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 0

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Southern Nuclear Operating Company, Inc.
Edwin I. Hatch Nuclear Plant, Units 1 and 2
Docket Nos. 50-321 and 50-366

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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 to the guidance of NEI 12-06, or provide an acceptable alternative to demonstrate compliance with the requirements of Order EA-12-049.

2.0 EVALUATION PROCESS

In accordance with the provisions of Contract NRC-HQ-13-C-03-0039, Task Order No. NRC-HQ-13-T-03-0001, Mega-Tech Services, LLC (MTS) performed an evaluation of each licensee's Integrated Plan. As part of the evaluation, MTS, in parallel with the NRC staff, reviewed the original Integrated Plan and the first 6-month status update, and conducted an audit of the licensee documents. The staff and MTS also reviewed the licensee's answers to the NRC staff's and MTS's questions as part of the audit process. The objective of the evaluation was to assess whether the proposed mitigation strategies conformed to the guidance in NEI 12-06, as endorsed by the positions stated in JLD-ISG-2012-01, or an acceptable alternative had been proposed that would satisfy the requirements of Order EA-12-049. The audit plan that describes the audit process was provided to all licensees in a letter dated August 28, 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 (Final Safety Analysis Report (FSAR) program, procedure program, quality assurance program, modification configuration control program, etc.) will generally be accepted. For example, references to existing FSAR information that supports the licensee's overall mitigating strategies plan, will be assumed to be correct, unless there is a specific reason to question its accuracy. Likewise, if a licensee states that they will generate a procedure to implement a specific mitigating strategy, assuming that the procedure would otherwise support the licensee's plan, this evaluation accepts that a proper procedure will be prepared. This philosophy for this evaluation and the ISE does not imply that there are any limits in this area to future NRC inspection activities.

3.0 TECHNICAL EVALUATION

By letter dated February 27, 2013, (ADAMS Accession No. ML13059A385), and as supplemented by the first six-month status report in letter dated August 27, 2013 (ADAMS Accession No. ML13240A238), Southern Nuclear Operating Company, Inc., (the licensee or SNC) provided the Edwin I. Hatch Nuclear Plant, Units 1 and 2, (HNP or Hatch) Integrated Plan for Compliance with Order EA-12-049. The Integrated Plan describes the strategies and guidance under development for implementation by the licensee for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the NRC staff in its review, leading to the issuance of an interim staff evaluation and audit report. The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the Order.

3.1 EVALUATION OF EXTERNAL HAZARDS

Sections 4 through 9 of NEI 12-06 provide the NRC-endorsed methodology for the determination of applicable extreme external hazards in order to identify potential complicating factors for the protection and deployment of equipment needed for mitigation of BDBEEs leading to an extended loss of all alternating current (ac) power (ELAP) and loss of normal access to the ultimate heat sink (LUHS). 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.

On page 5 in its Integrated Plan under the section to determine extreme external hazards, the licensee stated that the applicable extreme external hazards for Hatch are seismic, ice, high winds and high temperature as detailed below:

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 pages 5, 6 and 7 of the Integrated Plan the licensee stated that per the Hatch Unit 1 (HNP-1) and Hatch Unit 2 (HNP-2) Final Safety Analysis Reports (FSAR) Section 2.5, the seismic criteria for HNP include two design basis earthquake spectra: Operating Basis Earthquake (OBE) and the Design Basis Earthquake (DBE) (Safe Shutdown Earthquake). The OBE and the DBE are 0.08g and 0.15g, respectively; these values constitute the design basis of HNP.

The licensee also stated that the flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in the Integrated Plan. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed.

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

3.1.1.1 Protection of FLEX Equipment – Seismic Hazard

NEI 12-06, Section 5.3.1 states:

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

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

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

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

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

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

On pages 24, 31, 37 and 46 of the Integrated Plan the licensee stated 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. The storage buildings construction will be completed for 2 sets of FLEX equipment by the date the first unit will reach the Order EA-12-049 implementation completion due date. HNP procedures and programs are being developed to address storage structure requirements.

During the audit process the licensee stated that protection of portable/FLEX equipment will be meet the guidelines in NEI 12-06, Section 11.3. The storage building/location will meet the design basis Safe Shutdown Earthquake (SSE), ASCE 7-10, or be located outside a structure evaluated for seismic interactions to ensure equipment is not damaged. All large portable FLEX equipment required for mitigating a seismic hazard will be secured to ensure protection of SSCs during seismic events. Procedural guidance for storage of FLEX equipment will include provisions for prevention of seismic interaction between FLEX equipment and other equipment.

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

3.1.1.2 Deployment of Portable Equipment – Seismic Hazard.

As discussed in NEI 12-06, Section 5.3.2, the following five considerations for the deployment of portable equipment following a seismic event should be addressed:

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 of 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 pages 5, 6, and 7 of its Integrated Plan the licensee stated that they had reviewed the applicable sections of their UFSAR and determined that Hatch does not have a soil liquefaction concern within the area of the principle structures. On page 12 of its Integrated Plan the licensee states that chosen pathways will be evaluated for liquefaction for the non-power block areas utilized for the deployment paths for Phase 2.

During the audit process the licensee stated that diverse connection points for equipment are provided such that at least one of the alternatives will remain accessible following a seismic event with no access required through a non-seismically robust structure.

During the audit process the licensee stated that HNP does not rely on a water source, such as a downstream dam, that is not seismically robust. The FLEX strategy uses the seismically robust CST and installed piping from the intake structure along with portable pumps for a source of water. The reviewer noted that the Hatch intake structure is located on the Altamaha River and verified that there are no dams on the Altamaha River.

During the audit process the licensee stated that the storage building doors will include manual operation capability. No power systems (other than trucks) are required to move FLEX equipment.

During the audit process the licensee stated that the FLEX equipment will be transported using heavy duty trucks or other vehicles capable of moving the heaviest piece of equipment. These vehicles will be designated as FLEX equipment and will be reasonably protected from screened in 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 deployment of portable equipment during a seismic hazard if these requirements are implemented as described.

3.1.1.3 Procedural Interfaces – Seismic Hazard.

NEI 12-06, Section 5.3.3 states:

> There are four procedural interface considerations that should be addressed.
>
> 1. Seismic studies have shown that even seismically qualified electrical equipment can be affected by BDB seismic events. In order to address these considerations, each plant should compile a reference source for the plant operators that provides approaches to obtaining necessary instrument readings to support the implementation of the coping strategy (see Section 3.2.1.10). This reference source should include control room and non-control room readouts and should also provide guidance on how and where to measure key instrument readings at containment penetrations, where applicable, using a portable instrument (e.g., a Fluke meter). Such a resource could be provided as an attachment to the plant procedures/guidance. Guidance should include critical actions to perform until alternate indications can be connected and on how to control critical equipment without associated control power.
>
> 2. Consideration should be given to the impacts from large internal flooding sources that are not seismically robust and do not require ac power (e.g., gravity drainage from lake or cooling basins for non-safety-related cooling water systems).
>
> 3. For sites that use ac power to mitigate ground water in critical locations, a strategy to remove this water will be required.
>
> 4. Additional guidance may be required to address the deployment of FLEX for those plants that could be impacted by failure of a not seismically robust downstream dam.

During the audit process the licensee stated that procedures/instructions for obtaining vessel level measurements when ac and dc power is not available will be developed/enhanced through the FLEX procedure development process and will contain: 1) reference sources for operators to obtain necessary instrument readings to support implementation of the coping strategy; 2) how and where to measure key readings at containment penetrations (where applicable) using a portable instrument; 3) critical actions that may be necessary to perform until alternate indications can be connected (measured); and, 4) instructions on how to control critical equipment without control power, if required.

During the audit process the licensee stated that worst case flooding of the turbine building, due to an expansion joint failure, would result in a water level 11 inches below the elevation of the pad on which the safety-related batteries are mounted. Other system failures in the turbine building (fire protection, condensate storage, demineralized water, potable water, reactor building closed cooling water, condensate and feedwater systems) would produce flood levels below that analyzed for the circulating water system expansion joint failure flood. The flooding of the turbine or control buildings described above does not impede access for actions required to implement the FLEX strategies. Further, sections 4.8 and 9.4 Appendix D of the Hatch Fire Hazards Analysis states that protection against postulated piping failures in fluid systems outside containment has been evaluated for both Unit 1 and Unit 2. Piping for fire protection systems is seismically supported in areas where its failure could affect safety-related systems. Large outside water storage tanks pose no threat for internal flooding since failure of the tanks would result in water loss outside of safety-related structures.

During the audit process the licensee also stated that ac power is not required to mitigate groundwater at the HNP site and will not be required by FLEX strategies.

During the audit process the licensee stated that there are no downstream dams on the Altamaha River.

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 for coping with a seismic hazard if these requirements are implemented as described.

3.1.1.4 Considerations in Using Offsite Resources – Seismic Hazard.

NEI 12-06, Section 5.3.4 states:

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

On page 14 of the Integrated Plan regarding the Regional Response Center (RRC) Plan, the licensee stated, in part that HNP will utilize the industry RRC for Phase 3 equipment. HNP has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER). The two (2) industry RRCs will be established to support utilities in response to BDBEE. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Communications will be established between the affected nuclear site and the SAFER team and required equipment mobilized as needed. Equipment will initially be moved from an RRC to a local staging area, established by the SAFER team and the utility. The equipment will be prepared at the staging area prior to transportation to the site. First arriving equipment, as established during development of the nuclear site's SAFER Response Plan (playbook), will be delivered to the site within 24 hours from the initial request.

During the audit process the licensee provided the additional information regarding the considerations in using offsite resources following a seismic event.

Plans are to deliver equipment from offsite sources via truck or air lift. These vehicles will follow pre-selected routes directly to the plant site staging area or to an intermediate staging area approximately 25 miles from the site. The delivery of equipment from the intermediate staging area will use the same methodology. The staging areas are large hard-surfaced areas of approximately 2 to 3 acres in size. Helicopter landing considerations are accounted for in selection of the areas. These areas are designed to accommodate the equipment being delivered from the RRC.

The RRC personnel will commence delivery of a pre-selected equipment set from the RRC center upon notification by the plant site. Typically deliveries will go by truck with preselected routes and any necessary escort capabilities to ensure timely arrival at one of the staging areas. Depending on time constraints, equipment can be flown commercially to a major airport near the plant site and trucked or air lifted from there to the staging areas. The use of helicopter delivery is typically considered when routes to the plant are impassable and time considerations for delivery will not be met with ground transportation.

Multiple pre-selected routes are one method to circumvent the effects of screened in hazards and these routes will take into account potentially impassible areas such as bridges, rivers, heavily wooded areas and towns. The drivers will have the routes marked and will be in communication with the SAFER Control Center to ensure that the equipment arrives on time.

Procedures will document the best means to obtain resources from offsite following a screened in hazards as recommended in NEI 12-06, Section 5.3.4, consideration 1 including the location of local staging areas, and methods of transportation.

The licensee also stated that SAFER walk down has been completed at the HNP site and the "SAFER Response Plan" will be available in June 2015.

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 use of off-site resources if these requirements are implemented as described.

3.1.2 Flooding

NEI 12-06, Section 6.2 states:

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

NEI 12-06, Section 6.2.1 states in part:

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

On page 5 of its Integrated Plan regarding the determination of applicable extreme external hazards, the licensee stated that the external flood hazard assessment is not applicable because HNP is built above the design basis flood level. Per HNP-2 FSAR Chapter 2 (Section 2.4) (Unit 1 FSAR refers to information in Unit 2 FSAR) the Probable Maximum Flood (PMF) elevation is 105 ft. with wave crests to 108.3 ft. The grade level at HNP is 129.5', and the floor elevation in the Intake Structure is 111 ft. Therefore, HNP is built above the design basis flood level and is considered a “dry” site by the NEI 12-06, Section 6.2.1 guidance and “dry” sites are not required to evaluate flood-induced challenges.

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 evaluation of 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 mile per hour (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 6 of the Integrated Plan regarding the determination of applicable extreme external hazards, the licensee stated that HNP is located at 31°56'2" N latitude and 82°20'39" W longitude and in accordance with NEI 12-06 Figures 7-1 and 7-2 guidance, hurricanes and tornado hazards are applicable to Hatch.

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

3.1.3.1 Storage of Portable Equipment - High Wind 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 page 25 of the Integrated Plan, the licensee stated that protection of associated portable equipment from hazards from severe storms with high winds would be provided. The piping used to provide core cooling to the RPV will be contained within buildings that are protected from storms and high winds. Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. HNP procedures and programs are being developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP.

