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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.
Joseph M. Farley Nuclear Plant, Units 1 & 2
Docket Nos. 50-348 and 364

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

2.0 EVALUATION PROCESS

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

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

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

- Spent Fuel Pool Cooling Strategies
- Containment Function Strategies
- Programmatic Controls
    - Equipment Protection, Storage, and Deployment
    - Equipment Quality

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

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

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

3.0 TECHNICAL EVALUATION

By letter dated February 27, 2013 (ADAMS Accession No. ML13059A387), and as supplemented by the first six-month status report in letter dated August 27, 2013 (ADAMS Accession No. ML13240A240), Southern Nuclear Operating Company, Inc. (the licensee or Southern) provided the Integrated Plan for Compliance with Order EA-12-049 for Joseph M. Farley Nuclear Plant Units 1 & 2 (FNP) (ADAMS Accession No. ML13059A387). The Integrated Plan describes the strategies and guidance under development for implementation by Southern 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 beyond-design-basis external events leading to an extended loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink (UHS). These hazards are broadly grouped into the categories discussed below in Sections 3.1.1 through 3.1.5 of this evaluation. Characterization of the applicable hazards for a specific site includes the identification of realistic timelines for the hazard; characterization of the functional threats due to the hazard; development of a strategy for responding to events with warning; and development of a strategy for responding to events without warning.

3.1.1 Seismic Events

NEI 12-06, Section 5.2 states:

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

On page 6 of the Integrated Plan, the licensee stated that per the FSAR, the Safe Shutdown Earthquake (SSE) for the site is 0.10g. In addition, the licensee stated that the Farley site screens in for an assessment for seismic hazard.

On page 7 of the Integrated Plan regarding key site assumptions, the licensee stated that seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012, are not completed and therefore not assumed. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.

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 seismic hazard, 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 page 8 of the Integrated Plan regarding key site assumptions to implement NEI 12-06 strategies, the licensee stated that FLEX components will be designed to be capable of performing in response to the screened in hazards in accordance with NEI 12-06, Phase 2 FLEX components stored at the site will be protected against the screened in hazards in accordance with NEI 12-06, and deployment strategies and deployment routes will be assessed for hazards impact.

On page 12 of the Integrated Plan regarding strategies deployment, the licensee stated that FNP procedures and programs will be 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 FNP.

On page 13 of the Integrated Plan regarding programmatic controls, the licensee stated that FNP 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.

On page 29 of its Integrated Plan describing how to maintain reactor coolant system (RCS) inventory control of pressurized water reactor (PWR) portable equipment in Phase 2, the licensee stated that the Mode 1-4 RCS FLEX pump will be pre-staged in the auxiliary building to allow ease of access and installation. Further, the licensee stated the primary strategy for core cooling without the steam generators (SGs) available will be to utilize an onsite FLEX pump for RCS injection, hereafter referred to as the Mode 5-6 FLEX RCS pump. This pump will be pre-staged on the 100 foot elevation of the auxiliary building.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the FLEX equipment storage building will be a Seismic Category I structure.

NEI 12-06 Section 5.3.1 states that a licensee should secure large portable FLEX equipment such as pumps and power supplies to protect them during a seismic event. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that it would secure any large portable FLEX equipment stored in the proximity of permanent structures, systems, and components against seismic events, and will evaluate seismic systems interactions of the same portable FLEX equipment.

On page 15 in the FNP Integrated Plan, the licensee stated that the turbine steam admission valves will remain open for two hours utilizing compressed air from the associated air accumulator. After two hours, operator action is required to manually open the steam admission valves and then manually control the speed of the turbine-driven auxiliary feedwater (TDAFW) pump by throttling open the TDAFW trip and throttle valve to control turbine speed and pump discharge pressure per existing procedural guidance. During the audit process, the licensee stated that the turbine steam admission valves and operators, including air accumulators, are safety related Seismic Category I.

The FNP Integrated Plan did not describe the storage or staging for portable ventilation fans and the electric generators/gas-powered portable fans to be used to cool the control room. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that storage and staging of FLEX equipment will be determined during the design development and procedure development stage; however, equipment will be stored/staged in a class I structure or protected storage location.

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

3.1.1.2 Deployment of FLEX Equipment – Seismic Hazard

NEI 12-06, Section 5.3.2 states:

> The baseline capability requirements already address loss of non-seismically robust equipment and tanks as well as loss of all AC. So, these seismic considerations are implicitly addressed.
>
> There are five considerations for the deployment of FLEX equipment following a seismic event:
>
> 1. If the equipment needs to be moved from a storage location to a different point for deployment, the route to be traveled should be reviewed for potential soil liquefaction that could impede movement following a severe seismic event.
>
> 2. At least one connection point for the FLEX equipment will only require access through seismically robust structures. This includes both the connection point and any areas that plant operators will have to access to deploy or control the capability.
>
> 3. If the plant FLEX strategy relies on a water source that is not seismically

robust, e.g., a downstream dam, the deployment of FLEX coping capabilities should address how water will be accessed. Most sites with this configuration have an underwater berm that retains a needed volume of water. However, accessing this water may require new or different equipment.

4. If power is required to move or deploy the equipment (e.g., to open the door from a storage location), then power supplies should be provided as part of the FLEX deployment.

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

On page 12 in the section of its Integrated Plan regarding strategic deployment to implement NEI 12-06 strategies, the licensee stated FNP procedures and programs will be 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 FNP, routes for transporting FLEX equipment from storage location(s) to deployment areas will be developed, and chosen pathways will be evaluated for applicable hazards associated with the areas utilized for the deployment path or storage locations for Phase 2. On page 41 in the FNP Integrated Plan, the licensee discussed that cooling water flow through the containment coolers will be provided by a portable pump and heat exchanger skid from the RRC. On page 49 in the FNP Integrated Plan, the licensee discussed that the long-term phase of the FLEX cooling strategy is reliant on moving from makeup/boil-off to making use of the flow through the SFP heat exchanger that will be cooled by the portable RRC pump and heat exchanger skid. The FNP Integrated Plan did not provide a description of where the portable pump and heat exchanger skid from the RRC will be staged and how they will then be deployed. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the licensee is still evaluating the strategy and use of RRC heat exchangers. An updated response to this question will be provided no later than the August 2014 six-month update. This item is identified as Confirmatory Item 3.1.1.2A, in Section 4.2.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the storage facility will be located just outside the Protected Area within the Owner Controlled Area. Multiple haul routes will be available from the storage facility to any staging area. Storage location and appropriate haul routes will be evaluated for access per NEI 12-06, Section 5.3.2.

On page 23 in the section of its Integrated Plan describing PWR portable equipment for the final phase (Phase 3) of its strategy for maintaining core cooling and heat removal, the licensee discussed using a new source of water for feeding the SGs after about 37 hours to supply the Condensate Storage Tank (CST) by processing water from Service Water (SW) Pond (i.e., the UHS) through water treatment equipment provided by one of the Regional Response Centers (RRCs) established by the nuclear industry to provide off site support. During the audit process, the licensee discussed why it expected the effects caused by a beyond design basis seismic event or external flood (e.g., significant debris, mud, river diversion, flow blockage) on the Chattahoochee River and the ability to refill the UHS from the river if the ELAP event is minimal. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the UFSAR Section 2.4.9, Channel Diversion, states that the river upstream from the site does not have sufficiently high banks to cause a potential diversion of the river. With Lake Seminole varying between elevation 76 feet mean sea level (msl) and elevation 78 feet msl, a temporary blockage of the river upstream from FNP would not seriously affect the quantity of water available to the river water intake structure. The SW FLEX pump from the RRC will feature screens to remove large or unusual debris from the river water supply prior to transfer (via hoses) to the SW Pond, where any mud or suspended solids will settle. Demineralizer equipment from the RRC will be designed to process water drawn from the SW Pond for makeup. The licensee stated because the design of the seismic Category I SW Pond assures sufficient inventory for 30 days without makeup, there will be substantial time to overcome any effects on the Chattahoochee River following a beyond design basis seismic event or external flood (e.g., river diversion, fiver blockage, unusual debris, mud) that could hinder the ability to refill the UHS from the river.

On page 24 in the section of its Integrated Plan listing deployment conceptual designs for maintaining core cooling and heat removal, the licensee stated that Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored. After the building design and location are finalized, the deployment routes, including deployment routes for off-site RRC equipment will be evaluated for external hazards to demonstrate a clear deployment path. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that Phase 3 equipment will be staged or stored on firm, flat ground and will not be stored in a structure.

On page 8 in the section on key assumptions, the licensee stated that the design-hardened connections are protected against external events or are established at multiple and diverse location. FLEX components will be designed to be capable of performing in response to the "screened in" hazards in accordance with NEI 12-06.

