 of its Integrated Plan, in the SOE, the licensee described load shedding activities as follows:

> Time: 15 - 30 min, DC Load Shedding. Following loss of all AC power, the station batteries are the only source of electrical power. The station batteries supply the dc buses and the ac vital instrument buses. Since ac emergency power is not available to charge the station batteries, battery power supply must be conserved to permit monitoring and control of the plant until ac power can be restored. The intent of load shedding is to remove all large non-essential loads as soon as practical, consistent with preventing damage to plant equipment.
>
> Time: within 4 hr, Provide Charging to Batteries A and/or B (Load shedding provides additional time). Design analysis DA-EE-97-069, *Sizing of Vital Batteries A and B,* shows that the Ginna station batteries are adequate to sustain power to the current load profiles for the duration of a four hour station blackout, using a temperature of 55 degrees F. In addition, ECA-0.0 provides load shedding guidance to the operators for preserving battery capacity and maintaining required voltage levels. DA-EE-2001-028, *Vital Battery 8 Hour Capacity,* was subsequently performed and documents an 8 hour capacity given the load shedding directed by procedure ECA-0.0 ATT-8.0, *Attachment DC Loads.*

In the Sequence Of Events Timeline (Attachment 1A of the Integrated Plan), the licensee also identified that within 4 hours of the Elapsed Time, the battery chargers will start charging the Batteries A and/or B.

During the audit process, the licensee stated that the minimum DC bus voltage required to ensure proper operation of all electrical equipment is 108.6 V. This ensures that devices supplied by the batteries have adequate voltage levels after accounting for line losses between the battery terminals and the devices. Design analysis DA-EE-99-047, 125 V DC System Loads and Voltages, provides a detailed analysis supporting this minimum voltage number.

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 dc 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 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.

   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.

Regarding the attributes of NEI 12-06, Section 3.2.2, following item (15), N+1 quantities of FLEX equipment:

On pages 88 and 89 its Integrated Plan, the licensee listed types and quantities of portable equipment needed to support the mitigating strategies assigned to non-specific safety function uses. The reviewer could not confirm which listed equipment matched described functions in the strategy description sections of the Integrated Plan and thus, could not confirm that quantities satisfy the N+1 site quantity specified in NEI 12-06 for FLEX equipment. Minimum quantities of miscellaneous equipment such as cable and hoses may not reasonably be determined at this stage of FLEX strategies development. This is identified as Confirmatory Item 3.3.1.A in Section 4.2.

On page 13 in its Integrated Plan, the licensee described that Preventive Maintenance procedures (PMs) will be established for all components and testing procedures will be developed with frequencies established based on type of equipment, original equipment manufacturer (OEM) recommendations and considerations made within EPRI guidelines.

Review of the Integrated Plan for Ginna revealed 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 NRC staff will evaluate the resulting program through the audit and inspection processes.

During the NRC audit, Ginna informed the NRC of their plans to abide by this generic 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 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 maintenance and testing, if these requirements are implemented as described.

3.3.2 Configuration Control

NEI 12-06, Section 11.8 states:

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.

On page 13 in its Integrated Plan, the licensee described that Ginna has established a system designation for emergency portable equipment and will manage this system in a manner consistent with CENG procedure CNG-OP-4.01-1000, *Integrated Risk Management*. All elements of the program described in Section 11 of NEI 12-06, including recommended "should" items will be included in the station program. A system engineer will be assigned the responsibility for configuration control, maintenance and testing. The equipment for FLEX will have unique identification numbers. Installed structures, systems and components pursuant to 10 CFR 50.63(a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, *Station Blackout*. PMs will be established for all components and testing procedures will be developed with frequencies established based on type of equipment, original equipment manufacturer recommendations and considerations made within EPRI guidelines.

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, Training, states:

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. Periodic training should be provided to site emergency response leaders 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.

On page 13 of its Integrated Plan, the licensee described that new training of general station staff and Emergency Planning personnel will be performed no later than 2015, prior to the Ginna unit design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training.

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 OFFSITE 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).

On pages 13 and 14 of its Integrated Plan, the licensee described that CENG has signed contracts and issued purchase orders to PIM for Ginna for participation in the establishment and support of two RRCs through SAFER. Each RRC will hold five sets of equipment, four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle.

The licensee further described that the two RRCs are located in Phoenix, Arizona and Memphis, Tennessee. There are no designated alternate equipment sites; however, each site has agreed to enter portable FLEX equipment inventory into the Rapid Parts Mart which is an internet based search capability currently used for other spare part needs. This capability provides a diverse network of potential alternate equipment sites for portable FLEX equipment.