On pages 32, 37, and 47 of the Integrated Plan, regarding the strategies for maintaining containment, SFP cooling and safety function support, the licensee stated that protection of associated portable equipment from hazards from severe storms with high winds would be provided as described above for the Core Cooling strategy and in addition as follows:

The piping used to provide makeup flow to the SFP is contained within buildings that are protected from storms and high winds.

FLEX air compressors will be stored in storage buildings designed and protected from storms and high winds in accordance with NEI 12-06.

During the audit process the licensee stated that the storage building/location will meet the design basis Safe Shutdown Earthquake (SSE), ASCE 7-10, or be located outside a structure and evaluated for seismic interactions to ensure equipment is not damaged. Any large portable FLEX equipment (N) required for mitigating a seismic hazard will be secured to ensure protection of SSCs during seismic events. Procedural guidance for storage of FLEX equipment will include provisions for prevention of seismic interaction between FLEX equipment and other equipment. The reviewer noted that the use of ASCE 7-10 for the storage structure or the storage of the equipment outside falls under the guidance of NEI 12-06, Section 7.3.1, Configuration 1.b or 1.c.

During the audit process the licensee stated that design of the storage facility will be determined during the design development phase. The design of the storage structure will address the protection of FLEX equipment from high winds. There will be sufficient FLEX equipment in the structure / location to supply the HNP FLEX needs for the Phase 2 strategies. Additionally, any FLEX equipment located outside the storage structure will be suitably protected from high winds. The need to verify that the axis of separation and the distance between the storage locations provides assurance that a single tornado would not impact all locations is identified as Confirmatory Item 3.1.3.1.A in Section 4.2

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

3.1.3.2 Deployment of Portable Equipment – High Wind Hazard.

NEI 12-06, Section 7.3.2 states:

> There are a number of considerations which apply to the deployment of FLEX equipment for high wind hazards:
>
> 1. For hurricane plants, the plant may not be at power prior to the simultaneous ELAP and LUHS condition. In fact, the plant may have been shut down and the plant configuration could be established to optimize FLEX deployment. For example, the portable pumps could be connected, tested, and readied for use prior to the arrival of the hurricane. Further, protective actions can be taken to reduce the potential for wind impacts. These factors can be credited in considering how the baseline capability is deployed.
>
> 2. The ultimate heat sink may be one of the first functions affected by a hurricane due to debris and storm surge considerations. Consequently, the evaluation should address the effects of ELAP/LUHS, along with any other equipment that would be damaged by the postulated storm.
>
> 3. Deployment of FLEX following a hurricane or tornado may involve the need to remove debris. Consequently, the capability to remove debris caused by these extreme wind storms should be included.
>
> 4. A means to move FLEX equipment should be provided that is also reasonably protected from the event.
>
> 5. The ability to move equipment and restock supplies may be hampered during a hurricane and should be considered in plans for deployment of FLEX equipment.

On pages 6 and 7 of the Integrated Plan the licensee stated that deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours and that deployment strategies and deployment routes will be assessed for hazards impact.

On page 52 of the Integrated Plan the licensee listed two (2) vehicles with sufficient rating that can tow the pumps and diesel generators (DGs) to be used to transport portable equipment and clear debris in Phase 2. On Page 54 of the Integrated Plan, the licensee listed debris-clearing equipment as part of the Phase 3 response equipment/commodities. The reviewer noted that per the assumptions on pages 6 and 7 of the Integrated Plan, the Phase 3 response equipment/commodities would arrive sometime after 6 hours from the initiating event.

On pages 55 and 56, of the Integrated Plan, the licensee lists various items of portable equipment being utilized before the arrival of debris clearing equipment. This includes, beginning at 10 hours, the transition from Phase 1 to Phase 2 for Core cooling function by placing FLEX pumps in service to make up to the CST and powering up the station battery chargers using a FLEX 600 Vac DG to supply power to the buses C and D.

During the audit process the licensee also stated that debris removal equipment will be used to aid, as necessary, transport of equipment from its storage location to its final staging area for operation. Primary and alternate routes for transport are being established and removal of potential obstacles along these routes is being evaluated regarding severe conditions due to screened in hazards. The results of this evaluation will be addressed in the design process and/or included in procedural guidance, as necessary.

The licensee also stated that preliminary obstacles and interference review indicates a need for medium sized construction equipment to ensure timely clearance of any route. An example of such equipment is a wheeled loader with bucket and fork-lift capability. The large thick rubber tires and low end torque provide efficient response in clearing any path under the majority of severe conditions. The drivability and operator protection provided with this equipment are also a consideration in selection. HNP will have the afore-mentioned equipment stored in the onsite FLEX equipment storage facility or reasonably protected from the site screened in hazards. Based on preliminary assessment of haul paths and debris removal equipment it is estimated to take less than 4 to 6 hours to sufficiently clear a haul path in any scenario. There will be either on-site personnel or ERO call out personnel capable of operating the debris removal equipment. This will ensure FLEX Phase 2 equipment can be deployed and available between 8 to 10 hours post event.

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 portable equipment during a severe storm high winds hazard if these requirements are implemented as described.

3.1.3.3 Procedural Interfaces – High Wind Hazard

NEI 12-06, Section 7.3.3, states:

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

On page 12, of the Integrated Plan, the licensee stated that the HNP deployment strategy will be included within an administrative program. HNP procedures and programs are being developed in accordance with NEI 12-06 to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP. Routes for transporting FLEX equipment from storage location(s) to deployment areas will be developed as the FLEX storage facility details are identified and finalized. The identified paths and deployment areas will be accessible during all modes of operation. The administrative program will have elements that ensure pathways will be kept clear or will require actions to clear the pathways.

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 for coping with the severe storm with high wind hazard if these requirements are implemented as described.

3.1.3.4 Considerations in Using Offsite Resources – High wind hazard.

NEI 12-06, Section 7.3.4 states:

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

The NRC staff reviewed the licensee's plans for the use of offsite resources during the severe storm with high wind hazard.

On page 14, of the Integrated Plan, the licensee stated, in part:

> HNP will utilize the industry RRC for Phase 3 equipment. HNP has contractual agreements in place with the SAFER. The two (2) industry RRC will be established to support utilities in response to BDBEE. Equipment will initially be moved from an RRC to a local staging area, established by the SAFER team and the utility. The equipment will be prepared at the staging area prior to transportation to the site.

During the audit process the licensee provided additional information regarding location of local staging areas and methods to be used to deliver the equipment to the site. These were previously described in this technical evaluation report, Section 3.1.1.4, "Considerations in Using Offsite Resources – Seismic Hazard."

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 during the severe storm with high wind hazard if these requirements are implemented as described.

3.1.4 Snow, Ice and Extreme Cold

As discussed in NEI 12-06, Section 8.2.1:

All sites should consider the temperature ranges and weather conditions for their site in storing and deploying their FLEX equipment consistent with normal design practices. All sites outside of Southern California, Arizona, the Gulf Coast and Florida are expected to address deployment for conditions of snow, ice, and extreme cold. All sites located north of the 35th 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 pages 5 and 6, of the Integrated Plan, the licensee stated that HNP site is located at 31°56'2" N, which is below the 35th parallel. Thus, the capability to address hindrances caused by extreme snowfall with snow removal equipment need not be provided. According to HNP-2 FSAR Section 2.4.7, there is no record of the Altamaha River freezing over. The minimum recorded river temperature is at Doctortown, Georgia (approximately 35 miles SE of HNP) and is 37.4°F, and is safely above the freezing temperature. Therefore, there is no risk of ice blockage, frazil ice, or loss of UHS due to ice. The HNP site is located within the region characterized by Electric Power Research Institute (EPRI) as ice severity level 5. The plant's design basis is 0.25 inches of ice every 9 years. As such, the Hatch site is subject to severe icing conditions. Thus the Hatch site screens in for an assessment for extreme cold for ice only.

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

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

NEI 12-06, Section 8.3.1 states:

> These considerations apply to the protection of FLEX equipment from snow, ice, and extreme cold hazards:
>
> 1. For sites subject to significant snowfall and ice storms, portable FLEX equipment should be stored in one of the two configurations.
>
>   a. In a structure that meets the plant's design basis for the snow, ice and cold conditions (e.g., existing safety-related structure).
>
>   b. In a structure designed to or evaluated equivalent to ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures* for the snow, ice, and cold conditions from the site's design basis.
>
>   c. Provided the N sets of equipment are located as described in a. or b. above, the N+1 equipment may be stored in an evaluated storage location capable of withstanding historical extreme weather conditions such that the equipment is deployable.
>
> 2. Storage of FLEX equipment should account for the fact that the equipment will need to function in a timely manner. The equipment should be maintained at a temperature within a range to ensure its likely function when called upon. For example, by storage in a heated enclosure or by direct heating (e.g., jacket water, battery, engine block heater, etc.).

On page 25, of the Integrated Plan, the licensee stated that protection of associated portable equipment from hazards from snow, ice, and extreme cold would be provided as follows:

> The piping used to provide core cooling to the RPV will be contained within buildings that are protected from snow, ice, and extreme cold. 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. The storage buildings construction will be completed for 2 sets of FLEX equipment by the date the first unit will reach the Order EA-12-049 implementation completion due date. The remaining FLEX equipment will be available and protected by the implementation completion date for the second unit.

During the audit process the licensee stated that HNP only screens in for icing for the hazards included in Section 8 of NEI 12-06. Because advance warning of freezing weather would be available, actions can be taken in advance to prepare for adverse conditions (including personnel actions). Existing resources such as sand for spreading on icy deployment routes are also available. Protection of FLEX equipment, control of FLEX equipment, and implementation of FLEX strategies will be incorporated into plant procedures. These procedures will address the protection of FLEX equipment from ice.

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 storage and protection of equipment from snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.4.2 Deployment of Portable 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 12 of the Integrated Plan, the licensee stated, in part, that their deployment strategy will be included within an administrative program and:

- HNP procedures and programs are being developed in accordance with NEI 12-06 to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP.

- Routes for transporting FLEX equipment from storage location(s) to deployment areas will be developed as the FLEX storage facility details are identified and finalized.
- The identified paths and deployment areas will be accessible during all modes of operation. The administrative program will have elements that ensure pathways will be kept clear or will require actions to clear the pathways.
- The chosen pathways will be evaluated for applicable hazards for the non-power block areas utilized for the deployment path or storage locations for Phase 2.

On pages 5 and 6, of the Integrated Plan, the licensee stated that according to HNP-2 FSAR Section 2.4.7, there is no record of the Altamaha River freezing over. The minimum recorded river temperature is at Doctortown, Georgia (approximately 35 miles SE of HNP) and is 37.4°F, and is safely above the freezing temperature. Therefore, there is no risk of ice blockage, frazil ice, or loss of UHS due to ice.

During the audit process the licensee stated that because advanced warning of freezing weather would be available, actions can be taken to prepare for adverse conditions (including personnel actions). Existing resources such as sand for spreading on icy deployment routes are also available. Protection of FLEX equipment, control of FLEX equipment, and implementation of FLEX strategies will be incorporated into plant procedures. These procedures will address the protection of FLEX equipment from ice.

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 portable equipment during a snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.4.3 Procedural Interfaces – Snow, Ice, and Extreme Cold Hazard

NEI 12-06, Section 8.3.3, states:

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

As discussed in Section 3.1.4.2, HNP only screens in for icing of those hazards described in Section 8 of NEI 12-06. Protection of FLEX equipment, control of FLEX equipment, and implementation of FLEX strategies will be incorporated into plant procedures. These procedures will address the protection of FLEX equipment from ice.

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

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

NEI 12-06, Section 8.3.4, states:

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

On page 14, of the Integrated Plan, the licensee stated, in part, that HNP will utilize the industry RRC for Phase 3 equipment. HNP has contractual agreements in place with SAFER. The two (2) industry RRCs will be established to support utilities in response to BDBEEs. Equipment will initially be moved from an RRC to a local staging area. The equipment will be prepared at the staging area prior to transportation to the site.

During the audit process the licensee provided additional information regarding location of local staging areas and methods to be used to deliver the equipment to the site. These were previously described in this technical evaluation report, Section 3.1.1.4, “Considerations in Using Offsite Resources – Seismic Hazard.”

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 using offsite resources during a snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.5. High Temperatures

NEI 12-06, Section 9.2 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.

The licensee stated that HNP screens in for extreme high temperature.