On pages 21 and 22 in the section of the Integrated Plan on maintaining core cooling and heat removal, the licensee stated:

- Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically 'rugged' structure, which will inherently protect it from local hazards such as vehicle impact.
- Diverse connection points for CST fill capability from the FLEX pumps will be provided with at least one connection point protected from tornado missiles.
- Connection points for the SG and CST FLEX pumps will be designed to withstand the applicable hazards.
- Electrical connection points for the onsite FLEX DGs will be designed to withstand the applicable hazards.

On page 39 in the section on maintaining containment, the licensee stated the connections for FLEX diesel generator (DG) will be installed seismically rugged and protected or in structures that are seismically rugged or qualified.

On page 45 in the section on maintaining SFP cooling, the licensee stated it will install a connection on the SFP Cooling system's heat exchanger discharge line to allow makeup to be supplied to the SFP without accessing the SFP area during an ELAP/LHUS 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 subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of FLEX equipment during a seismic event, if these requirements are implemented as described.

3.1.1.3 Procedural Interfaces – Seismic Hazard

NEI 12-06, Section 5.3.3 states:

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

On pages 16, 19, and 24 in the sections of its Integrated Plan, regarding the strategy for maintaining core cooling and heat removal key reactor parameters, for the initial, transition, and final phases, the licensee stated that it will utilize the industry developed guidance from the Owners Groups, Electric Power Research Institute (EPRI) and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current emergency operating procedures (EOPs).

NEI 12-06, Section 5.3.3, Guideline 1 states:

> a. Reference source for the operators for obtaining necessary instrument readings to support implementation of the coping strategy is needed for both control room and non-control room readouts and how and where to measure key readings at containment penetrations (where applicable) using a portable instrument;
> b. Guidance should include critical actions to perform until alternate indications can be connected (measured) [an example would be – guidance on what the operator should do if SG pressure indication was lost during the time you are connecting a portable instrument to read SG pressure]; and
> c. Guidance should include instructions on how to control critical equipment without control power.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that Farley is developing procedural guidance to address implementation of the FLEX strategies (See Section 3.2.1.5 of this report). The licensee's response stated that manual operation of the TDAFW pump without associated control power will be relatively light work with operators making occasional entries for minor manual adjustments to the Trip-Throttle Valves to control speed. Continuous standby in the room by operators is not required. The operators are trained on manual operation of the TDAFW pump. They are also trained on working in high temperature areas in the plant. Manual operation of the TDAFW pump is controlled by existing procedures.

The licensee's plan for the development of mitigating strategies with respect to the procedural interfaces did not address Guideline 2 in Section 5.3.3 of NEI 12-06 for seismic hazards. This guideline is associated with large internal flooding sources that are not seismically robust and do not require ac power. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the evaluation of large internal flood sources that are not seismically robust and do not require ac power has not been completed and will be provided no later than the August 2014 six-month update. The licensee stated that at this time, no internal flood sources of this nature have been identified. This has been identified as Confirmatory Item 3.1.1.3A, in Section 4.1.

Guidelines 3 and 4 in Section 5.3.3 of NEI 12-06 are associated with the use of ac power to mitigate ground water in critical locations and the existence of non-seismically robust downstream dams, respectively. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the site does not rely on ac power to mitigate ground water intrusion and does not rely on a non-seismically robust downstream dam to contain water that is used as the source of water for the UHS.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural interfaces for a seismic event, 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 in the section of its Integrated Plan regarding the regional response plan, the licensee stated that FNP will utilize the industry RRCs for Phase 3 equipment. FNP has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER). The industry will establish two RRCs to support utilities in response to BDBEEs. Each RRC will hold five sets of equipment: four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. The 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. Development of FNP's playbook is identified by FNP as an Open Item. Development of the SAFER Response Plan (playbook) is identified as Confirmatory Item 3.1.1.4A, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to considerations in using offsite resources during or following a seismic event, 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 7 in the section of its Integrated Plan regarding key site assumptions, the licensee stated that flood re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012, are not completed and therefore not assumed in this submittal.

On page 6 in the section of its Integrated Plan regarding the determination of applicable extreme external hazards, the licensee stated an external flood hazard assessment is not applicable, as Farley is built above the design basis flood level. Per Farley FSAR Chapter 2, the Probable Maximum Flood (PMF) stage is 144.2 feet (ft) msl without wave run-up, and with wave run-up the flood height is 153.3 ft msl. The grade level of safety-related structures at Farley is 154.5 ft msl. Therefore, Farley is built above the design basis flood level and is considered a dry site by the NEI guidance. Because the Farley site screens out for an assessment for external flooding, it does not have to characterize a flood or evaluate protection and deployment of FLEX strategies.

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

3.1.2.1 Protection of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.1 states:

> These considerations apply to the protection of FLEX equipment from external flood hazards:
>
> 1. The equipment should be stored in one or more of the following configurations:
>
>   a. Stored above the flood elevation from the most recent site flood analysis. The evaluation to determine the elevation for storage should be informed by flood analysis applicable to the site from early site permits, combined license applications, and/or contiguous licensed sites.
>
>   b. Stored in a structure designed to protect the equipment from the flood.
>
>   c. FLEX equipment can be stored below flood level if time is available and plant procedures/guidance address the needed actions to relocate the equipment. Based on the timing of the limiting flood scenario(s), the FLEX equipment can be relocated [footnote 2 omitted] to a position that is protected from the flood, either by barriers or by elevation, prior to the arrival of the potentially damaging flood levels. This should also consider the conditions on-site during the increasing flood levels and whether movement of the FLEX equipment will be possible before potential inundation occurs, not just the ultimate flood height.
>
> 2. Storage areas that are potentially impacted by a rapid rise of water should be avoided.

The first sentence in NEI 12-06, Section 6.2.3.1, Guideline 1 expects licensees to use the most recent site flood analysis. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the licensee is unaware of any external flooding analyses that exceed the current design bases.

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

3.1.2.2 Deployment of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.2 states:

> There are a number of considerations which apply to the deployment of FLEX equipment for external flood hazards:
>
> 1. For external floods with warning time, the plant may not be at power. In fact, the plant may have been shut down for a considerable time and the plant

configuration could be established to optimize FLEX deployment. For example, the portable pump could be connected, tested, and readied for use prior to the arrival of the critical flood level. Further, protective actions can be taken to reduce the potential for flooding impacts, including cooldown, borating the RCS, isolating accumulators, isolating RCP seal leak off, obtaining dewatering pumps, creating temporary flood barriers, etc. These factors can be credited in considering how the baseline capability is deployed.

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

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

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

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

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

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

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

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

The licensee's plan as it relates to deployment of FLEX equipment from the external flooding hazards is silent regarding deployment because external floods have been screened out of the FNP 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 deployment of FLEX equipment during a flooding hazard, if these requirements are implemented as described.

3.1.2.3 Procedural Interfaces – Flooding Hazard

NEI 12-06, Section 6.2.3.3 states:

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

The FNP Integrated Plan is silent regarding Procedural Interfaces because the site screens as a dry site and as such, no response is required in this section.

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 associated with a flooding hazard, if these requirements are implemented as described.

3.1.2.4 Considerations in Using Offsite Resources – Flooding Hazard

NEI 12-06, Section 6.2.3.4 states:

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

The FNP Integrated Plan is silent regarding Considerations in Using Offsite Resources because the site screens as a dry site and as such, no response is required in this section.

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 a flooding hazard, if these requirements are implemented as described.

3.1.3 High Winds

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

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

The screening for high wind hazard associated with tornadoes was 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.

High wind event guidelines are to be treated in four primary areas: protection of portable equipment, deployment of portable equipment, procedural interfaces, and considerations in using off-site resources. These areas are discussed further in Sections 3.1.3.1 through 3.1.3.4, below.

On page 6 and 7 in the section of its Integrated Plan regarding the determination of applicable extreme external hazards, the licensee stated that hurricane and tornado hazards are applicable and the FNP site screens in for an assessment of High Wind 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 screening for high wind hazards, if these requirements are implemented as described.

3.1.3.1 Protection of FLEX 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 pages 21 and 22 in the section of its Integrated Plan regarding maintaining core cooling and heat removal, the licensee stated the piping and connection points used to provide core cooling and heat removal to the SG will be contained within buildings that are protected or will be designed for protection 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. Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically 'rugged' structure, which will inherently protect it from local hazards such as vehicle impact. Diverse connection points for CST fill capability from the FLEX pumps will be provided with at least one connection point protected from tornado missiles.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the storage building for FLEX equipment would be Seismic Category I.

NEI 12-06, Section 2.3 states in part:

> Considering the external hazards applicable to the site, the FLEX mitigation equipment should be stored in a location or locations such that it is reasonably protected such that no one external event can reasonably fail the site FLEX capability.

During the audit process, the licensee stated it would prevent or mitigate one external event from failing the site FLEX capability by storing FLEX equipment in Seismic Category I structures. This is particularly important for mitigation of tornado missiles.