The licensee further described that SAFER will provide requested portable FLEX equipment to a local staging area where the equipment will be serviced (e.g., fuel and lubricating oil) and made ready for transport to the site. The staging area must be outside the 25 mile radius of the site, because the FLEX strategy evaluations assume that there will be significant damage and no power or communications within the 25 mile radius. If an individual site provides qualified power and communications to a staging area within the 25 mile radius, then that staging area will be considered acceptable. The RRC will support initial portable FLEX equipment delivery to the site within 24 hours of a request for deployment.

The licensee further described that each site will develop a playbook which will provide the detail necessary to ensure the successful delivery of the portable FLEX equipment from the RRC to the local staging area and from the local staging area to the site.

During the audit the licensee provided additional information describing that the SAFER site-specific Response Plan will contain information on the specifics of generic and site specific equipment obtained from the RRC. Off site equipment will be procured through SAFER. SAFER plans to align with the EPRI templates for maintenance, testing and calibration of the equipment. The SAFER site-specific Response Plan will also contain the logistics for transportation of the equipment, staging area set up, and other needs for ensuring the equipment and commodities sustain the site's coping strategies. Routes will be evaluated for post-event conditions, and provisions for alternative transportation, such as airlifting, will be considered in the plans.

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 offsite resources, if these requirements are implemented as described.

4.0 OPEN AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

Item Number	Description	Notes
3.2.4.8.B	Additional information is needed from the licensee to determine whether the proposed approach utilizing an installed ac power source provides an equivalent level of flexibility for responding to an undefined event as would be provided through conformance with NEI 12-06.	

4.2 CONFIRMATORY ITEMS

3.1.1.A	Confirm that the licensee commits to address the results of the seismic and flooding re-evaluations pursuant to the NRC's 50.54(f) letter of March 12, 2012.	
3.1.1.1.A	Protection, seismic – confirm that large portable FLEX equipment such as pumps and power supplies would be secured as appropriate to protect them during a seismic event and that stored equipment and structures would be evaluated and protected from seismic interactions to ensure that unsecured and/or non-seismic components do not damage the equipment.	
3.1.1.3.A	Procedural Interfaces – seismic – confirm that a reference source for the plant operators is provided that provides approaches to obtaining necessary instrument readings to support the implementation of the coping strategies.	

3.1.4.2.A	Snow, ice and extreme cold – confirm that potential loss of access to the UHS and flow path due to extreme low temperatures, e.g., due to ice blockage or formation of frazil ice, is assessed and resolved.	
3.2.1.A	Confirm resolution of open item to develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulator prior to nitrogen injection into the RCS. Confirm resolution of boration requirements.	
3.2.1.B	Confirm evaluation of the recommendation to consider the prioritization of staging portable equipment that may be required to isolate/vent the accumulators when certain cooldown maneuvers are necessitated.	
3.2.1.1.A	Confirm completion of timelines used in conjunction with the thermal hydraulic analysis to document the duration of each phase for each critical function, and the basis for the duration.	
3.2.1.2.A	RCP seals - If RCP seals are changed to non-Westinghouse seals, the acceptability of the use of non-Westinghouse seals should be addressed, and the RCP seal leakage rates for use in the ELAP analysis should be provided with acceptable justification.	
3.2.1.2.B	High temperature RCP seal concern - If applicable, confirm justification that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate of 21 gpm/seal used in the ELAP is adequate and acceptable.	
3.2.1.8.A	The licensee informed the NRC staff of its intent to abide by the generic approach described in the PWROG August 15, 2013 position paper related to modeling the timing and uniformity of boric acid mixing within the reactor coolant system (RCS) under natural circulation conditions potentially involving two-phase flow. Confirm that the additional conditions discussed in the NRC endorsement letter are satisfied.	
3.2.1.9.A	Confirm design information and supporting analysis developed for portable equipment that provides the inputs, assumptions, and documented analysis that the mitigation strategy and support equipment will perform as intended.	
3.2.3.A	Containment analysis - Confirm completion of containment analysis and incorporation of results into mitigation strategies.	
3.2.4.2.A	Ventilation – confirm completion of GOTHIC calculations and incorporation of results into mitigation strategies.	
3.2.4.4.A	Emergency lighting – confirm development of lighting strategies.	
3.2.4.4.B	Communications – confirm completion of upgrades.	
3.2.4.5.A	Protected Area Access- confirm that strategies are in place to allow access to protected areas as needed to execute mitigation strategies.	
3.2.4.8.A	Confirm that Single Line Diagrams are provided showing the necessary electrical isolations and protection information.	
3.3.1.A	Confirm sufficient quantities of FLEX equipment to meet N+1.	

If you have any questions, please contact John Boska at 301-415-2901.

Sincerely,

/RA/

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

Docket No. 50-244

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

cc w/encl:

Mr. Joseph E. Pacher
Vice President
R.E. Ginna Nuclear Power Plant
R.E. Ginna Nuclear Power Plant, LLC
1503 Lake Road
Ontario, NY 14519

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