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

3.1.5.1 Storage of Portable 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 25, of the Integrated Plan, the licensee stated that protection of associated portable equipment from hazards from high temperatures would be provided as follows:

Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required, as normal room ventilation will be utilized. The schedule to construct structures is still to be determined. The storage buildings construction will be completed for 2 sets of FLEX equipment by the date the first unit will reach the Order EA-12-049 implementation completion due date. The remaining FLEX equipment will be available and protected by the implementation completion date for the second unit.

HNP procedures and programs are being developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP.

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 and storage of portable equipment during the high temperature hazard if these requirements are implemented as described.

3.1.5.2 Deployment of Portable 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 process the licensee stated that equipment specifications developed for procurement of FLEX equipment will specify the extreme conditions applicable to the site for areas in which the FLEX equipment needs to function or will be stored. SNC will procure the FLEX equipment to comply with these requirements. As indicated in the Integrated Plan, FLEX equipment will be designed for protection from high temperatures (104°F per FSAR Table 2.3-2) or installed inside buildings that provide protection from high temperatures. Multiple haul routes will be available from storage facility to any deployment area. The storage location and appropriate haul routes will be evaluated for access per NEI 12-06 Section 9.3.2. The reviewer noted that the HNP-2 FSAR, Section 2.3.2.2.B. lists the extreme temperature values for the site region as 105.5 °F (Savannah) and 107.0 °F (Macon) with a return period of 50 years or 111.0 °F (Savannah) and 113.3 °F (Macon) with a return period of 100 years. The reviewer further noted that the HNP-2 FSAR, Table 2.3-1 includes a footnote regarding an extreme high temperature of 105 °F in July 1879 (recorded at another site in the locality around Savannah) and that Table 2.3-2 includes a footnote regarding an extreme high temperature of 106 °F in June 1954 (recorded at another site in the locality around Macon). The reviewer was unable to locate an explicit statement of the safety-related design limit for high temperature within the HNP-2 FSAR, but noted that Section 3.1 states that:

> The design basis for protection against natural phenomena is in accordance with GDC [General Design Criterion] 2 [as specified in Appendix A to 10 CFR Part 50]. Structures, systems, and components important to safety are designed to

> withstand the effects of natural phenomena such as earthquakes, tornadoes, and floods without loss of the capability to perform those safety functions necessary to cope with appropriate margin to account for uncertainties in the historical data. The natural phenomena postulated in the design are presented in sections 2.3, 2.4, and 2.5.

The need to verify the normal safety-related design limit for high temperature with respect to the disparity between the listed extreme high temperatures is identified as Confirmatory Item 3.1.5.2.A in Section 4.2.

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

3.1.5.3 Procedural Interfaces – High Temperature Hazards

NEI 12-06, Section 9.3.3 states:

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

On page 25, 32, 38 and 47, of the Integrated Plan, the licensee stated that protection of associated portable equipment from hazards from high temperatures would be provided as follows:

> Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required, as normal room ventilation will be utilized. The schedule to construct structures is still to be determined. The storage buildings construction will be completed for 2 sets of FLEX equipment by the date the first unit will reach the Order EA-12-049 implementation completion due date. The remaining FLEX equipment will be available and protected by the implementation completion date for the second unit.
>
> HNP procedures and programs are being developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP.

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

3.2 PHASED APPROACH

Attachment (2) to Order EA-12-049 describes the three-phase approach required for mitigating BDBEEs in order to maintain or restore core cooling, containment and SFP cooling capabilities. The phases consist of an initial phase using installed equipment and resources, followed by a transition phase using portable onsite equipment and consumables and a final phase using offsite resources.

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

3.2.1 Reactor Core Cooling, Heat Removal and Inventory Control Strategies

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

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

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

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

3.2.1.1 Computer Code Used for ELAP Analysis

NEI 12-06, Section 1.3 states in part:

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

On pages 55 and 56 of the Integrated Plan, the licensee provided a Sequence of Events (SOE) Timeline identifying elapsed time from time zero for each plant response action following the start of the simultaneous ELAP and LUHS event. On pages 8 through 12 of the Integrated Plan, "Sequence of Events and Technical Basis" the licensee provided a discussion of the time constraints identified in Attachment 1A Table of its Integrated Plan. The licensee also stated that GE-Hitachi Nuclear Energy (GEH) developed a document (NEDC-33771P / NEDO-33771, "GEH Evaluation of FLEX Implementation Guidelines," Revision 1 (hereinafter NEDC-33771P, ADAMS Accession No. ML130370742)) to supplement the guidance in NEI 12-06 by providing additional BWR-specific information regarding the individual plant response to the ELAP and LUHS events. The document includes identification of the generic event scenario and expected plant response, the associated analytical bases, and recommended actions for performance of a site-specific gap analysis. In the document, GEH utilized the NRC accepted SUPERHEX (SHEX) computer code methodology for BWR's long-term containment analysis for the ELAP analysis. As part of this document, a generic BWR 4/Mark I containment NSSS evaluation was performed which is applicable to the HNP. The licensee stated that this guidance was utilized, as appropriate, to develop coping strategies and for prediction of the plant's response.

During the audit process the licensee stated that a preliminary analysis to evaluate the mitigating strategies was developed using the Modular Accident Analysis Program (MAAP4) computer code.

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

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

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

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

(4) In using MAAP4, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (Electric Power Research Institute Report 1020236). This should include response at a plant-specific level regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included.

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

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

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

The licensee stated during the audit that:

> [T]he [preliminary] analysis will be revised to conform to the Nuclear Energy Institute (NEI) position paper dated June 2013, entitled "Use of Modular Accident Analysis Program (MAAP) in Support of Post-Fukushima Applications" (ADAMS Accession No. ML13190A201). According to the October 3, 2013 letter from the NRC to NEI (ADAMS Accession No. ML13275A318), NRC staff has reviewed this position paper and has not identified any concerns regarding the use of MAAP4 in performing containment analyses in satisfying the intent of the NRC Order EA-12-049. A list of limitations is provided for MAAP use in establishing a timeline for BWRs, which meets the intent of NRC Order EA-12-049.
>
> The revised MAAP analysis will conform to these limitations and will provide the relevant information for the NRC staff to confirm the acceptability of the analysis. HNP will address the five limitations utilizing the industry developed template. The revised MAAP analysis is not expected to significantly change the strategies or the timing presented in the HNP Integrated Plan.

> The revised MAAP analysis is scheduled to be available on the e-portal no later than the third six month update report (August, 2014).

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

3.2.1.2 Recirculation Pump Seal Leakage Models

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

On page 11, of the Integrated Plan, the licensee stated, in part:

> Per the guidance in 10 CFR 50.63 and Regulatory Guide 1.155, HNP is an alternate ac, four (4) hour coping plant for Station Blackout (SBO) considerations. Applicable portions of supporting analysis have been used in ELAP evaluations (HNP-2 FSAR Section 8.4.2) as starting points for the evaluations performed to meet the guidance from NEI 12-06. Key assumptions not addressed in the EA-12-049 order were per the existing SBO evaluations. Some of these SBO based assumptions used for ELAP are reactor coolant system (RCS) inventory losses are limited to normal system leakage and recirculation pump seal leakages (18 gal/min per pump maximum).

During the audit process the licensee stated:

> The assumed recirculation pump leakage of 18 gpm is consistent with the existing station blackout licensing basis and is greater than the assumed leakage of 0 gpm for BWR/4 plants with Mark I containments in NEDC-33771P.
>
> In the preliminary MAAP analysis, recirculation pump leakage of 18 gpm (2 pumps for 36 gpm total leakage) is modeled by iteratively creating a break in the reactor coolant system (single-phase liquid) with a break size sufficient to generate 36 gpm leakage at full reactor pressure. The recirculation pump has a multi-stage seal design with multiple restricting orifices, but seal leakage is modeled as single phase break flow versus modeling the seal opening restrictions. Normal seal leakage at reactor pressure is less than 1 gpm. Since the leakage is modeled as break flow, the amount of leakage decreases as reactor pressure is lowered early into the event.
>
> A preliminary analysis to evaluate the mitigating strategies was developed using the MAAP4 computer code which includes drywell atmosphere characteristics; however, the analysis will be revised to conform to the Nuclear Energy Institute (NEI) position paper dated June 2013, entitled "Use of Modular Accident Analysis

Program (MAAP) in Support of Post-Fukushima Applications" (ADAMS Accession No. ML13190A201).

A review of the licensee's Integrated Plan and audit response determined that there is insufficient information provided to determine the adequacy of the determination of recirculation pump seal or other sources of leakage used in the ELAP analysis. Additional review will be required to evaluate the amount of seal leakage that was used in the HNP transient analyses and how the seal leakage was determined. This review will need to include the technical basis for the assumptions made regarding the leakage rate through the recirculation pump seals and also other sources. In addition, the review will need to include the assumed pressure-dependence of the leakage rate, and whether the leakage was determined or assumed to be single-phase liquid, two-phase mixture, or steam at the donor cell, and how mixing the leakage flow with the drywell atmosphere is modeled. This has been identified as Confirmatory Item 3.2.1.2.A in Section 4.2.

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

3.2.1.3 Sequence of Events

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

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

> Each site should establish the minimum coping capabilities consistent with unit-specific evaluation of the potential impacts and responses to an ELAP and LUHS. In general, this coping can be thought of as occurring in three phases:
>
> - Phase 1: Cope relying on installed plant equipment.
> - Phase 2: Transition from installed plant equipment to on-site FLEX equipment.
> - Phase 3: Obtain additional capability and redundancy from off-site equipment until power, water, and coolant injection systems are restored or commissioned.
>
> In order to support the objective of an indefinite coping capability, each plant will be expected to establish capabilities consistent with Table 3-1 (BWRs). Additional explanation of these functions and capabilities are provided in NEI 12-06 Appendix C, "Approach to BWR Functions."

In response to the need to identify expected time constraints, the licensee's Integrated Plan includes a discussion of time constraints on pages 8 through 12 and a Sequence of Events Timeline, Attachment 1A, on pages 55 and 56. On pages 10 and 11 of the Integrated Plan in the section on Technical Basis Support information for the sequence of events the licensee stated that the Boiling Water Reactor Owners Group (BWROG), GE-Hitachi (GEH) developed a document (NEDC-33771P, Revision 1) to supplement the guidance in NEI 12-06 by providing additional BWR-specific information regarding the individual plant response to the ELAP and LUHS events. The document includes identification of the generic event scenario and expected plant response, the associated analytical bases and recommended actions for performance of a site-specific gap analysis. In the document, GEH utilized the NRC accepted SUPERHEX (SHEX) computer code methodology for BWR's long-term containment analysis for the ELAP analysis. As part of this document, a generic BWR 4/Mark I containment NSSS evaluation was performed. The BWR 4/Mark I containment analysis is applicable to the HNP (a BWR 4 Mark I plant) coping strategy because it supplements the guidance in NEI 12-06 by providing BWR-specific information regarding plant response for core cooling, containment integrity, and SFP cooling. The guidance provided in the guidance was utilized as appropriate to develop coping strategies and for prediction of the plant's response. The NSSS vendor performed Hatch site-specific evaluations associated with RPV and containment response and impacts.

In a several places on page 9 of the Integrated Plan, the licensee stated that a formal validation of the timeline would be performed once the procedure guidance is developed and related staffing study is completed.

During the audit process the licensee stated that a preliminary analysis to evaluate the mitigating strategies was developed using the MAAP4 computer code; however, the analysis will be revised to conform to the Nuclear Energy Institute (NEI) position paper dated June 2013, entitled "Use of Modular Accident Analysis Program (MAAP) in Support of Post-Fukushima Applications" (ADAMS Accession No. ML13190A201). According to the October 3, 2013 letter from the NRC to NEI (ADAMS Accession No. ML13275A318), NRC staff has reviewed this position paper and has not identified any concerns regarding the use of MAAP4 in performing containment analyses in satisfying the intent of the NRC Order EA-12-049. A list of limitations was provided for MAAP use in establishing a timeline for BWRs, which meets the intent of NRC Order EA-12-049. The licensee stated that the revised MAAP analysis will conform to these limitations and will provide the relevant information for the NRC staff to confirm the acceptability of the analysis. HNP will address the five limitations utilizing the industry-developed template. The revised MAAP analysis is not expected to significantly change the strategies or the timing presented in the HNP Integrated Plan.

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 SOE, if these requirements are implemented as described.

3.2.1.4 Systems and Components for Consequence Mitigation

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

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

and,

> Design requirements and supporting analysis should be developed for portable

equipment that directly performs a FLEX mitigation strategy for core, containment, and SFP that provides the inputs, assumptions, and documented analysis that the mitigation strategy and support equipment will perform as intended.