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

3.1.3.2 Deployment of FLEX Equipment – High Wind Hazard

NEI 12-06, Section 7.3.2 states:

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

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

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

The licensee's Integrated Plan did not address whether FNP intends to implement protective actions regarding deployment of FLEX equipment if hurricane force winds are expected in a short period. This item is identified as Open Item 3.1.3.2A, in Section 4.1.

Regarding the loss of the UHS, on page 8 of the Integrated Plan the licensee stated that the Integrated Plan defines strategies capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site.

On page 64 in the section of its Integrated Plan on FLEX portable equipment listing Phase 3 response equipment/commodities, the licensee listed unspecified debris clearing equipment. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated the equipment that will be onsite for debris removal could be used to clear any haul routes, as necessary. Debris removal equipment will be used to aid, as necessary, transport of equipment from its storage location to its final staging area for operation. Obstacles and Interference review has shown a need for medium sized construction equipment to ensure timely clearance of any route. Haul routes for transport are being established and removal of potential obstacles along these haul routes is being evaluated regarding severe conditions due to weather and seismic events

On page 61 and 62 of the Integrated Plan in the section listing portable equipment for Phase 2, the licensee stated that it would have two vehicles capable of towing pumps and DGs, and would have multiple flatbed trailers to transport hoses, strainers, cables, etc. The Integrated Plan did not discuss the protection of these vehicles and trailers designed to transport FLEX equipment. This item is identified as Confirmatory Item 3.1.3.2B, in Section 4.2.

On page 8 in the section of its Integrated Plan on key assumptions associated with implementation of FLEX strategies for FNP, the licensee stated that Phase 2 FLEX components stored at the site will be protected against the "screened in" hazards in accordance with NEI 12-06.

On page 24 in the section of its Integrated Plan listing deployment conceptual designs for maintaining core cooling and heat removal, the licensee stated that Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored. After the building design and location are finalized, the deployment routes, including deployment routes for off-site RRC equipment will be evaluated for external hazards to demonstrate a clear deployment path. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that Phase 3 equipment will be staged or stored on firm, flat ground and will not be stored in a structure.

On pages 21 and 22 in the section of the Integrated Plan on maintaining core cooling and heat removal, the licensee stated:

- Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically 'rugged' structure, which will inherently protect it from local hazards such as vehicle impact.

- Diverse connection points for CST fill capability from the FLEX pumps will be provided with at least one connection point protected from tornado missiles.
- Connection points for the SG and CST FLEX pumps will be designed to withstand the applicable hazards.
- Electrical connection points for the onsite FLEX DGs will be designed to withstand the applicable hazards.

The Integrated Plan did not discuss how it would mitigate the effects of a hurricane on the ability to move equipment from offsite and restock supplies. This item is identified as Open Item 3.1.3.2C, in Section 4.1.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Open Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of FLEX equipment in or following a wind hazard event, 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.

The licensee's plan did not provide any information with regards to procedural interface considerations as they relate to tornados and hurricanes. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that haul routes for transport are being established and removal of potential obstacles along these haul routes is being evaluated regarding severe conditions due to weather and seismic events. The results of this evaluation will be addressed in the design process and/or included in procedural guidance, as necessary.

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 regarding the 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.

On page 14 in the section of its Integrated Plan regarding the regional response plan, the licensee stated that FNP will utilize the industry RRCs for Phase 3 equipment. FNP has contractual agreements in place with SAFER. The two industry RRC will be established to support utilities in response to BDBEEs. Each RRC will hold five sets of equipment: four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. The 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. Development of FNP's playbook is identified by FNP as an Open Item by the licensee. Development of the playbook was identified previously as Confirmatory Item 3.1.1.4A, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to considerations in using offsite resources during high wind events, 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 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. NEI 12-06, Section 8.2.1, further specifies that all sites located north of the 35^{th} Parallel should provide the capability to address extreme snowfall with snow removal equipment. Finally, all sites except for those within Level 1 and 2 of the maximum ice storm severity map contained in NEI 12-06, Figure 8-2 should address the impact of ice storms.

On page 6 in the section of its Integrated Plan regarding the determination of applicable extreme external hazards, the licensee stated the guidelines provided in NEI 12-06 generally exclude the need to consider extreme snowfall at plant sites in the southeastern U.S. below the 35^{th} parallel. The FNP site is located at 31 degrees 13' N latitude and 85 degrees 06' W longitude. Thus, the licensee determined that the capability to address hindrances cause by extreme snowfall with snow removal equipment need not be provided. In addition, on the same page the licensee stated according to FSAR Section 2.4.7, there is no record of the Chattahoochee River icing over. Therefore the licensee concluded that there is no risk of ice blockage, frazil ice, or loss of UHS due to ice. The FNP site is located within the region characterized by EPRI as ice severity level 4. As such, the Farley site is subject to severe icing conditions. The licensee stated the Farley site screens in for an assessment of 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 snow, ice and extreme cold, 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.).

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that it would construct the FLEX equipment storage structure to be Seismic Category I.

NEI 12-06, Section 3.2.2 states plant procedures/guidance should specify actions necessary to assure that equipment functionality can be maintained in an ELAP/LUHS. Section 8.2 provides guidance on approaches to snow, ice, and extreme cold challenges. Section 8 states that extreme temperatures may also present challenges and a combination of significant snowfall, ice, and extreme cold cannot be ruled out. Listed categories of snow, ice, and extreme low temperatures include frazil ice. On page 8 in the FNP Integrated Plan, the licensee stated, in part that FLEX components will be designed to be capable of performing in response to "screened in" hazards in accordance with NEI 12-06. On page 6 in the FNP Integrated Plan, the licensee stated that there is no risk of frazil ice at the site. The licensee's response to the EA-12-049 Mitigation Strategy Audit regarding frazil ice stated that the SW Pond is the UHS for the site and the primary source of water for replenishing the CST. During normal plant operation, there is typically a nominal 30,000 gallons per minute (gpm) flow into and out of the pond; this recirculation of warm water in the pond adds heat to the pond preventing it from freezing or the development of frazil 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 protection of FLEX equipment – snow, ice and extreme cold hazard, if these requirements are implemented as described.

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

NEI 12-06, Section 8.3.2 states:

> There are a number of considerations that apply to the deployment of FLEX equipment for snow, ice, and extreme cold hazards:
>
> 1. The FLEX equipment should be procured to function in the extreme conditions applicable to the site. Normal safety-related design limits for outside conditions may be used, but consideration should also be made for any manual operations required by plant personnel in such conditions.
>
> 2. For sites exposed to extreme snowfall and ice storms, provisions should be made for snow/ice removal, as needed to obtain and transport FLEX equipment from storage to its location for deployment.
>
> 3. For some sites, the ultimate heat sink and flow path may be affected by extreme low temperatures due to ice blockage or formation of frazil ice. Consequently, the evaluation should address the effects of such a loss of UHS on the deployment of FLEX equipment. For example, if UHS water is to be used as a makeup source, some additional measures may need to be taken to assure that the FLEX equipment can utilize the water.

Although tables on pages 61 and 62 and pages 63 and 64 in the Integrated Plan list required Phase 2 and Phase 3 equipment, respectively, there is no equipment identified for removing or mitigating ice during and following extreme ice storms. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that protection of equipment from ice and cold weather, transportation of equipment during an ice storm and removal of ice will be specified in the response procedures; this will include identification of any needed equipment. This item has been identified as Confirmatory Item 3.1.4.2A, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of FLEX equipment – 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 above, the licensee did not provide sufficient information to address the effects of an extreme ice storm on transporting the equipment. This item is previously identified as Confirmatory Item 3.1.4.2A, in Section 4.2.

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

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

NEI 12-06, Section 8.3.4, states:

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

On page 14 in the section of its Integrated Plan regarding the regional response plan, the licensee stated that FNP will utilize the industry RRCs for Phase 3 equipment. FNP has contractual agreements in place with SAFER. The two industry RRC will be established to support utilities in response to BDBEEs. Each RRC will hold five sets of equipment: four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. The 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. Development of FNP's playbook is identified by FNP as an Open Item by the licensee. Development of the playbook was identified previously as Confirmatory Item 3.1.1.4A, in Section 4.2.

The licensee's Integrated Plan did not identify how RRC equipment would be delivered to the site in the event of an extreme ice storm. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that transportation of equipment during an ice storm will be specified in the response procedures; this will include identification of any needed equipment. This item has been identified previously as Confirmatory Item 3.1.4.2A, 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 consideration of using offsite resources in 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.

On page 7 in the section of its Integrated Plan regarding the determination of applicable extreme external hazards, the licensee stated per NEI 12-06, Section 9.2, all sites will address high temperatures. Thus, the FNP site screens in for an assessment 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 of high temperatures, if these requirements are implemented as described.

3.1.5.1 Protection of FLEX Equipment - High Temperature Hazard

NEI 12-06, Section 9.3.1, states:

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

On page 21 in the section of its Integrated Plan regarding the strategies for maintaining core cooling in the transition phase (Phase 2), the licensee stated that storage/protection of equipment from high temperature hazard would be provided because storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required. FNP procedures and programs are being developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to FNP.

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

3.1.5.2 Deployment of FLEX Equipment - High Temperature Hazard

NEI 12-06, Section 9.3.2 states:

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

The FNP Integrated Plan did not address the effect of excessive high temperatures on the capability to deploy FLEX equipment. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that concrete buckling is not anticipated due to the limited amount of concrete associated with the haul paths that will be used for deploying FLEX equipment. There are multiple deployment routes available in the event that a haul path is not accessible. Equipment will be onsite for debris removal could also be used to clear any haul routes, as necessary. The Integrated Plan did not address the potential effects of high temperature on deployment of FLEX equipment with respect to the expansion of sheet metal, swollen door seals, etc. This item is identified as Open Item 3.1.5.2A, in Section 4.1.

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

3.1.5.3 Procedural Interfaces - High Temperature Hazard

NEI 12-06, Section 9.3.3 states:

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

The licensee's plan and the licensee's response to the EA-12-049 Mitigation Strategies Audit did not address procedural interfaces in the context of how extreme high temperatures could affect portable FLEX equipment. This is item is identified as Confirmatory Item 3.1.5.3A, in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural interfaces for a high temperature event, 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 beyond-design-basis external events 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 beyond-design-basis external event 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)/RCS/SG 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.

On page 5 of the Integrated Plan, the licensee stated that the Order EA-12-049 requires a three-phased approach for mitigating beyond-design-basis external events and stated that the Integrated Plan complies with the order.

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 phased approach, if these requirements are implemented as described.

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

NEI 12-06, Table 3-2 and Appendix D summarize one acceptable approach for the reactor core cooling & heat removal, and RCS inventory control strategies. This approach uses the installed auxiliary feedwater (AFW)/emergency feedwater (EFW) system to provide SG makeup sufficient to maintain or restore SG level in order to continue to provide core cooling for the initial phase. This approach relies on depressurization of the SGs for makeup to the RCS with a portable injection source in order to provide core cooling for transition and final phases. This approach accomplishes RCS inventory control and maintenance of long term subcriticality through the use of low leak reactor coolant pump seals.

On pages 26 and 27 the FNP Integrated Plan describes a different Phase 1 method than described in NEI 12-06, Table 3-2 for RCS cooling and heat removal during Modes 5 and 6 when SGs are not available. If an ELAP event occurs when FNP is in Mode 5 without the SGs available, manual action will be required to provide makeup to the RCS via gravity feed from the Seismic Category 1 Refueling Water Storage Tank (RWST) during Phase 1. The licensee stated that a concrete shield wall around the RWST ensures that tank is protected from missiles.

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

The FNP Integrated Plan stated that depressurization of the SGs and therefore the RCS will be delayed until approximately 10 hours after an ELAP event occurs, rather than beginning as early as one hour after the event. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the generic analysis of WCAP-17601 demonstrated that there is no need to cooldown and depressurize the RCS for plants with low leakage seals (See Section 3.2.1.2). The analysis indicated that the core would remain covered for at least 7 days. The licensee chose to cooldown at ten hours to ensure that there was sufficient time to stage Phase 2 equipment prior to initiating cooldown.

It was not clear from the FNP Integrated Plan if asymmetric RCS cooling (i.e., use of less than all three SGs) was evaluated for FNP. The licensee's response to the EA-12-049 Mitigation Strategy Audit clarified that the Farley coping strategy uses symmetric cooling with all three SGs.

During the NRC audit process, the licensee was requested to specify which analysis performed in WCAP-17601 is being applied to Farley. Additionally, the licensee was asked to justify the use of that analysis by identifying and evaluating the important parameters and assumptions demonstrating that they are representative of FNP and appropriate for simulating the ELAP transient. This is identified as Confirmatory Item 3.2.1A, in Section 4.2 below

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

3.2.1.1 Computer Code Used for the ELAP Analysis

NEI 12-06, Section 1.3 states, in part:

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

The licensee provided a Sequence of Events (SOE) in the Integrated Plan, which included the time constraints and the technical basis for the site. That SOE is based on an analysis using the industry-developed NOTRUMP computer code. NOTRUMP was written to simulate the response of PWRs to small break loss of coolant accident (LOCA) transients for licensing basis safety analysis.

The licensee has decided to use the NOTRUMP computer code for simulating the ELAP event. Although NOTRUMP has been reviewed and approved for performing small break LOCA analysis for PWRs, the NRC staff had not previously examined its technical adequacy for simulating an ELAP event. In particular, the ELAP scenario is differentiated from typical design-basis small-break LOCA scenarios in several key respects, including the absence of normal ECCS injection and the substantially reduced leakage rate, which places significantly greater emphasis on the accurate prediction of primary-to-secondary heat transfer, natural circulation, and two-phase flow within the RCS. As a result of these differences, concern arose associated with the use of the NOTRUMP code for ELAP analysis for modeling of two-phase flow within the RCS and heat transfer across the SG tubes as single-phase natural circulation transitions to two-phase flow and the reflux condensation cooling mode. Reliance on the NOTRUMP code for the ELAP analysis of Westinghouse plants is limited to the flow conditions prior to reflux condensation initiation. This includes specifying an acceptable definition for reflux condensation cooling. This item is identified as Confirmatory Item 3.2.1.1A, in Section 4.2.

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

3.2.1.2 RCP Seal Leakage Rates

NEI 12-06, Section 1.3 states:

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

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

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

- WCAP-17601-P, Revision 1, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs" dated January 2013 (ADAMS Accession No. ML13042A011 and ML13042A013 (Non-Publically Available)).
- A position paper dated August 16, 2013, entitled "Westinghouse Response to NRC Generic Request for Additional Information (RAI) on Reactor coolant (RCP) Seal Leakage in Support of the Pressurized Water reactor Owners Group (PWROG)" (ADAMS Accession No. ML13190A201 (Non-Publically Available)).

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

(1) For the plants using Westinghouse RCPs and seals that are not the SHIELD shutdown seals, the RCP seal initial maximum leakage rate should be greater than or equal to the upper bound expectation for the seal leakage rate for the ELAP event (21 gpm/seal) discussed in the PWROG white paper addressing the RCP seal leakage for Westinghouse plants (Reference 2). If the RCP seal leakage rates used in the plant-specific ELAP analyses are less than the upper bound expectation for the seal leakage rate discussed in the whitepaper, justification should be provided. If the seals are changed to non-Westinghouse seals, the acceptability of the use of non-Westinghouse seals should be addressed, and the RCP seal leakage rates for use in the ELAP analysis should be provided with acceptable justification. As indicated in the licensee's Integrated Plan and response to the audit process, FNP will use SHIELD seals. Therefore, this issue is not applicable to FNP.

(2) In some plant designs, such as those with 1200 to 1300 pounds per square inch absolute (psia) SG design pressures and no accumulator backing of the main steam system Power-Operated Relief Valve (PORV) actuators, the cold legs could experience temperatures as high as 580 degrees F before cooldown commences. This is beyond the qualification temperature (550 degrees F) of the O-rings used in the RCP seals. For those Westinghouse designs, a discussion of the information (including the applicable analysis and relevant seal leakage testing data) should be provided to justify that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate of 21 gpm/seal used in the ELAP is adequate and acceptable. The PWROG is working on these issues and will submit position papers to the NRC that will contain test data regarding the maximum seal leakage rates of Westinghouse traditional and Generation 3 SHIELD seals, and Flowserve seals at higher cold-leg temperatures. The NRC will review the position papers when received. This item is identified as Confirmatory Item 3.2.1.2A, in Section 4.2.

(3) Some Westinghouse plants have installed or will install the SHIELD shutdown seals, or other types of low leakage seals, and have credited or will credit a low seal leakage rate (e.g., 1 gpm/seal) in the ELAP analyses for the RCS response. For those plants, information should be provided to address the impacts of the Westinghouse 10 CFR Part 21 report, "Notification of the Potential Existence of Defects Pursuant to 10 CFR Part 21," dated July 26, 2013 (ADAMS No. ML13211A168) on the use of the low seal leakage rate in the ELAP analysis. This item is identified as Open Item 3.2.1.2B, in Section 4.1.

(4) If the seals are changed to the newly designed Generation 3 SHIELD seals, or non-Westinghouse seals, the acceptability of the use of the newly designed Generation 3 SHIELD seals, or non-Westinghouse seals should be addressed, and the RCP seal leakages rates for use in the ELAP analysis should be provided with acceptable justification. The PWROG is working on these issues and will submit to the NRC position papers that will contain test data regarding the maximum seal leakage rates of Generation 3 SHIELD seals and Flowserve seals. The NRC will review the position papers when received. This item is identified as Confirmatory Item 3.2.1.2C, in Section 4.2.