NEI 12-06, Section 3.2.1.12 states:

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

On page 24 of the Integrated Plan the licensee provided a list of modifications necessary for implementing the core cooling strategies:

- Install connection points on the RHRSW piping at the intake structure for the FLEX pump discharge hose connection. (Primary and alternate strategies) (This modification also provides sufficient capacity to connect the larger RRC pump to the RHRSW piping to provide flow to the RHR HXs for SDC or torus cooling).

- Install connection points on the RHRSW piping in RB to provide makeup flow to CST, SFP, vessel injection flow via RHR or CRD, and cooling water flow to RHR, MCR, and RCIC room coolers (Primary and alternate strategies).

- Install new RB penetration and modify existing RB penetration to facilitate connection points for hose to provide makeup flow to CST (Primary strategy).

- Install new connections at CST for makeup from the FLEX pumps via the RHRSW piping (Primary strategy).

- Install hose connection point at CRD piping for alternate method of direct injection (Alternate strategy).

- Add connection points and cabling at control building wall to connect FLEX 600 Vac diesel generators to the 600 Vac Bus C and Bus D to provide power to battery chargers and critical ac components (Primary strategy).

- Add connection points and transfer switches locally at battery chargers to provide for direct connection from 600 Vac DGs (Alternate strategy).

On pages 30 and 31 of the Integrated Plan, the licensee described the modifications necessary for implementing the containment strategies:

> Hardened Containment Vent System (HCVS) (i.e., Reliable Hardened Vent) is currently installed but will be enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.
>
> Add connection points and cabling at control building wall to connect FLEX 600 Vac diesel generators to the 600 Vac Bus C and Bus D to provide power to

battery chargers and critical ac components (Primary strategy).

Add connection points and transfer switches locally at battery chargers to provide for direct connection from 600 Vac DGs (Alternate strategy).

On page 46 of the Integrated Plan, the licensee listed the following modifications:

- Enclose the small area between the MCR entry door and the 164’ elevation door of the stairwell leading to the MCR to create a path for continuous flow of air from the 130’ elevation to the MCR.

- Modify RB penetrations for connection points for air compressors

- Modify air supply to the gate seals to provide backup air from a FLEX air compressor. This will involve running hard pipe from the 130’ elevation of the RB to the refuel floor gate seal accumulator tank.

- Modify RHRSW and RB Service Water system to provide a cross-connect to supply cooling water for MCR chillers, RCIC room coolers, and RHR room coolers.

On pages 21 and 22, of the overall Integrated Plan, the licensee addressed the use of water directly from the ultimate heat sink, the Altamaha River:

Use of raw water (Altamaha River) as a direct injection source was evaluated by GEH for impact to fuel and heat transfer. GEH concluded that there would not be a serious threat to the fuel from use of river water, but stated that potential clogging of the inlet or outlet of the fuel bundles should be minimized by including some level of straining to minimize ingress of large quantities of debris with the river water. This recommendation will be addressed by connecting to the RHRSW system upstream of the currently installed system strainers (D002A/B and D003A/B) such that any river water injected is directed through the system strainers. The strainers are in parallel such that one remains in service while the other is in maintenance. In addition, the suction hose of the FLEX pumps will be fitted with a strainer to prevent large debris from entering the suction of the pump. Also, the water level will be maintained above the top of fuel throughout the ELAP so cooling of the fuel does not solely rely on flow from the bottom of the fuel assembly.

Providing defense in depth for RCIC, the FLEX pumps deployed at the river can provide RPV injection via the normal RHR injection flow path. The same connections from the river to the reactor building as used in the primary strategy will be able to supply water to the RHR SW header in the reactor building.

Phase 2 strategies for makeup water during Modes 4-5 will be identical to core cooling strategies during Operation, Startup, and Hot Shutdown modes. FLEX pumps will take suction from the UHS/river and discharge into the RHRSW piping (to cross-connect into the RHR injection flow path), or discharge into the CRD connection as shown in Figure 1, Flow Diagram for FLEX Strategies.

The licensee was requested to confirm the ability of the portable FLEX pumps to deliver the required flow through the system of flex hoses, couplings, valves, elevation changes, etc., for either the primary or the alternate strategies discussed above.

During the audit process, the licensee stated that the technical bases for sizing portable/FLEX equipment will meet the requirements determined using standard industry practices for hydraulic calculations to model system losses through flex hoses, couplings, valves, elevation changes, etc. Preliminary evaluations were performed to determine the performance criteria listed on pages 52 and 53 of the Integrated Plan. The revised evaluation is scheduled to be available on the e-portal no later than the fourth six-month update report (February, 2015). Review of the licensee's revised evaluation is identified as Confirmatory Item 3.2.1.4.A in Section 4.2.

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

3.2.1.5 Monitoring Instrumentation and Controls

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

> The parameters selected must be able to demonstrate the success of the strategies at maintaining the key safety functions as well as indicate imminent or actual core damage to facilitate a decision to manage the response to the event within the Emergency Operating Procedures and FLEX Support Guidelines or within the SAMGs. Typically these parameters would include the following:
>
> - RPV Level
> - RPV Pressure
> - Containment Pressure
> - Suppression Pool Level
> - Suppression Pool Temperature
> - SFP Level
>
> The plant-specific evaluation may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance, or to indicate imminent or actual core damage.

On Page 19 of the Integrated Plan, the licensee provided the following list of instrumentation credited or recovered.

- RPV Level
- RPV Pressure
- Drywell & Torus Pressure
- Drywell & Torus Temperature
- Torus Water Level
- SFP Level

On page 20 of the Integrated Plan, the licensee stated that the following instruments would remain available during load stripping due to their power sources:

- RPV Level – NR
- RPV Level – WR
- RPV Pressure
- RPV Pressure - Local Indication
- Drywell Wide Range Radiation Monitor

In addition, the Key Reactor Parameters can be determined from a local reading using standard I&C instruments and there are local indications exist such as CST tank level.

On pages 24, 28, 31, 33, 37, 39, 46, and 50 in the Integrated, the licensee stated that, in part, that they would rely on the same instruments as were listed for Phase 1 core cooling and in addition:

Phase 2 and Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

On page 30 of the Integrated Plan, the licensee stated that a “Hardened Containment Vent System (HCVS) (i.e., Reliable Hardened Vent [RHV]) is currently installed but will be enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.” In addition, the licensee listed the following as essential containment instrumentation:

Drywell & Torus Pressure
Drywell & Torus Temperature
Torus Water Level
Containment Hardened Vent Radiation Monitor
RHV system valve position indication
RHV system pressure indication
RHV system power status
Nitrogen system supply status
RHV effluent temperature

On page 34 of the Integrated Plan, the licensee stated that key SFP parameters would be “Per NRC Order EA-12-051.”

During the audit process the licensee stated that as stated on page 19 of the Integrated Plan, key instruments are installed plant instrumentation to monitor core cooling, containment, and spent fuel cooling and are also used during a SBO and therefore their tolerances/accuracies have already been determined to be acceptable. Since these instruments will be continuously powered during the event from Class 1E batteries (i.e., first in Phase 1 by the batteries themselves and then in Phase 2 and beyond by the FLEX generators through their associated Class 1E battery chargers) there is no expected impact on accuracy except for the SFP level instruments where accuracy is addressed in compliance with Order EA-12-051.

NEI 12-06, Section 11.2 states:

> 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.

During the audit process the licensee stated that existing HNP guidance 31EO-TSG-001-0 and 31EO-TSG-002-0, Technical Support Guidelines (TSGs) and 34AB-R22-003-1(2), Station Blackout (SBO), provide direction to control critical equipment including manual operation of the RCIC system and manual operation of the SRVs. HNP procedures/instructions for obtaining vessel level measurements when ac and dc power are not available will be developed/enhanced through the FLEX procedure development process. FLEX Support Guidelines (FSGs) and supporting procedures developed in accordance with NEI 12-06, Section 5.3.3 will contain: reference sources for operators to obtain necessary instrument readings to support implementation of the coping strategy and how and where to measure key readings at containment penetrations (where applicable) using a portable instrument; critical actions that may be necessary to perform until alternate indications can be connected (measured); and instructions on how to control critical equipment without control power, if required. Discussion of the plans for conforming to Section 5.3.3 Consideration 1 is anticipated to be included in the fourth six-month update report (February, 2015).

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

3.2.1.6 Motive Power, Valve Controls and Motive Air System

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

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

and,

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

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

On pages 15 and 16 of the Integrated Plan, the licensee stated, in part:

> The primary method of reactor pressure control is by operation of the SRVs.

> Operator control of reactor pressure using SRVs requires dc control power and pneumatic pressure (supplied by station batteries and the drywell pneumatics system. For Phase 1, the power for the SRVs is supplied by the station batteries. At event initiation the normal pneumatic supply is lost due to loss of power, but each SRV is provided an accumulator, which contains enough pneumatic pressure to operate each valve through 5 open/close cycles . In addition, the 9,000-gallon liquid nitrogen storage tank automatically supplies backup pneumatic pressure for SRV operation and the unit specific nitrogen storage tanks can be cross tied, thus providing a large volume of pneumatic supply to either unit. Mechanical SRV operation will also control reactor pressure.

On page 21 of the Integrated Plan, the licensee stated, in part:

> During Phase 2, reactor pressure will be controlled by manual operation of SRVs as described in Phase 1. As backup to the nitrogen tank and the SRV accumulators, pre-staged emergency N2 bottles can be valved in per 34SO-P70-001-1 (2), Drywell Pneumatic System.

During the audit process the licensee stated that the liquid nitrogen storage tanks and their foundations are seismic Category I. The tanks are provided tornado missile protection by their location on each side of the HNP-1 reactor building railway airlock. HNP-2 FSAR Table 17.2-2 lists the Nitrogen Inerting System as a safety-related system, including the storage tank, makeup supply piping and valves, ambient vaporizer and piping and valves forming part of containment. HNP-1 FSAR Table D9-1, Sh. 5, states that the Nitrogen Makeup System (as required for DBA mitigation) is a safety-related system. In addition, the tanks are inherently protected from missiles due to having enclosures on multiple sides and/or being physically located adjacent to other robust structures.

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

3.2.1.7 ELAP During 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:

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

NEI 12-06, Section 13.1, "Overall Integrated Plan Submittal," states:

> 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 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. The NRC staff will evaluate the licensee's resulting program through the audit and inspection processes.

During the audit process, SNC stated that Hatch will incorporate the supplemental guidance provided in the NEI position paper entitled "Shutdown / Refueling Modes" to enhance the shutdown risk process and 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 the analysis of an ELAP during Cold Shutdown or Refueling if these requirements are implemented as described.

3.2.1.8 Use of Portable Pumps

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

> Regardless of installed coping capability, all plants will include the ability to use portable pumps to provide RPV/RCS/SG makeup as a means to provide diverse capability beyond installed equipment. The use of portable pumps to provide RPV/RCS/SG makeup requires a transition and interaction with installed systems. For example, transitioning from RCIC to a portable FLEX pump as the source for RPV makeup requires appropriate controls on the depressurization of the RPV and injection rates to avoid extended core uncovery. Similarly, transition to a portable pump for SG makeup may require cooldown and depressurization of the SGs in advance of using the portable pump connections. Guidance should address both the proactive transition from installed equipment to portable and reactive transitions in the event installed equipment degrades or fails. Preparations for reactive use of portable equipment should not distract site resources from establishing the primary coping strategy. In some cases, in order to meet the time-sensitive required actions of the site-specific strategies, the FLEX equipment may need to be stored in its deployed position.
>
> The fuel necessary to operate the FLEX equipment needs to be assessed in the plant specific analysis to ensure sufficient quantities are available as well as to address delivery capabilities.

NEI 12-06 Section 11.2 states in part:

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

In the Integrated Plan on pages 52 and 53, the licensee listed several portable pumps to be utilized for coping strategies. There are numerous references in the Integrated Plan regarding the use of pumps, hoses, pipe runs and connection hardware to facilitate the implementation of coping strategies.

During the audit process the licensee stated that the technical bases for sizing portable/FLEX equipment will meet the requirements determined using standard industry practices for hydraulic calculations to model system losses through flex hoses, couplings, valves, elevation changes, etc. Preliminary evaluations were performed to determine the performance criteria listed on pages 52 and 53 of the Integrated Plan. The revised evaluation is scheduled to be available on the e-portal no later than the fourth six-month update report (February, 2015).

This was previously discussed in Section 3.2.1.4 of this technical evaluation report. Confirmatory Item 3.2.1.4.A in Section 4.2 pertains.

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 equipment, if these requirements are implemented as described.