The current understanding by the NRC staff 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 Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the reactor coolant pump seal leakages rates, if these requirements are implemented as described.

3.2.1.3 Decay Heat

NEI Section 3.2.1.2 states in part:

> The initial plant conditions are assumed to be the following:
>
> (1) Prior to the event the reactor has been operating at 100 percent rated thermal power for at least 100 days or has just been shut down from such a power history as required by plant procedures in advance of the impending event.

The review sought information on a list of initial plant conditions used in the core decay heat removal analysis. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that a plant-specific analysis to validate the FNP FLEX strategies was performed by Westinghouse (LTR-FSE-12-25 Rev. 2). In addition to reviewing the strategy, Westinghouse customized the generic WCAP-17601 analysis to model the FNP strategy. The representative decay heat removal calculations in WCAP-17601-P, Revision 1 using the NOTRUMP code assume that the plant is operating at 100 percent power with the reactor coolant system average temperature and pressurizer pressure in their normal operating bands. The plant-specific analysis performed also assumed the reactor is operating initially at 100 percent power for the case of SG feed, or had been shutdown from that condition for a duration bounding of typical refueling outage time frames for SGs being unavailable. Beyond the first 24 hours, the minimum injection flow rate to account for decay heat was based on a Farley calculation. The formula is based on MUHP-2310, Westinghouse Owner's Group Severe Accident Management Guidance with the following parameters for Farley: full power rating of 2775 MWt; PORV pressure setpoint of 2335 psia; maximum temperature of injection source of 120 degrees F.

The Westinghouse nuclear steam supply system (NSSS) calculations in WCAP-17601 using the NOTRUMP code were performed with the American Nuclear Society (ANS) 5.1 1979 + 2 sigma decay heat model and assumed the reactor is initially operating at 100 percent power. Implementation of this model includes fission product decay heat resulting from the fission of U-235, U-238, and Pu-239 and actinide decay heat from U-239 and Np-239. The power fractions are typical values expected for each of the three fissile isotopes through a three region burn-up with an enrichment based on typical fuel cycle feeds that approach 5 percent. A conversion ratio of 0.65 was used to derive the decay power of the two actinides U-239 and Np-239. Fission product neutron capture is treated per the ANS standard. The decay heat curve assumed in the Westinghouse calculations in WCAP-17601 is representative of FNP Units 1 and 2.

The Westinghouse-developed PWR Core Cooling Position Paper, Revision 0, PA-PSC-0965, November 2012, on page 15 of 34 states that:

> To maintain the target SG pressure each plant must demonstrate the ability to release steam at the mass flow rate necessary to remove decay heat at the reduced SG pressure. In addition, each plant must demonstrate the ability to cooldown the plant at the desired rate starting at *1 hour* after ELAP event initiation.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that each SG atmospheric power operated relief valve is sized to pass approximately 10 percent of plant maximum calculated steam flow at the SG no-load pressure of 1,025 pounds per square inch gauge (psig). Therefore the relief capacity of one valve is greater than the decay heat at one hour after shutdown.

The Westinghouse-developed PWR Core Cooling Position Paper, Revision 0, PA-PSC-0965, November 2012, on page 16 of 34 states that:

> As the RCS cools down and SG pressure lowers, the ability of the steam driven AFW/EFW pump to supply feedwater flow may degrade. There is typically a minimum required steam supply pressure to operate the steam driven AFW/EFW pump for turbine and/or pump protection. If long term recovery requires operating below this minimum pressure, then operators should implement the Alternate

> Low Pressure Feedwater strategy or the plant should implement appropriate design modifications to allow operation of the steam driven AFW/EFW system in this range.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the primary FLEX strategy is to continue to operate the TDAFW pump as long as there is sufficient steam to drive the turbine. The TDAFW pump is capable of operating until a steam pressure of approximately 90 pounds per square inch (psi), which is the same as the manufacturer's minimum required steam supply pressure for the TDAFW pump. The SG FLEX pump will be used to continue the water supply to the SGs once the steam pressure drops below the minimum supply pressure.

The Westinghouse-developed PWR Core Cooling Position Paper, Revision 0, PA-PSC-0965, November 2012, on page 16 of 34 notes that:

> A significant variable for coping with an ELAP event is decay heat. If such an event occurs either during or shortly after start-up, then decay heat will be much less than nominal post-trip values resultant from operation at rated thermal power for several months. Control of RCS temperature may be challenged when decay heat is low, especially when the TDAFW pump is in service. If the ability to maintain SG pressure above the target SG pressure is challenged due to steam demand of the steam driven AFW/EFW pump, then operators should cycle the steam driven AFW/EFW pump or implement the Alternate Low Pressure Feedwater strategy. Note that under these conditions, due to low decay heat, it is anticipated that the required time to stage and execute the Alternate Low Pressure Feedwater strategy will be less stringent.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated FNP operators are trained on manual operation of the TDAFW pump using FNP procedures. The operators are also trained on working in high temperature areas in the plant. Entry into such environments is governed by FNP's industrial safety procedures with controls for work in heat stress situations. Continuous standby in the room is not required. Frequent TDAFW speed changes are not required.

On page 26 in the FNP Integrated Plan, the licensee stated that as the RCS is cooled, the level within the RCS will occupy less volume and will require makeup and boron. This borated makeup volume will be injected from the safety injection (SI) accumulators during normal RCS cooldown following an ELAP event. Prior to injection of the entire SI accumulator inventory, the SI accumulators will be isolated if necessary to avoid nitrogen injection into the RCS, which has the potential to inhibit natural circulation. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that procedural guidance for isolating the accumulators prior to injection of the entire inventory to avoid nitrogen injection into the RCS will be provided by emergency operating procedures. This action will be performed in Phase 3 after both 600V AC motor control centers (MCCs) U and V are energized.

On page 23 of 34 in the Westinghouse-developed PWR Core Cooling Position Paper, Revision 0, PA-PSC-0965, November 2012, the Pressurized Water Reactor Owners Group (PWROG) stated:

> Because of uncertainties in these types of analyses, the PWROG recommends all plants provide a vent strategy unless borated water injection is not required to

maintain subcriticality at 350 degrees F.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the capability to vent the RCS via the reactor head vent valves is maintained in the FNP FLEX strategy. Plant-specific Westinghouse analysis was used to determine the flow, pressure, and timing requirements for injection of borated water to ensure sub-criticality will be maintained. Injection of borated water will be initiated approximately 14 hours after an ELAP event occurs using the RCS FLEX pump. If inventory shrinkage during cooldown is inadequate, then letdown can be initiated by opening the reactor vessel head vent valves. The head vent valves are dc-powered solenoid valves and can be operated from the control room. PORVs can be used as a backup, per plant procedures.

On page 32 of 34 in the Westinghouse-developed PWR Core Cooling Position Paper, Revision 0, PA-PSC-0965, November 2012, the PWROG states that it recommends that primary makeup be initiated PRIOR to reflux boiling to avoid build-up of diluted water in the cold legs. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that plant-specific Westinghouse analysis determined that single phase natural circulation is maintained for greater than 29 hours with no inventory makeup and the FNP FLEX strategy of initiation of cooldown at 10 hours after ELAP initiation. Thus, the licensee concludes that two-phase or reflux cooling is never entered in the FNP FLEX strategy.

On page 23 in the FNP Integrated Plan, the licensee stated that prior to depletion of the CST and Reactor Makeup Water Storage Tank (RMWST) inventory at approximately 37 hours, a new source of water for feeding the SGs will be provided to supply the CST by processing water from the SW Pond (i.e., the UHS) through water treatment equipment provided by the RRC.

Page 2-2 of WCAP-17601-P, Revision 1, states that:

> The containment temperature increase due to the lack of adequate ventilation will also contribute to the potential for nitrogen injection by heating the accumulators, SITs or CFTs. The specifics of this can be very plant specific due to containment design and gas cover pressure variations. In addition, the heat transfer from the containment environment to the cover gas itself can have a fair degree of uncertainty associated with it.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the effects of containment heating/temperature on accumulator injection have been considered in developing the target cooldown temperature/pressure. The FNP strategy includes over 100 psi of margin to account for potential non-conservatisms.

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

3.2.1.4 Initial Values for Key Plant Parameters and Assumptions

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

On page 7 and 8 in the section of its Integrated Plan in regards to key site assumptions to implement NEI 12-06 strategies, the licensee stated that the following conditions exist for the baseline case:

- Seismically designed dc battery banks are available.
- Seismically designed ac and dc electrical distribution is available.
- Plant initial response is the same as Station Blackout (SBO) event.
- Best estimate analysis and decay heat are used to establish operator time and action.
- No single failure of SSC is assumed except those in the base assumptions (i.e., [emergency diesel generator] EDG operation). Therefore, TDAFW will perform either via automatic control or with manual operation capability per the guidance in NEI 12-06.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated the various time constraints related to RCS Inventory and Reactivity are based on the March 4, 2013, Westinghouse letter, LTR-FSE-12-25 Revision 2, "Evaluation to Support FNC FLEX Strategies for Farley Nuclear Plant." This letter details a site-specific evaluation for Farley consistent with the methodology of WCAP-17601.

The Westinghouse-developed PWR Core Cooling Position Paper, Revision 0, PA-PSC-0965, November 2012, states that:

> A key understanding is that each NSSS vendor's generic approach is based on a specific set of parameters (reference plant parameters) to demonstrate the concepts and approaches described in this document and WCAP-17601. *Therefore, each plant must evaluate the parameters utilized to determine if the data presented is representative of their plant or perform the necessary evaluations/analyses to address the differences.* In addition, the identified gaps and recommendations are based on given assumptions and inputs which must be validated for applicability by each plant.

Review of the FNP Integrated Plan did not disclose a discussion of the evaluation performed of the parameters used in WCAP-17601 as to how they represent FNP and did not provide validation of the gaps and recommendations in PA-PSC-0965 with respect to FNP. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that a plant-specific analysis to validate the FNP FLEX strategies was performed by Westinghouse (LTR-FSE-12-25 Rev. 2). In addition to reviewing the strategy, Westinghouse customized the generic WCAP-17601 analysis to model the FNP strategy. The FNP Integrated Plan directly or indirectly credits the following WCAP-17601 analyses: Section 5.1.3 – Turbine Driven Auxiliary Feedwater Pump Heat and RCS Heat Loss; Section 5.2.2 – Westinghouse AFW Consumption/CST Requirements; Section 5.7.1 – Westinghouse Generic Case Results; and Section 3.1 – Conclusions/Recommendations – Westinghouse and Section 3.4 – Recommended Instrumentation for an ELAP. These analyses apply to Westinghouse NSSS designs with three RCS loops, consistent with FNP. The case matrix for the assumptions on each Westinghouse design is presented in Section 4.1.1.1. PA-PSC-0965 identifies gaps and recommendations for plants to consider in the development of their Integrated Plans. All gaps and recommendations were considered in the development of the FNP Integrated Plan.

In order to understand the baseline coping capability of a plant following an ELAP, NEI 12-06, Section 3.2.1 discusses general criteria and baseline assumptions. Review of the FNP Integrated Plan did not uncover a discussion of the assumed CST temperature when determining the heat removal capability of the TDAFW pump at FNP. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated the CST is the source of water for the TDAFW pump. 120 degrees F was used for conservatism, as it is used in the existing Severe Accident Management Guideline (SAMG) analysis, with the current licensing basis value at 110 degrees F.

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 initial values for key plant parameters and assumptions, if these requirements are implemented as described.

3.2.1.5 Monitoring Instrumentation and Controls

NEI 12-06, Section 3.2.1.10 states in part:

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

On pages 16 and 17 of the Integrated Plan regarding maintaining RCS core cooling & heat removal, the licensee listed the installed instrumentation credited for maintaining core cooling and heat removal during Phase 1 of an ELAP. They included the following parameters:

SG Level (9 instruments)
SG Pressure (9 instruments)
AFW flow to SGs (3 instruments)
CST Level (2 instruments)
RCS Temperature (three cold legs)
RCS Temperature (three hot legs)
RCS Pressure (two wide range)
Core Exit Thermocouples (51 for Unit 1 and 49 for Unit 2)
Source Range Neutron Flux (two instruments)

The licensee indicated in the FNP Integrated Plan that as they continue to evaluate the FLEX strategy, they 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 (NEI 12-06 Rev. 0, Section 3.2.1.10)..

FNP identified SG pressure, SG level, AFW flow to SGs, RCS T-cold, RCS T-hot, RCS WR pressure and DC bus voltage as remaining available following dc bus extended load shed. FNP also expects to have core exit thermocouples and source range neutron flux instruments available in Phase 2 and beyond. In addition, the licensee stated, in part that local indications such as CST level will remain available and key reactor parameters can be determined from a local reading using standard I&C instruments.

On page 32 of 34, in PA-PSC-0965, Revision 0, Westinghouse states that:

> The current Westinghouse generic guidance background information for ECA-0.0, Loss of All AC Power, … directs plants with [Reactor Coolant Pump (RCP) seals designed to maintain RCP seal leakage less than or equal to 1 gpm per RCP] installed to monitor PRZR [pressurizer] level and RCS subcooling prior to initiating an RCS cooldown to ensure the seals are performing as designed.

The FNP Integrated Plan indicated that four instruments monitor pressurizer level following an ELAP 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, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to monitoring instrumentation and controls, if these requirements are implemented as described.

3.2.1.6 Sequence of Events

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

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

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

In order to support the objective of an indefinite coping capability, each plant will be expected to establish capabilities consistent with Table 3-2 (PWRs). Additional explanation of these functions and capabilities are provided in NEI 12-06 Appendix D, "Approach to PWR Functions."

The SOE is discussed in the Integrated Plan on pages 9 to 12 and in Attachment 1A on pages 65 and 66.

The plan identifies nine time constraints needed for success of FLEX mitigating strategies:

- Entry into ELAP has the first time constraint. Entry is assumed to occur at 30 minutes after an ELAP with the constraint at greater than 40 minutes after an ELAP. 30 minutes was selected by the licensee to ensure that ELAP entry conditions can be verified by control room staff and it is validated that EDGs are not available.

- Staging portable control room lighting is assumed to be completed at 35 minutes after an ELAP. The time constraint is at greater than 45 minutes after an ELAP. The period of 5 minutes past ELAP entry was selected by the licensee to ensure that control room portable lighting is established prior to the extended load shed de-energizing the emergency control room lighting.

- Completing the dc load shed is the third important action and is assumed to be completed at 50 minutes after an ELAP event. The time constraint is at greater than 60 minutes after an ELAP. 50 minutes represents 20 minutes past ELAP entry, which ensures that dc buses are available from battery sources. Phase 2 battery recharging is assumed to begin at 8 hours. The dc buses are readily accessible to the operator. Load stripping consists of opening 11 breakers on Unit 1 and 10 breakers on Unit 2 using local control switches. As an operator aid, the breakers/ control switches will be appropriately labeled to show which are required to be opened to facilitate an extended load shed.

- Putting the TDAFW pump into manual mode is the fourth important action and is to be completed prior to two hours after an ELAP. The TDAFW uninterruptable power supply and batteries provide power for a minimum of 2 hours for automatic or remote manual operation of TDAFW pump and turbine. In addition, the TDAFW turbine steam admission valves will remain open for at least 2 hours utilizing compressed air from the associated air accumulator. After 2 hours operator action is required to manually open the TDAFW turbine steam admission valves, and then manually control TDAFW turbine speed by throttling open the TDAFW trip and throttle valve to control turbine speed and pump discharge pressure.

- Powering up both trains of station Class 1E dc power via battery chargers powered by an onsite FLEX DG is the fifth important action. The time constraint is at greater than 8.5 hours after an ELAP. Current battery durations are calculated to be greater than 8.5 hours. The on-site FLEX DG will be deployed during the 6-8 hour time frame to power the battery chargers by 8 hours.

- Initiating depressurization of the steam generators to achieve the RCS cooldown and depressurization by 19 hours after an ELAP is the sixth important action. The time constraint is 15 hours after an ELAP. Licensee calculations show that initiating cooldown at 16 hours allows sufficient time for RCS depressurization (estimate 4 hours) prior to when borated makeup must be started for maintaining sub-criticality at the most limiting core conditions.

- Making up to the CST from the RMSWT within 12 hours is the seventh important action. The time constraint is at approximately 12.5 hours after an ELAP. Prior to depletion, the CST will be provided with makeup from the RMWST, which is Seismic Category 1 and missile protected.

- Initiating boration of the RCS by 14 hours after an ELAP to ensure the reactor is maintained subcritical is the eighth important action. The time constraint is at approximately 19 hours after an ELAP. The Westinghouse RCS makeup evaluation for FNP determined that injecting approximately 5,000 gallons from the BAST/BAT provides sufficient shutdown margin for the worst case boration requirements (i.e., end-of-life). Initiating makeup from the BAST/BAT at 19 hours ensures adequate boration to maintain long-term sub-criticality is accomplished within 24 hours (i.e., prior to addition of net positive reactivity from xenon decay and cooldown following the reactor trip) with injection rate limited by letdown through the upper head vent flowpath.

- Makeup to the CST from an offsite water source by 36 hours after an ELAP event is the ninth important action. The time constraint is at approximately 37 hours after an ELAP. Prior to depletion of the initial CST inventory and supplemental RMWST inventory, the CST will require makeup from the service water pond (i.e., the UHS) through portable water treatment equipment (filtration/demineralizer plant) from the RRC that will furnish a makeup water source to the CST sufficient to remove decay heat from the steam generators.