3.2.2 Spent Fuel Pool Cooling Strategies

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

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

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

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

1. All boundaries of the SFP are intact, including the liner, gates, transfer

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

On page 35 of the Integrated Plan, the licensee stated, in part, that:

> The normal SFP water level at the event initiation is 21 feet over the top of the stored spent fuel. Using the design basis maximum heat load, the SFP water inventory will heat up from 110°F to 212°F during the first 12 hours for Unit 1 and Unit 2. Thus, the transition from Phase 1 to Phase 2 for SFP cooling function will occur at approximately at 12 hours.
>
> The required makeup rate to maintain the fuel pool filled during this time will be 24 gpm. However 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 onsite and offsite. Note that the time to boil is determined from the design basis decay heat load in the SFP. The design basis SFP heat load is the heat load 30 days following a refueling outage (HNP-2 FSAR Section 9.1.2.3.1). More realistic time dependent heat loads post-shutdown are available in procedures 34AB-G41-001-1 and 34AB-G41-001-2. Makeup to the SFP will be provided by one of three baseline capabilities.
>
> Full Core Offload
>
> Calculation SMNH 98-019 concludes that the time to boil in the SFP for a core offload is 4.2 hours, and the water loss is 72 gpm. However 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 onsite and offsite. Thus, Phase 2 actions after 8 hours will be acceptable because only 3.52 feet of level (16,416 gallons) will have evaporated by 8 hours into the ELAP.
>
> *Primary Strategy Method 1*
> The first method will be with the FLEX pump connected and providing flow to the RHRSW system piping at the Intake Structure to supply water to the new FLEX piping in the reactor building. A branch line will be provided that terminates on the refueling floor with a hose connection. A hose long enough to reach the SFP will be pre-staged nearby to allow filling of the SFP utilizing river water (primary source) via FLEX pump. The flow requirement for this method will be 24 gpm which can be easily supplied by the FLEX pump.
>
> *Primary Strategy Method 2*
> The second method will be with the FLEX pump connected and providing flow to the RHRSW system piping at the Intake Structure and cross-connecting the RHRSW system to the seismically qualified Reactor Building Service Water (RBSW) system piping in the reactor building. The RBSW piping provides an emergency fill connection to the Fuel Pool Cooling System SFP makeup piping. As noted above, this method of makeup will be required to supply 24 gpm.

Primary Strategy Method 3

The third method to provide water to the SFP utilizes the FLEX pump connected to the RHRSW piping at the intake structure to supply water to the new FLEX piping in the reactor building. A branch line will be provided that terminates on the refueling floor with a hose connection. A hose long enough to reach the SFP will be pre-staged nearby to allow connection to a monitor spray nozzle on the refuel floor. The monitor spray nozzle will be used as necessary to provide spray flow over the SFP. According to the NEI 12-06 guide, a 250 gpm flow rate is required for a SFP spray. The required head at this flow rate is about 270 ft (120 psi).

On page 44 of the Integrated Plan, the licensee stated, in part:

> Per the NEI 12-06 guidance, a baseline capability for Spent Fuel Cooling is to provide a vent pathway for steam and condensate from the SFP. The roof of the reactor refueling floor is equipped with vents designed to open/operate automatically on a pressure differential of 55 lb/ft2 between the secondary containment and the outside atmosphere (HNP-1 FSAR Section 3.3.2.3 and HNP-2 FSAR Section 3.3.2.3). However, under Station Blackout conditions, the roof vents have no power to operate and must be operated manually. Manual operation of the roof vents will be required at the time that the SFP commences boiling, at approximately 12 hours into the event. The SBO/FLEX strategy to cope with the pressurization of the refueling floor and prevent buildup of steam and condensation will be to operate the vents using the manual "pull chains" from the roof of the reactor building and/or to open the air lock doors. Both of these strategies are provided in the Technical Support Guidelines (Attachment 20). In order to establish flow of air through the SFP area it will be necessary to open stairwell doors at the refuel floor elevation and the 130' elevation. Additionally, a door to the outside (through secondary containment) must be opened.

During the audit process the licensee stated that the FLEX procedures will require a vent to be established before the SFP commences boiling no earlier than 12 hours. This action will be added to Attachment 1A: Sequence of Events Timeline of the Integrated Plan. In addition, existing Technical Support Guideline, 31EO-TSG-001-0, includes steps to establish a SFP area vent path. This action will be incorporated into the FLEX response procedures as appropriate to ensure opening is performed before access is affected by the heat and humidity from the SFP.

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 3-1 and Appendix C provide a description of the safety functions and performance attributes for BWR containments, which are to be maintained during an ELAP as defined by Order EA-12-049. The safety function applicable to a BWR with a Mark II containment listed in Table 3-1 is Containment Pressure Control/Heat Removal, and the method cited for accomplishing this safety function is Containment Venting or Alternative Containment Heat Removal. Furthermore, the performance attributes listed in Table C-2 denote the containment's function is to provide a reliable means to assure containment heat removal. JLD-

ISG-2012-01, Section 5.1 is aligned with this position stating, in part, that the goal of this strategy is to relieve pressure from the containment.

On page 29 of the Integrated Plan, the licensee stated, in part:

> As the torus heats up and the water begins to boil, the containment will begin to heat up and pressurize. Additionally, the torus water level rises due to the transfer of inventory from the CST to the torus (via RCIC and SRVs). According to MAAP analysis, at approximately 7.5 hours, the torus level will increase to the SRVTPLL (Safety Relief Valve Tail Pipe Level Limit) while concurrently; the containment pressure is approaching the Pressure Suppression Pressure (PSP) limit. Because it is necessary to ensure the capability of SRVs to perform the pressure relief function, and it is necessary to maintain containment integrity, the containment will be vented to reduce torus inventory and containment pressure at approximately 7.5 hours. The HCVS will be used as implemented per EA-12-050, Reliable Hardened Containment Vents with control from the main control room (MCR) or remote operating station.
>
> The torus temperature will also be a limiting factor for implementation of the ELAP strategy. As discussed in Phase 1 Core Cooling section, RCIC suction temperature will be allowed to go as high as 230°F. At the time that RCIC suction is swapped from the CST to the torus, torus temperature will be approximately 220°F and rapidly increasing. By opening the HCVS at approximately the 7.5 hour point, the temperature peaks at approximately 225°F at approximately 8.6 hours.
>
> The containment design pressure is 56 psig (HNP-1 FSAR Section 5.2.2.2 and HNP-2 FSAR Section 6.2.3.1.1). Containment pressure limits are not expected to be reached during the event as indicated by MAAP analysis, because the HCVS will be opened prior to exceeding any containment pressure limits.
>
> Thus, containment integrity will not be challenged and remains functional throughout the event. As indicated by MAAP analysis, the containment will require venting with the Reliable Hardened Vent (RHV) system at approximately 7.5 hours after event initiation. Monitoring of containment (drywell) pressure and temperature will be available via normal plant instrumentation.
>
> Phase 1 (i.e., the use of permanently installed plant equipment/features) of containment integrity will be maintained throughout the duration of the event; no non-permanently installed equipment will be required to maintain containment integrity. Therefore, there is no defined end time for the Phase 1 coping period for maintaining containment integrity. An alternative strategy for containment during Phase 1 is not provided, because containment integrity is maintained by the plant’s design features.

On page 30 of the Integrated Plan, the licensee stated that existing procedures HNP EOP, 31EO-EOP-012-1(2), Primary Containment Control, directs operators in the protection and control of containment integrity. The licensee will utilize the industry-developed guidance from the Owners Groups, 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.

On page 31 of the Integrated Plan the licensee stated, in part, that containment integrity is maintained by permanently installed equipment [as previously described for Phase 1]. Portable FLEX diesel generators will be employed, as discussed in Phase 2 Core Cooling section, to charge the station batteries and maintain dc bus voltage. The following modifications are necessary for Phase 2:

- Add connection points and cabling at control building wall to connect FLEX 600 Vac diesel generators to the 600 Vac Bus C and Bus D to provide power to battery chargers and critical ac components (Primary strategy).
- Add connection points and transfer switches locally at battery chargers to provide for direct connection from 600 Vac DGs (Alternate strategy).

On pages 31 and 33 of the Integrated Plan, the licensee stated that they would rely on the same installed equipment described for Phase 1 and, in addition:

> Phase 2 FLEX [and Phase 3 FLEX] equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

On page 33 of the Integrated Plan the licensee stated that the coping strategies for Phase 3 would be the same as for Phase 2.

On page 55 of 61, “Sequence of Events Timeline”, the licensee indicates their plan to use Hardened Containment Vents per EOPs to maintain containment parameters starting at 7.5 hours into the event. In Staff Requirements Memorandum SRM-SECY-12-0157, “Consideration of Additional Requirements for Containment Venting System for Boiling Water Reactors with Mark I and Mark II Containments,” the Commission has approved Option 2 to issue a modification to Order EA-12-050, “Order Modifying Licenses With Regard to Reliable Hardened Containment Vents,” to require licenses for Boiling Water Reactors (BWRs) with Mark I and Mark II containments to upgrade or replace the reliable hardened vents required by Order EA-12-050, with a containment venting system designed and installed to remain functional during severe accident conditions. The revision to Order EA-12-050 and the revised interim staff guidance JLD-ISG-2012-02, “Compliance with Order EA-12-050, Reliable Hardened Containment Vents,” are scheduled to be issued in the near future. The revised order nominally expands the scope of the reliable hardened vent from preventing core damage to mitigating an ELAP after severe core damage with vessel breach to the drywell floor. The expanded scope will have an impact on Mark I and Mark II BWR responses to comply with Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design Basis External Events.”

In the 6-month update, dated August 27,2013, the licensee indicated they will revise strategies to comply with NRC Order EA-12-050 with information from the industry, NEI, and NRC relative to the new requirements and schedule associated with NRC Order EA-13-109. They anticipate the revised criteria and implementation schedule may impact containment venting procedures, training and demonstrations related to the compliance date for NRC Order EA-12-049. They plan to request a relief request in a separate letter to the NRC in a future 6-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 ventilation support function 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.

The licensee was requested discuss the need for, or use of, plant cooling systems necessary to assure that coping strategy functionality can be maintained. During the audit process the license stated that no additional cooling water systems are required to maintain operation of installed plant equipment credited in the FLEX primary strategies. Loss of HVAC in areas with credited FLEX equipment is evaluated as a part of the design process. For example, operation of RCIC does not require the use of any auxiliary cooling systems. The control system for the RCIC system is located outside of the RCIC pump/turbine room and is not exposed to elevated temperatures; therefore no cooling system is needed for the RCIC room that would need the support of an auxiliary cooling water system.

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

3.2.4.2 Ventilation-Equipment Cooling

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

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

> that equipment failure does not occur as a result of a loss of forced ventilation/cooling. Actions should be tied to either the ELAP/LUHS or upon reaching certain temperatures in the plant. Plant areas requiring additional air flow are likely to be locations containing shutdown instrumentation and power supplies, turbine-driven decay heat removal equipment, and in the vicinity of the inverters. These areas include: steam driven [auxiliary feedwater] AFW pump room, HPCI and RCIC pump rooms, the control room, and logic cabinets. Air flow may be accomplished by opening doors to rooms and electronic and relay cabinets, and/or providing supplemental air flow.
>
> Air temperatures may be monitored during an ELAP/LUHS event through operator observation, portable instrumentation, or the use of locally mounted thermometers inside cabinets and in plant areas where cooling may be needed. Alternatively, procedures/guidance may direct the operator to take action to provide for alternate airflow in the event normal cooling is lost. Upon loss of these systems, or indication of temperatures outside the maximum normal range of values, the procedures/guidance should direct supplemental air flow be provided to the affected cabinet or area, and/or designate alternate means for monitoring system functions.
>
> For the limited cooling requirements of a cabinet containing power supplies for instrumentation, simply opening the back doors is effective. For larger cooling loads, such as HPCI, RCIC, and AFW pump rooms, portable engine-driven blowers may be considered during the transient to augment the natural circulation provided by opening doors. The necessary rate of air supply to these rooms may be estimated on the basis of rapidly turning over the room’s air volume.
>
> Temperatures in the HPCI pump room and/or steam tunnel for a BWR may reach levels which isolate HPCI or RCIC steam lines. Supplemental air flow or the capability to override the isolation feature may be necessary at some plants. The procedures/guidance should identify the corrective action required, if necessary.
>
> Actuation setpoints for fire protection systems are typically at 165-180°F. It is expected that temperature rises due to loss of ventilation/cooling during an ELAP/LUHS will not be sufficiently high to initiate actuation of fire protection systems. If lower fire protection system setpoints are used or temperatures are expected to exceed these temperatures during an ELAP/LUHS, procedures/guidance should identify actions to avoid such inadvertent actuations or the plant should ensure that actuation does not impact long term operation of the equipment.