On page 31 of 34, in the Westinghouse-developed PWR Core Cooling Position Paper, Revision 0, PA-PSC-0965, November 2012, the PWROG states that establishing plant conditions that will allow the SG FLEX pump to be utilized should be performed as soon as plant resources allow providing defense-in-depth for maintaining an adequate heat sink should the installed AFW system fail. On page 10 in the FNP Integrated Plan, the licensee stated it would initiate depressurization of the SGs to achieve the RCS cooldown and depressurization 10 hours after the beginning of an ELAP.

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

3.2.1.7 Cold Shutdown and Refueling

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 process. Southern Nuclear Operating Company, Inc. informed the NRC of its plan 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 the analysis of an ELAP during Cold Shutdown or Refueling if these requirements are implemented as described.

3.2.1.8 Core Sub-Criticality

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

> All plants provide means to provide borated RCS makeup.

On page 10 in its Integrated Plan, the licensee indicates that at about 10 hours into the ELAP operators will initiate depressurization of the SGs to achieve RCS cooldown and depressurization. The FNP Integrated Plan stated this allows sufficient time for RCS depressurization prior to when borated makeup must be started for maintaining sub-criticality at the most limiting core conditions.

The licensee stated that cooldown of the RCS will result in a decrease in loss of the RCS inventory from RCP seal leakages, and, in turn, an increase in available time for the operator to take action and maintain the core covered with water. In the presence of a negative moderator temperature coefficient, the cooldown by steaming through the atmospheric relief valves (ARVs) increases positive reactivity in the core. If the control rod worth from the inserted control rods following a reactor trip and the boron concentration from safety injection is not sufficient to overcome the positive reactivity addition from the cooldown, the reactor will return to power. As a result of the power increase and RCS pressure decrease, the calculated departure from nucleate boiling ratios (DNBRs) may decrease, possibly causing fuel damage.

On page 11 in its Integrated Plan, the licensee stated that at 14 hours after the initiation of the ELAP it will initiate boration of the RCS to ensure the reactor is maintained subcritical with a time constraint of approximately 19 hours. The Westinghouse RCS makeup evaluation for FNP determined that injection approximately 5,000 gallons from the Boric Acid Storage Tank (BAST/BAT) provides sufficient shutdown margin for the worst case boration requirements (i.e., end-of-life). Initiating makeup from the BAST/BAT at 19 hours ensures adequate boration to maintain long-term sub-criticality is accomplished within 24 hours (i.e., prior to addition of net positive reactivity from xenon decay and cooldown following the reactor trip) with injection rate limited by letdown through the upper head vent flow path.

On page 19 of PA-PSC-0965, Revision 0, Westinghouse stated in part that:

> If the CLAs/SITs/CFTs are to be utilized as the borated water source (especially early in an ELAP event when window of opportunity is during period of time when xenon peak occurs), injecting the additional borated water volume may be beneficial. Therefore, *if the utility demonstrates the capability to directly monitor CLA/SIT/CFT level (considering instrument uncertainty and impact of containment conditions) and ability to isolate or vent CLA/SIT/CFTs as soon as level reaches minimum setpoint,* then an Alternate Primary Makeup/Boration strategy may direct additional SG pressure reduction

The FNP Integrated Plan lacks a discussion of the boron mixing model used for the re-criticality analysis in support of the plant FLEX mitigation strategies, and needed to address the adequacy of the boron mixing model for the intended purpose with support of an analysis and/or boron mixing test data applicable to the ELAP conditions. The NRC staff asked the licensee to discuss the boron mixing model used in the ELAP analysis. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that FNP's primary strategy is to maintain single phase natural circulation in the RCS. Analysis was performed by Westinghouse to determine the timing associated with the required makeup to maintain single phase natural circulation. The licensee provided the sub-criticality analysis, which determined the required RCS makeup to achieve a boron concentration that corresponds to a shutdown margin of 1,000 pcm. Boron concentrations of the injection sources and the RCS were assumed at their limiting (i.e., lowest) allowable values based on Technical Specification limits. No credit was taken for negative reactivity from xenon. The licensee stated that the results indicated that the shutdown margin is maintained with either injection source within 24 hours following the start of an ELAP event. If the accumulators are isolated, at the most limiting conditions, RCS makeup would need to begin at 14 hours after an ELAP.

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

The Pressurized Water Reactor Owners Group submitted a position paper, dated August 15, 2013 (withheld from public disclosure due to proprietary content), which provides test data regarding boric acid mixing under single-phase natural circulation conditions and outlined applicability conditions intended to ensure that boric acid addition and mixing would occur under conditions similar to those for which boric acid mixing data is available. The licensee's response to the EA-12-049 Mitigation Strategy Audit informed the NRC staff that FNP intended to abide by the generic approach to boric acid mixing in OG-13-284, including applying the five limitations. However, the NRC staff concluded that the August 15, 2013, position paper was not adequately justified and has not endorsed this position paper. As such, resolution of this concern for FNP is identified as Open Item 3.2.1.8A in Section 4.1.

The licensee's approach described above, as currently understood by the NRC staff, provides an acceptable alternative to the guidance to NEI 12-06, and subject to the successful closure of issues related to the Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to core sub-criticality, if these requirements are implemented as described.

3.2.1.9 Use of Portable Pumps

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

> Regardless of installed coping capability, all plants will include the ability to use portable pumps to provide RPV/RCS/SG makeup as a means to provide diverse capability beyond installed equipment. The use of portable pumps to provide RPV/RCS/SG makeup requires a transition and interaction with installed systems. For example, transitioning from RCIC to a portable FLEX pump as the source for RPV makeup requires appropriate controls on the depressurization of the RPV and injection rates to avoid extended core uncovery. Similarly, transition to a portable pump for SG makeup may require cooldown and depressurization of the SGs in advance of using the portable pump connections.

> Guidance should address both the proactive transition from installed equipment to portable and reactive transitions in the event installed equipment degrades or fails. Preparations for reactive use of portable equipment should not distract site resources from establishing the primary coping strategy. In some cases, in order to meet the time-sensitive required actions of the site-specific strategies, the FLEX equipment may need to be stored in its deployed position.
>
> The fuel necessary to operate the FLEX equipment needs to be assessed in the plant specific analysis to ensure sufficient quantities are available as well as to address delivery capabilities.

On pages 18 and 19 in the section of its Integrated Plan discussing the strategy for maintaining core cooling and heat removal in the transition phase, the licensee stated that Phase 2 requires a baseline capability for reactor core cooling strategy to connect a portable pump for injection into the SGs in the event that the TDAFW pump fails or when ample steam is no longer available to drive the TDAFW pump‘s turbine. To allow for defense-in-depth actions in the event of an unforeseen failure of the TDAFW pump, the SG FLEX pump should be staged and made ready for service as soon as resources become available following the ELAP event.

The licensee stated to use the SG FLEX pump, the coping strategy depressurizes the SGs to below the SG FLEX pump discharge pressure. Depressurization of the SGs will require deploying shift operators (SOs) to locally open the ARVs. The SOs, coordinating with the Main Control Room (MCR) will depressurize the SGs via the ARVs to a pressure of approximately 300 psig. To conservatively envelop any scenario with an early TDAFW failure and provide the capability to restore secondary heat sink, the SG FLEX pump will be sized based on decay heat at one hour after reactor shutdown. This corresponds to a flow rate of approximately 300 gpm at a discharge pressure equal to the SG injection pressure, 300 psig, in addition to all head losses (i.e., hoses, piping, connections and elevation of feed injection point) from the discharge of the SG FLEX pump to the SG.

The Integrated Plan further stated that throughout Phase 2, it is expected that the TDAFW pump or the SG FLEX pump will be in operation with suction from the CST and discharge to the SGs. For injection using the SG FLEX Pump, the pump would normally be staged at a location near the CST. The supply source for the SG FLEX pump will be the CST and the discharge of the SG FLEX pump will be directed to the discharge piping of the AFW pumps on the 100 foot elevation.

The Integrated Plan stated the CST is capable of providing a minimum of 12.5 hours of water for SG injection (applicable to both TDAFW pump injection and SG FLEX Pump injection into SGs). A CST FLEX pump will be provided for CST makeup. The makeup strategy for the CST is first to supply water from the RMWST. The licensee stated the RMWST is a Seismic Category 1 tank, is missile protected, and is capable of providing an additional 24.5 hours to the 12.5 hours of available inventory in the CST.

On page 23 in the section of its Integrated Plan discussing the strategy for maintaining core cooling and heat removal in Phase 3, the licensee used a portable pump for strategy implementation. Phase 3 of the core cooling strategy will be expected to begin following exhaustion of the CSTs and RMWSTs at approximately 37 hours. The Phase 3 core cooling strategy for SG will be provided by a SW FLEX pump capable of providing the entire inventory of water from the SW Pond (UHS) through RRC water treatment equipment and then to the CST. Prior to depletion of the UHS, there will be the capability to refill the UHS from the

Chattahoochee River via temporary equipment from off-site.