On pages 40 and 43 of the Integrated Plan, the licensee stated, in part:

> For long term operation (6 months), the safety-related components of the RCIC room are designed to operate with area temperatures of 148 °F as discussed in the HNP-1 FSAR Section 10.18.5 and HNP-2 FSAR Section 9.4.2.2.3. The existing GOTHIC calculation SMNH-12-008 explores different cases of room heat up with a loss of all cooling. … To determine the temperature impact to the RCIC room over an extended period, the curves in the above calculation were extrapolated to 72 hours. The extrapolation indicated that temperature in the

> RCIC room will rise to approximately 131°F in approximately 72 hours. Thus RCIC room temperature will be maintained well below equipment design limits during RCIC operations in all Phases.
>
> It is not anticipated that habitability of the RCIC room will be required; however, if personnel habitability becomes necessary then a method of cooling or exhausting heat from the RCIC room will be established. The room cooler will be powered after the 600 V FLEX diesel generators have been connected as emergency power. Cooling water from the RHRSW system will be supplied for the room coolers.

During the audit process the licensee confirmed that the modeled case does not credit any mitigating actions to reduce the room temperature. The average temperature at 72 hours remains below the acceptance criterion of 148°F. The also stated that the High Room temperature RCIC steam supply isolation is currently allowed to be disabled per the EOP flow chart using 31EO-EOP-100, Miscellaneous Emergency Overrides. As applicable this action will be addressed as part of the FLEX procedure development. Also, access to the RCIC room is not anticipated thus, no compensatory action for RCIC room high temperature is required since the RCIC system is capable of operation from the main control room following a BDBEE. If access were to become necessary such as RCIC black start, the anticipated tasks are minimal in nature and will require only short stay times.

On page 44, in the Integrated Plan, the licensee stated, in part:

> During battery charging operations in Phase 2 and 3, ventilation will be required in the main battery rooms due to hydrogen generation. The battery rooms are not evaluated for heat loads because the resultant temperature rise would be negligible. The calculation of main battery room hydrogen generation determines that hydrogen levels reach 2% in 1.98 days. Because the battery load calculations indicate the batteries will remain with sufficient power for greater than 12 hours, the batteries will likely not be placed on charge until at least 12 hours after event initiation. Hydrogen generation does not occur unless the batteries are on charge. Two percent (2%) hydrogen will not occur before approximately 2 1⁄2 days (i.e., 1.98 days plus 12 hours). Therefore, Phase 2 strategies can safely be used to establish a means to ventilate the rooms.
>
> There are two strategies for venting the battery rooms. The primary strategy will be to repower the existing emergency exhaust fans that are connected to the Emergency Power bus. This will occur after the FLEX DG has been connected to power the 600 V bus. The alternate strategy will be to prop open doors and set up portable fans.

The licensee was requested to provide a discussion of battery room ventilation to prevent hydrogen accumulation while recharging the batteries in Phases 2 or 3. The licensee was also requested to provide information on the adequacy of the ventilation provided in the battery room to protect the batteries from the effects of extreme high and low temperatures.

During the audit process the licensee stated, in part, that the primary strategy venting the battery rooms is to repower the existing emergency exhaust fans utilized in current Abnormal Operating Procedure response when Control Building ventilation is lost (U1/U2 FSAR Section 10.9.3.6.7/9.4.7.2.6). The existing emergency exhaust fans are powered from the Emergency

Power bus. Repowering these fans will occur just after the FLEX generator has been connected to power the Emergency Bus that also powers the 1E battery chargers. Hydrogen generation does not begin until battery charging begins. Because the existing emergency exhaust fans utilizing the existing design basis exhaust path will be able to perform their current function to remove hydrogen from the battery room where charging is taking place, thus no calculation for hydrogen accumulation was performed or is required.

During the audit process the licensee stated, in part, that during battery charging operations in Phases 2 and 3, in support of maintaining power to instrumentation and controls for core cooling, containment, and SFP cooling functions, ventilation may be required in the battery rooms. During the transition to Phase 2, a FLEX DG is connected to the Emergency Power bus to repower the battery charger and the existing emergency exhaust fans. This will provide ventilation to the battery room. If necessary due to extreme heat conditions, the doors will be manually propped open and then as needed forced ventilation can be established using portable fans (electric powered from the Phase 2 DG powering the battery charger). The licensee did not discuss any analysis or calculation for sizing of the portable fans that will be used to maintain temperature in the battery room to the acceptable level. This is identified as Confirmatory Item 3.2.4.2.A is Section 4.2

During the audit process the licensee stated that for extreme cold temperatures, the battery rooms would be at their normal operating temperature at the onset of the event and the temperature of the electrolyte in the cells would build up due to the heat generated by the batteries discharging and during re-charging. The battery rooms are located substantially internal to the plant leading to a much longer time required for extreme low outside temperatures to cause the electrolyte temperature to drop below 60 degrees F. Therefore, it is reasonable to assume that the room will remain near its pre-event temperature during the relatively short period of time until the FLEX generators are deployed and have energized the battery chargers. Once the battery chargers are energized, the battery chargers carry the DC load and charge the batteries.

In the Integrated Plan the licensee refers to Reference 11 as the source of the analysis that concluded that the battery room temperature rise is inconsequential. Reference 11 is "Miscellaneous Plant Area SBO Ambient Temperature Analysis [Vogtle Unit 2], Revision 4." During the audit process the licensee stated that the referenced Vogtle calculation in the HNP Integrated Plan contained a generic evaluation of the impact of battery usage on heat addition to battery rooms; this generic evaluation was utilized as input during the conceptual design phase when the HNP Integrated Plan was being developed. This generic input was used to justify not requiring any battery room ventilation for cooling during the initial phase of the coping period. This Vogtle calculation reference is still considered bounding and applicable to HNP.

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 ventilation support function if these requirements are implemented as described.

3.2.4.3 Heat Tracing

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

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

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

On page 25 of the Integrated Plan the licensee stated, in part:

The piping used to provide core cooling to the RPV will be contained within buildings that are protected from snow, ice, and extreme cold. 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. The storage buildings construction will be completed for 2 sets of FLEX equipment by the date the first unit will reach the Order EA-12-049 implementation completion due date. The remaining FLEX equipment will be available and protected by the implementation completion date for the second unit.

HNP procedures and programs are being developed to address storage structures requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP.

On page 37 of the Integrated Plan the licensee stated, in part:

The piping used to provide makeup flow to the SFP is contained within buildings that are protected from snow, ice, and extreme cold. Refer to Phase 2 of Maintain Core Cooling to address storage and protection features of support equipment.

On page 47 of the Integrated Plan the licensee stated, in part:

FLEX air compressors will be stored in storage buildings designed and protected from high temperatures in accordance with NEI 12-06. The storage buildings construction will be completed for 2 sets of FLEX equipment by the date the first unit will reach the Order EA-12-049 implementation completion due date. The remaining FLEX equipment will be available and protected by the implementation completion date for the second unit.

During the audit process the license stated, in part, that the Hatch site screens in for an assessment for extreme cold for icing only, therefore, the need for heat tracing is not anticipated. At this time in the design process, no requirement for heat tracing during an ELAP has been identified. Normal heat tracing requirements for FLEX tie-ins (e.g., the water-filled portion of the new branch line from the Core Spray suction line) will be addressed by the design process controlled by engineering procedures. Lines that are heat traced normally that are required to support the FLEX strategy with flow through them at initiation of the event should not require heat trace since they are already heated and flow has been established. At HNP, heat tracing has limited use and typically is used related to the cooling towers and sanitary (potable) water system.

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 and freeze protection if these requirements are implemented as described.

3.2.4.4 Accessibility-Lighting and Communications

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

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

On page 41 of the Integrated Plan the licensee stated, in part:

> The communication plan for HNP in response to an ELAP will rely on elements of the NTTF recommendation 9.3 emergency preparedness communication assessment performed in response to the March 12, 2012 NRC letter entitled, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident." The request for information asked that licensees assess their current communications systems and equipment during a large scale natural event and loss of all alternating current power. On October 31, 2012, HNP committed to address identified communication actions for the items identified in the assessment.
>
> For Phase 1 communication coping, the plant Public Address (PA) system, with battery backup, will assist with initial notifications and directions to on-site personnel, the on-shift Emergency Response Organization (ERO) personnel, and in-plant response personnel. Battery operated satellite phones will assist with initial notifications and directions to off-site Emergency Response Organization (ERO) personnel and other personnel. The battery operated satellite phones will be maintained in a charged condition and will not be dependent on the availability of power, or onsite or off-site infrastructure.

On page 45 of the Integrated Plan the licensee repeated the items described above for Phase 1 and supplemented by the following for Phase 2:

> The specific items for Phase 2 from the referenced 9.3 assessment are the plant

public address (PA) system will be repowered using FLEX DGs, and a rapidly deployable communications kit will be utilized to support both satellite and radio communications, if needed, for the ERO, including field monitoring teams. The mobile communications systems will be self-powered via a generator located on board and maintained in a charged condition and independent of onsite or off-site infrastructure. The generator can be refueled using multiple fuel sources, which would be available on-site. The mobile communications system does not rely on the availability of either on-site or off-site infrastructure other than satellites, which are assumed to be unaffected by the postulated LSEE.

During the audit process the licensee stated, in part, that the standard gear/equipment of operators with duties in the plant (outside the main control room (MCR)) includes flashlights for which use is considered as a standard practice/skill of the craft. Procedures for implementation of the FLEX strategies will include guidance on equipment necessary to facilitate the actions necessary for the FLEX strategies, including the need for flashlights. Sufficient spare flashlights and batteries will be available to respond to this event in various locations in the Plant, such as the maintenance shop area and operator annex. Portable DC powered area lights will be stored as Phase 2 equipment for use as necessary. When Phase 2 FLEX diesel generators are connected to the battery chargers, power will be available to ensure essential lighting to the Control Room is maintained. Although not credited, in addition, Appendix R lighting provides for emergency lighting in select areas of the plant including the MCR, where operators or maintenance personnel may need to perform actions, during loss of power conditions. The Appendix R lights have batteries that last for a minimum of 8 hours.

The NRC staff has reviewed the licensee communications assessment (ADAMS Accession No. ML12306A200) required by in response to the March 12, 2012 10 CFR 50.54(f) request for information letter for HCGS and, as documented in the staff analysis (ADAMS Accession No. ML13123A128) has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. Therefore, there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.2 Guideline (8) regarding communications capabilities during an ELAP. This has been identified as Confirmatory Item 3.2.4.4.A in Section 4.2 for confirmation that upgrades to the site's communications systems have been completed.

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 lighting and communications support for accessibility for operator actions, if these requirements are implemented as described.

3.2.4.5 Protected and Internal Locked Area Access

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

Plant procedures/guidance should consider the effects of ac power loss on area access, as well as the need to gain entry to the Protected Area and internal locked areas where remote equipment operation is necessary.

At some plants, the security system may be adversely affected by the loss of the preferred or Class 1E power supplies in an ELAP. In such cases, manual actions specified in ELAP response procedures/guidance may require additional actions to obtain access.

During the audit process the licensee stated that a Security procedure exists (82SS-SEC-037, Security Compensatory Actions, as developed for B.5.b response) and as applicable, FSGs will be developed to ensure that operators can access the required areas in the event of a loss of power. Additional details on controls for access to security controlled or internal locked areas where extended loss of all power (ELAP) would disable normal controlled access will be contained in the FSGs or associated 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 access to protected and locked internal plant areas if these requirements are implemented as described.

3.2.4.6 Personnel Habitability – Elevated Temperature

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

> *Plant procedures/guidance should consider accessibility requirements at locations where operators will be required to perform local manual operations.*
>
> Due to elevated temperatures and humidity in some locations where local operator actions are required (e.g., manual valve manipulations, equipment connections, etc.), procedures/guidance should identify the protective clothing or other equipment or actions necessary to protect the operator, as appropriate.
>
> FLEX strategies must be capable of execution under the adverse conditions (unavailability of installed plant lighting, ventilation, etc.) expected following a BDBE resulting in an ELAP/LUHS. Accessibility of equipment, tooling, connection points, and plant components shall be accounted for in the development of the FLEX strategies. The use of appropriate human performance aids (e.g., component marking, connection schematics, installation sketches, photographs, etc.) shall be included in the FLEX guidance implementing the FLEX strategies.

Section 9.2 of NEI 12-06 states,

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

On page 40 of the Integrated Plan, the licensee states, in part:

> <u>Main Control Room Accessibility</u>
>
> Under ELAP conditions with no mitigating actions taken, initial analysis projects the control room to surpass 110°F (the assumed maximum temperature for efficient human performance as described in NUMARC 87-00) in a time of approximately 9 hours. The Phase 1 FLEX strategy is to block open the entrance at the stairwell to the MCR and the lower stairwell doors coupled with the

opening of the outside freight elevator doors when the MCR temperature reaches 96°F (the assumed outside temperature at the time of event occurrence). This will establish a flow path for air to flow from the control building (and outside) 130' elevation to the MCR. The preliminary assessment indicates that by employing this strategy the MCR temperature will rise to approximately 108°F at the 9 hour point by which time Phase 2 actions can be implemented which include the employment of a portable fan in the stairwell and the MCR doors.

RCIC Room Accessibility

The existing GOTHIC calculation SMNH-12-008 (Reference 3) explores different cases of room heat up with a loss of all cooling. The transients evaluated by this calculation continue for 8 hours for purposes of immediate operator action determination. Under the Station Blackout case the temperature remains below 148°F for the entire transient of 8 hours. To determine the temperature impact to the RCIC room over an extended period, the curves in the above calculation were extrapolated to 72 hours. The extrapolation indicated that temperature in the RCIC room will rise to approximately 131°F in approximately 72 hours. Thus RCIC room temperature will be maintained well below design limits during RCIC operations in Phase 1. For the purposes of NEI 12-06 it is not anticipated that continuous habitability would be required in the RCIC room. If personnel entry is required into the RCIC room then personal protective measures such as ice vests will be taken. Site industrial safety procedures currently address activities with a potential for heat stress to prevent adverse impacts on personnel.

On page 43 of the Integrated Plan, the licensee states, in part:

Main Control Room Habitability

Primary Strategy
The primary strategy for maintaining the environment of the MCR during Phase 2 will be the employment of a portable fan in the stairwell and MCR doors. The fan will be powered by a portable FLEX diesel generator to initiate a forced air flow path up the stairwell in the control building and through the MCR, replacing hot MCR air with cooler air from the lower control building elevations and outside via the 130' elevation freight elevator doors.

Alternative Strategy
An alternate strategy for maintaining the environment of the MCR during Phase 2 will be to power the MCR chillers and air handling units if the 600 Vac switchgear is energized with the FLEX 600 Vac DG. Cooling water will be provided to the control room air conditioning units by cross-connecting RHRSW to the reactor building service water piping that supplies cooling water to the MCR air conditioning units. The new FLEX cross-connection will provide the means to supply 120 gpm each to two of the MCR air conditioning units.

RCIC Room Accessibility

Primary Strategy
The primary strategy for maintaining the environment of the RCIC room will use the same strategy as in Phase 1 section. Based on extrapolation of the heat up

curves in existing GOTHIC calculation SMNH-12-008, temperature in the RCIC room will rise to approximately 131°F in approximately 72 hours. Thus RCIC room temperature will be maintained well below equipment design limits during RCIC operations in Phase 1, Phase 2, and Phase 3.

Alternative Strategy
It is not anticipated that habitability of the RCIC room will be required; however, if personnel habitability becomes necessary then a method of cooling or exhausting heat from the RCIC room will be established. The room cooler will be powered after the 600 V FLEX diesel generators have been connected as emergency power. Cooling water from the RHRSW system will be supplied for the room coolers.

On page 49 of the Integrated Plan, the licensee states, in part:

<u>Main Control Room Accessibility</u>

The primary and secondary strategies for cooling the MCR are the same in Phase 3 as for Phase 2. However, the power for the MCR chillers and air handling units may be powered from the 4160 Vac emergency bus if it has been energized by RRC FLEX 4160 Vac DG instead of the FLEX 600 Vac DG.

<u>RHR Room Accessibility</u>

As part of Phase 3 strategies, an RHR pump will be placed into service in order to perform torus cooling and shutdown cooling. This results in heat addition to the RHR pump diagonal due to heat generated by the RHR pump motor as well as heat dissipated from the associated piping and RHR heat exchanger. For long term RHR pump operation, the RHR pump room must be cooled to maintain room temperatures within acceptable ranges (limited by maximum allowable RHR pump motor requirements). RHR Room Heat Up Analysis with Loss of Ventilation calculation, BH2-M-0625, documents a temperature of 196°F after operating one RHR pump, one RHR HX, and RHR piping for 24 hours without ventilation. RHR Room Heat up with Loss of Ventilation calculation, BH2-M-0560, for post Loss of Coolant Accident (LOCA) heat up, has a temperature of 148°F after operating for 1.5 hrs. with one RHR pump and one RHR heat exchanger. Each of these calculations indicates that the RHR room will reach its maximum design criteria of 148°F following a loss of ventilation. During an ELAP, this limit would be significantly exceeded, as shown in the calculation BH2-M-0625. Mitigating actions will therefore be employed to prevent the RHR room from surpassing its design maximum of 148°F as described in the FSAR (HNP-1 FSAR Section 10.18.5 and HNP-2 FSAR Section 9.4.2.2.3). This can be accomplished once the RRC 4160V FLEX DG will be connected to the 4160 Vac emergency bus at which time the RHR room cooler can be energized and cooling water supplied from the FLEX pump via the FLEX connections provided between the RHRSW piping and PSW cooling water supply piping.

An alternate means of cooling the RHR rooms if the room coolers are not available will be to use portable exhaust fans and hose trunks to exhaust RHR room air to outside the reactor building.

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 accessibility for operator actions if these requirements are implemented as described.

3.2.4.7 Water Sources.

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

> *Plant procedures/guidance should ensure that a flow path is promptly established for makeup flow to the steam generator/nuclear boiler and identify backup water sources in order of intended use. Additionally, plant procedures/guidance should specify clear criteria for transferring to the next preferred source of water.*
>
> Under certain beyond-design-basis conditions, the integrity of some water sources may be challenged. Coping with an ELAP/LUHS may require water supplies for multiple days. Guidance should address alternate water sources and water delivery systems to support the extended coping duration. Cooling and makeup water inventories contained in systems or structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles are assumed to be available in an ELAP/LUHS at their nominal capacities. Water in robust UHS piping may also be available for use but would need to be evaluated to ensure adequate NPSH can be demonstrated and, for example, that the water does not gravity drain back to the UHS. Alternate water delivery systems can be considered available on a case-by-case basis. In general, all CSTs should be used first if available. If the normal source of makeup water (e.g., CST) fails or becomes exhausted as a result of the hazard, then robust demineralized, raw, or borated water tanks may be used as appropriate.
>
> Heated torus water can be relied upon if sufficient [net positive suction head] NPSH can be established. Finally, when all other preferred water sources have been depleted, lower water quality sources may be pumped as makeup flow using available equipment (e.g., a diesel driven fire pump or a portable pump drawing from a raw water source). Procedures/guidance should clearly specify the conditions when the operator is expected to resort to increasingly impure water sources.

The licensee has addressed water sources for coping strategies on pages 21, 22, 26, 27 and 35 of the Integrated Plan, where reference is made to portable pumps taking suction from the Altamaha River. On page 21, the licensee states the following, in part:

> During the time that RCIC suction is aligned to the torus, the CST will be replenished by using portable FLEX pumps taking suction from the Ultimate Heat Sink (Altamaha River). The FLEX pumps will provide water to the CST via the existing RHRSW piping (between the intake structure and the reactor building), permanently installed FLEX piping in the reactor building, and a FLEX hose jumper from the reactor building to the CST.

During the audit process the licensee described how they will ensure that FLEX pumps and hoses will remain unhindered and clear of debris accumulation from untreated water sources.

They stated that the suction hose of the FLEX pumps will be fitted with a strainer to prevent large debris from entering the suction of the pump. Procedures will be developed to monitor and perform maintenance on all FLEX equipment as necessary, including cleaning the FLEX pump suction strainers while in operation. The connection to the RHRSW system will be upstream of the currently installed system strainers (D002A/B and D003A/B) such that any river water injected is directed through the system strainers. The strainers are in parallel such that one remains in service while the other is in maintenance. In addition, no strategies require continuous flow after the FLEX pumps are in service at 10 hours to successfully replenish water supplies or feed the core. Spare swappable strainers will be provided for the FLEX pumps. Therefore, an interruption in flow to exchange strainers is acceptable.

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.

On page 46 of the Integrated Plan the licensee identified modifications that would be made to facilitate safety functions support including:

> Add connection points and cabling at control building wall to connect FLEX 600 VAC diesel generators to the 600 VAC Bus C and Bus D to provide power to battery chargers and critical ac components (This is the same modifications noted in the Core Cooling Phase 2 section) (Primary strategy).
>
> Add connection points and transfer switches locally at battery chargers to provide for direct connection from 600 VAC DGs (This is the same modifications noted in the Core Cooling Phase 2 section) (Alternate strategy).

The licensee was requested to provide additional information regarding electrical isolations and interactions including the portable/FLEX diesel generators and the Class 1E diesel generators are isolated to prevent simultaneously supplying power to the same Class 1E bus. The licensee was also requested to describe how electrical isolation will be maintained such that (a) Class 1E equipment is protected from faults in portable/FLEX equipment and (b) multiple sources do not attempt to power electrical buses.

During the audit process the licensee stated, in part, that appropriate controls for the equipment will be implemented in procedures to ensure compliance with NEI 12-06 section 3.2.2.13. However, the primary goal of FLEX generators is to power components credited in the FLEX strategy. Connection points and other permanent modifications will be designed in accordance with approved design practices to ensure no adverse effects during normal operation. At the onset of the ELAP, Class 1E emergency diesel generators (EDGs) are assumed to be unavailable to supply the Class 1E busses. Portable generators are used in response to an ELAP in FLEX strategies for Phases 2 and 3. At the point when ELAP mitigation activities require tie-in of FLEX generators, in addition to existing electrical interlocks, procedural controls such as inhibiting EDG start circuits and breaker rack-outs (e.g., EDG breakers, offsite feeder breakers, etc.), will be employed to prevent simultaneous connection of both the FLEX generators and Class 1E EDGs to the same AC distribution system or component. Additionally, repowering the Class 1E electrical buses from either FLEX generators or subsequently the Class 1E EDGs (should they become available) will be accomplished manually and controlled by procedure; no automatic sequencing or automatic repowering of the buses will be utilized. FLEX strategies, including the transition from installed sources to portables sources (and vice versa), will be addressed in the FLEX procedures and guidance, which are in the development stage.

During the audit process the licensee stated that:

> Sizing calculations for the FLEX generators will create critical performance characteristics (kW, KVAR, and kVA demands for starting, stopping, and maintaining loads with margin) that must be met by the portable generators based on conservative estimates for the loads in Phase 2 and Phase 3. The quantity of FLEX generators being used to meet the core FLEX strategies per NEI 12-06 will satisfy the N+1 criteria. The sizing calculations will be made available on the e-Portal no later than the fourth six-month update report (February, 2015).
>
> These calculations are being developed in accordance with approved design processes that utilize appropriate design inputs for calculating electrical loads and the necessary considerations for use in sizing generators and their drivers (e.g., load starting requirements, voltage and frequency recovery requirements between applied loads, etc.). Loading and unloading of the generators will be controlled by procedure, based on vendor recommendations, to prevent overloading or tripping of the generators.
>
> The generators have not yet been selected but will be sized in accordance with industry criteria and capable of carrying the calculated loads, with margin. Any generator that satisfies the loading requirement as well as the KVAR and kVA demands during starting and running is acceptable.

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 electrical isolations and interactions if these requirements are implemented as described.

3.2.4.9 Portable Equipment Fuel.

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

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

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

> Fuel for FLEX equipment stored in structures with designs which are robust with

respect to seismic events, floods and high winds and associated missiles, remains available.

On page 22, of the Integrated Plan the licensee stated, in part:

> If onsite diesel fuel reserves are needed to operate temporary equipment, there are two primary locations to obtain diesel fuel. The first option would be the diesel day tanks. The second option would be to pump fuel directly from the seismically qualified underground fuel oil storage tanks. The fuel would be accessed through nozzles on the tank. A minimum of 175,000 gallons of diesel fuel is stored in the five fuel oil storage tanks and 2,500 gallons in the five day tanks. Adequate fuel supplies are available and accessible to operate emergency response equipment.

On pages 52 and 53 of the Integrated Plan, Attachment 1: Portable Equipment Lists for Phase 2 includes two (2) trailers with fuel tank, transfer pumps and portable fuel containers and for Phase 3 “two (2) diesel generator fuel transfer pump and hoses.

The licensee was requested to provide additional information that explains how fuel oil will be provided to the site to meet the NEI 12-06 objective for “indefinite" coping capabilities, a description of the refueling strategy for all FLEX equipment requiring diesel fuel/gasoline, and a description of how quality of stored fuel will be maintained.

During the audit process the license provided the following additional information:

> Diesel fuel oil is available from five underground fuel oil storage tanks, which are required to contain a minimum of 33,320 gallons each (>165,000 gallons total, reference Technical Specification LCO 3.8.3). Onsite fuel supplies are sufficient to maintain operation of diesel driven FLEX equipment beyond 72 hours (total consumption of all the diesel driven FLEX equipment during the initial 72 hours is estimated at less than 15,000 gallons per unit, based on representative calculations); offsite resources will be available beyond 72 hours.
>
> For the time period after 72 hours, existing agreements are in place with suppliers and Southern Company maintains a large quantity of fuel oil available throughout the region and at two other nuclear facilities such that there is reasonable assurance that supplemental fuel oil supplies will be available.
>
> As an enhancement from the Integrated Plan, fuel oil can be obtained by repowering the existing diesel fuel oil transfer pumps and pumping oil to a trailer mounted fuel tank. The trailer-mounted fuel tank will be reasonably protected. A refueling trailer will be towed back and forth between the fuel oil storage tanks and the portable FLEX equipment. Fuel will be pumped from the trailer-mounted tank to the FLEX equipment via a pump on the trailer.
>
> The quality of fuel oil in the emergency diesel generator fuel oil storage tanks is maintained in accordance with the Diesel Fuel Oil Testing Program (Technical Specifications Administrative Program 5.5.9). Fuel oil in the fuel tanks of portable diesel engine driven FLEX equipment will be maintained in the Preventative Maintenance program in accordance with the manufacturer’s guidance and existing site maintenance practices.

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 DC Power.

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

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

On page 9 of the Integrated Plan, the licensee stated, in part:

> At 1 hour, dc Load shed would be complete. A time period of 12 minutes past ELAP entry is selected to ensure that dc buses are available from battery sources. Phase 2 battery recharging is assumed to begin at 12 hours. Therefore, there is sufficient conservatism in the life of the dc power source. The dc buses are located in adjacent Switchgear Rooms on the ground elevation of the control building and are readily accessible to the operator. Unit 1 will not require any additional load shedding from the existing SBO response, while Unit 2 will load-shed 5 breakers (versus 14 breakers) at a local panel for deep load-shed as referenced on page 9. As an operator aid, the breakers will be appropriately identified (labeled) to show which are required to be opened to facilitate an extended load shed. From the time that ELAP conditions are declared, it is reasonable to expect that operators can complete the dc bus load shed in approximately 12 minutes. A formal validation of the timeline will be performed once the procedure guidance is developed and related staffing study is completed.

On page 22 of the Integrated Plan, the licensee stated, in part:

> The 125V dc batteries are available for greater than 12 hours without recharging.

Connection to 600V Bus C and D provides the ability to power Battery Chargers A/B and D/E, which charge the Batteries A and B and supply dc loads. The FLEX 600 Vac, 600 kW DG will be connected at approximately 10-12 hours and will be sized to power two 125/250 Vdc Battery Chargers, RCIC Controls, RHR Room Cooler and RHR Motor Operated Valves (MOVs) per division, and other selected loads.

On page 3 of the Enclosure to the six-month update to the Integrated Plan, the licensee stated in paragraph 9, item 1 that: Hatch Unit 1 will not require any additional load-shedding from the existing SBO response, while Unit 2 will load-shed 5 breakers (versus 14 breakers) at a local panel for deep load-shed as referenced on Page 9 of the Integrated Plan.

The licensee was requested to evaluate the consequences of a potential fire and explosion from the release of hydrogen from the main generator in the event of a loss of dc power to the backup seal oil pump on the main station generator.

During the audit process the licensee addressed the impact that a dc load shed would have on the backup dc seal oil pump which maintains sufficient seal oil pressure to prevent the escape of hydrogen from the main generator casing. The licensee stated that existing procedures, 34AB-R22-003-1(2), “Station Blackout (SBO),” and 31EO-TSG-001-0, “Technical Support Guideline,” include steps to vent the main generators and load shed the generator seal oil pumps. This action will be incorporated into the FLEX response procedures as appropriate.

The licensee was requested to identify whether the barometric condenser condensate pump will be shed from the dc bus and to discuss the potential for flooding in the RCIC room and the potential loss of RCIC function introduced by shedding of the condensate pump.

During the audit process the licensee stated that the barometric condenser condensate pump for the RCIC system is not load-shed from the dc bus as part of the ELAP coping strategy and remains operational to support RCIC system operation. Therefore, there are no RCIC room flooding or loss of RCIC function concerns that could exist if the barometric condenser condensate pump was not available. Also, during a black start of RCIC, flooding would not be a concern because black start does not necessarily mean the barometric condenser condensate pump is not powered. If the barometric condenser condensate pump is not powered, then, during this limited time, RCIC will be operated at reduced flow generating much less condensate until the FLEX generators will repower the impacted bus.

During the audit process the license stated that the NEI 12-06 electrical equipment powered from the dc bus utilized for FLEX is installed plant equipment and the minimum battery voltage used for FLEX analysis is the design basis value of 105 VDC terminal voltage. (U1/U2 FSAR 8.5.3 and 8.3.2.1.1)

During the audit process the licensee provided the following additional information requested by the NRC staff:

1. Calculation SNCH084-CALC-002 has since been replaced by four separate calculations (SENH-13-001, 002, 003 and 004) for each Station Service battery. These four calculations were prepared in accordance with the NEI white paper entitled “Battery Life Issue” and will be posted to e-portal once approved.

2. The load profiles are provided in the four new battery calculations identified in

part 1, which were developed in accordance with the NEI white paper entitled "Battery Life Issue".

3. Batteries 1A, 1B, and 2B do not require load shedding other than what is in the SBO coping strategy to extend battery life to approximately 15 hours. Therefore, the necessary impacts have already been addressed and procedures exist for shedding these loads. The recommended load shed for Station Battery 2A is presented below and was taken from the Engineering Report SNCH084-PR-002, which is referenced in the Integrated Plan:

Recommended DC Load Shed for Station Battery 2A

Unit	Battery	Panel	Breaker	Equipment Description
2	SSB2A	2R25-S001	4	Channel "A" RHR Relay Logic (2E11 System)
			5	Main Generator Primary Protective Relaying
			19	RHR Valve Indication 2E11-F103A and 2E11-F104A
			21	Startup XFMR's Diff Aux Relaying
			24	Core Spray "A" Relay Logic (2E21 System)

NEI 12-06 Section 3.2.2 paragraph 6 states: "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." Therefore, redundancy is not required, but for HNP redundancy is maintained except for MCR lighting.

During the audit process the licensee also stated that the revised calculations for capacity of the batteries are expected to be posted to the e-portal by the fourth six-month update (February, 2015). Review of this calculation is identified as Confirmatory Item 3.2.4.10.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 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.

On page 13 of its Integrated Plan regarding programmatic controls, the licensee stated that:

> HNP will implement an administrative program for implementation and maintenance of the HNP FLEX strategies in accordance with NEI 12-06 guidance.
>
> - *Equipment quality:* The equipment for ELAP will have unique identification numbers. Installed structures, systems and components pursuant to 10CFR50.63(a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout.
> - *Equipment protection:* HNP will construct structures to provide protection of the FLEX equipment to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.
> - *Storage and deployment:* HNP will develop procedures and programs to address storage structure requirements and deployment/haul path requirements relative to the hazards applicable to HNP.
> - *Maintenance and Testing:* HNP will utilize the standard EPRI industry PM process (Similar to the Preventive Maintenance Basis Database) for establishing the maintenance and testing actions for FLEX components. The administrative program will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines.
> - *Design Control:* HNP will follow the current programmatic control structure for existing processes such as design and procedure configuration.

The NRC staff reviewed the licensee's Integrated Plan and determined that the Generic Concern related to maintenance and testing of FLEX equipment is applicable to the plant. This Generic Concern has been resolved generically through the NRC endorsement of the EPRI technical report on preventive maintenance of FLEX equipment, submitted by NEI by letter dated October 3, 2013 (ADAMS Accession No. ML13276A573). The NRC staff's endorsement letter 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 developing a program 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 audit process the licensee 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 provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to equipment maintenance and testing, if these requirements are implemented as described.

3.3.2 Configuration Control.

NEI 12-06, Section 11.8 provides that:

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

On page 13 of the Integrated Plan, the licensee stated that HCGS will implement an administrative program for implementation and maintenance of the HCGS FLEX strategies in accordance with NEI 12-06 guidance. FLEX equipment 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. Standard industry preventive maintenance (PM) processes will be established for all components, and testing procedures will be developed and frequencies established based on the type of equipment 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, provides that:

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

2. 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 the Integrated Plan, the licensee stated that new training of general station staff and EP will be performed no later than 2016, prior to the 1st HNP unit design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training or other standard plant training processes where applicable.

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 page 14 of the Integrated Plan the licensee stated:

> HNP will utilize the industry RRC for Phase 3 equipment. HNP has contractual agreements in place with the SAFER. The two (2) industry RRC will be established to support utilities in response to BDBEE. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Communications will be established between the affected nuclear site and the SAFER team and required equipment mobilized as needed. Equipment will initially be moved from an RRC to a local staging area, established by the SAFER team and the utility. The equipment will be prepared at the staging area prior to transportation to the site. First arriving equipment, as established during development of the nuclear site's playbook, will be delivered to the site within 24 hours from the initial request.

During the audit process, as described in Section 3.1.1.4 of this technical evaluation report, the licensee addressed delivery of FLEX and FLEX support equipment to the plant site following a seismic event and noted that they would be used for any hazards applicable to HNP. They also stated that the SAFER walkdown had been completed and the "SAFER Response Plan" would be available in June 2015.

The licensee's plans, as discussed above, for the use of off-site resources conform to the minimum capabilities specified in NEI 12-06 Section 12.2, with regard to the capability to obtain equipment and commodities to sustain and backup the site's coping strategies (item 1 above). Insufficient information has been provided to conclude there is reasonable assurance that the licensee's development and implementation of guidance and strategies will conform to the remaining considerations (2 through 10 above) of NEI 12-06, Section 12.2 and will comply with the requirements of Order EA-12-049. During the audit process, the licensee addressed this issue by stating the PSEG is a participant in the SAFER is establishing contracts with SAFER to meet NEI 12-06 Section 12.2.

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 off-site resources if these requirements are implemented as described.

4.0 OPEN AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

Item Number	Description	Notes
(none)		

4.2 CONFIRMATORY ITEMS

Item Number	Description	Notes
3.1.3.1.A	Confirm that the axis of separation and distance between the storage locations provides assurance that a single tornado would not impact all locations.	
3.1.5.2.A	Confirm the normal safety-related design limit for high temperature to be applied to the equipment specifications for procurement of the portable equipment.	
3.2.1.1.A	From the June 2013 position paper, benchmarks must be identified and discussed which demonstrate that MAAP4 is an appropriate code for the simulation of an ELAP event at your facility.	
3.2.1.1.B	The collapsed level must remain above Top of Active Fuel (TAF) and the cool down rate must be within technical specifications limits.	
3.2.1.1.C	MAAP4 must be used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper.	
3.2.1.1.D	In using MAAP4, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (EPRI Report 1020236). This should include response at a plant-specific level regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included as follows: Nodalization, General two-phase flow modeling, Modeling of heat transfer and losses, Choked flow, Vent line pressure losses, and Decay heat.	
3.2.1.1.E	The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan must be identified and should be available on the ePortal for NRC staff to view. Alternately, a comparable level of information may be included in the supplemental response. In either case, the	

	analysis should include a plot of the collapsed vessel level to confirm that TAF is not reached (the elevation of the TAF should be provided) and a plot of the temperature cool down to confirm that the cool down is within technical specifications limits.	
3.2.1.2.A	Confirm the adequacy of the determination of recirculation pump seal leakage or other sources of leakage used in the ELAP analysis.	
3.2.1.4.A	Confirm that the technical bases for sizing portable/FLEX equipment will meet the requirements.	
3.2.4.2.A	Confirm that the licensee provides appropriate analysis or calculation for sizing of the portable fans that will be used to maintain temperature in the battery room at an acceptable level.	
3.2.4.4.A	Confirm that upgrades to the site's communications systems have been completed.	
3.2.4.10.A	Confirm the adequacy of the DC load shed calculations,	