The subsequent Phase 3 core cooling strategy requires heat removal equipment delivered from the RRC and a pump capable of removing heat from the reactor core in addition to other loads from the SFP and containment. The flow paths for decay heat removal would utilize piping in the Residual Heat Removal (RHR) system and Component Cooling Water (CCW) system. Establishing RHR cooling would require repowering the RHR pump via a DG delivered from the RRC to establish recirculation in the RCS. Heat removal would be through the RHR heat exchangers. The RHR heat exchangers would subsequently be cooled by flow from the CCW system. The CCW system would be cooled and circulated by an offsite heat exchanger and pump system powered from the RRC provided DG. The RRC heat exchanger would be sized to remove all decay heat from irradiated fuel located in the reactor cores and SFPs.

On page 29 in the section of its Integrated Plan in regards to maintaining RCS inventory control, the licensee stated for RCS inventory control and long term sub-criticality in Phase 2, the credited action will be to cooldown and depressurize the RCS for injection of boron and coolant inventory from first the accumulators, and then Phase 2 RCS FLEX pumps. Depressurizing the RCS to inject the accumulator occurs when the SGs are depressurized to 300 psig. The heat removed by depressurizing the SGs also cools the RCS to a T_{avg} of approximately 425 degrees F and an RCS pressure of 305 psig at saturation conditions.

The Integrated Plan further stated that following injection of the accumulators' inventory, the accumulators are isolated by closing the accumulator discharge valves to avoid nitrogen injection into the RCS due to subsequent plant cooldown and depressurization. Due to the low leakage seals, it is not anticipated that additional makeup other than that of the accumulators will be required to maintain adequate RCS inventory until Phase 3. However, based on plant specific Westinghouse analysis, injection of borated water needs to occur beginning approximately 14 hours after the ELAP/LUHS event occurs to ensure sub-criticality will be maintained. This will be accomplished using a Mode 1-4 RCS FLEX pump sized to inject borated water at the rate of 30 gpm at approximately 500 psig. The primary borated water source is approximately 2,000 gallons of highly borated water available in each Boric Acid Storage Tank. The alternate water source is the large volume (471,000 gallons) of borated water inventory available in the RWST for RCS injection. The Mode 1-4 RCS FLEX pump will be pre-staged in the auxiliary building to allow ease of access and installation. The Mode 1-4 FLEX pump will be powered from the onsite FLEX DG when installed. Primary and alternate connections for the discharge of the Mode 1-4 RCS FLEX pump into the RCS will be provided.

To provide support for the RCS inventory control (including RCS boration) coping strategy following an ELAP event, a 600 VAC DG will be staged and connected to power select loads. The loads that will be powered by this onsite FLEX Diesel Generator include a battery charger to each class 1E 125V dc switchgear, accumulator discharge isolation valves, and RCS FLEX pump (Mode 1-4 or Mode 5-6, as needed). The licensee stated the FLEX DG will have diverse connection points.

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 portable pumps, if these requirements are implemented as described.

3.2.2 Spent Fuel Pool Cooling Strategies

NEI 12-06, Table 3-2 and Appendix D summarize one acceptable approach for the SFP cooling strategies. This approach uses a portable injection source to provide 1) makeup via hoses on the refuel deck/floor capable of exceeding the boil-off rate for the design basis heat load; 2) makeup via connection to 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 gpm per unit (250 gpm to account for overspray). This approach will also provide a vent pathway for steam and condensate from the SFP.

The licensee stated in the FNP Integrated Plan it will also provide a vent pathway for steam and condensate from the SFP area.

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

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

On page 43 in its Integrated Plan in regards to maintaining SFP cooling during the initial phase of an ELAP, the licensee stated fuel in the SFP is cooled by maintaining water above the top of the fuel. Upon interruption of power to the installed SFP cooling pumps, the water inventory will heat up. Requirements for SFP makeup (which are not required until boil-off occurs in the SFPs) are based on the worst case design basis heat load and worst case fuel offload timing. In this scenario, the pool will start boiling at 5.6 hours after cooling is lost; however, water does not drop to 15 feet above the fuel for greater than 23 hours and active fuel is not uncovered for 53.1 hours. Makeup flow of about 77 gpm per pool will be required to maintain level for this worst case design basis heat load ELAP/LUHS event.

The Integrated Plan noted that the only Phase 1 action identified will be to open SFP room door and the new fuel room missile door to ventilate the SFP room to mitigate the steam caused by SFP boiling. This pathway will be established by manually propping open the missile door and propping open the door to the SFP room. The new fuel area door is locked and closed during normal operations.

On page 44 in its Integrated Plan in regards to maintaining SFP cooling during the initial phase, in the section for identifying modifications, the licensee referenced SNCF166-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events for Southern Nuclear Operating Company, Inc., Farley Nuclear Plant, Revision 1, as containing a list of credited instrumentation. In addition the licensee stated it will improve instrumentation in the SFP to meet the requirements of Order EA-12-051 regarding SFP level.

On page 45 in its Integrated Plan in regards to maintaining SFP cooling during the Phase 2, the licensee stated that to ensure minimum SFP level will be maintained, makeup to the SFP will be implemented prior to the SFP water level reaching 15 feet above the active fuel as indicated by the installed SFP level instrumentation. This timing depends on the stored fuel inventory and time since fuel was discharged from the core, but in all cases will be greater than 23 hours. The SW Pond is the preferred source of makeup for SFP boiloff.

There are four baseline capabilities related to SFP level that are specified in the NEI 12-06 guidance, three for makeup and one for venting the SFP area. The venting of the SFP area capability was discussed above. In the first baseline method, the SFP makeup is via hoses, directly into the pool. In the second baseline method, SFP makeup is via a connection to SFP cooling piping or another alternate location that does not require accessing the SFP room. In the third baseline method, a vent pathway for steam caused by SFP boiling is opened. In the fourth baseline method, operators will spray the SFP via portable monitor nozzles.

Operators will stage hoses for providing the makeup prior to SFP makeup being required. A manifold will be provided to connect three hoses: one that discharges directly into the SFP (Method 1), one that can provide makeup to the SFP through the SFP Cooling system (Method 2), and one that can supply the monitor spray nozzles (Method 4). The required spray flow rate is 250 gpm as established in NEI 12-06 (Table D-3). The minimum flow rate for the SFP FLEX pump is 250 gpm to each unit.

On page 49 in its Integrated Plan in the section identifying portable equipment for Phase 3, the licensee stated the long-term phase of the SFP FLEX cooling strategy is reliant on moving from makeup/boil-off to making use of the flow through the SFP heat exchanger that will be cooled by the portable RRC pump and heat exchanger skid. The SFP can be cooled indefinitely using the portable RRC pump and heat exchanger skid.

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

3.2.3 Containment Functions Strategies

NEI 12-06, Table 3-2 and Appendix D provide some examples of acceptable approaches for demonstrating the baseline capability of the containment strategies to effectively maintain containment functions during all phases of an ELAP. One of these acceptable approaches is by analysis.

NRC Order EA-12-049 stated in part that:

> The strategies shall be developed to add multiple ways to maintain or restore core cooling, containment and SFP cooling capabilities in order to improve the defense-in-depth of licensed nuclear power reactors.

NEI 12-06, Section 3.2.1.1 states in part that:

Procedures and equipment relied upon should ensure that satisfactory performance of necessary fuel cooling and containment functions are maintained.

On page 36 of its Integrated Plan regarding maintaining containment during Phase 1, the licensee stated that analysis is being performed to demonstrate that containment response following a postulated ELAP/ LUHS event does not challenge design limits until well after availability of RRC equipment and implementation of long term strategies to control pressure and temperature. This item is identified as Confirmatory Item 3.2.3A, in Section 4.2.

On page 38 of its Integrated Plan regarding maintaining containment during the Phase 2, the licensee stated that portable on-site FLEX DGs will be employed to charge the station batteries and maintain dc bus voltage for continued availability of required instrumentation.

On page 41 of its Integrated Plan regarding maintaining containment during the Phase 3, the licensee stated the Phase 3 coping strategy required for maintaining containment integrity involves either venting containment or using containment coolers for indefinite containment cooling. The Integrated Plan stated that the preferred option is to repower Train A containment cooling fans at low speed and supply a new source of cooling water to these containment coolers. Cooling water flow through the containment coolers will be provided by a portable pump and heat exchanger skid from the RRC. Modification is required to provide connection points to the SW lines and this strategy provides a Train A electrical powered alternative.

The Integrated Plan discusses an alternative plan using a containment venting strategy achieved by repowering the Post-LOCA Pressurization and Ventilation System. This system provides a filtered ventilation path to vent the containment atmosphere to the stack and provides a Train B electrical powered alternative.

On pages 41 and 42 in its Integrated Plan regarding maintaining containment, the licensee identified modifications necessary for Phase 3.

On page 36 in its Integrated Plan regarding maintaining containment, the licensee listed containment pressure indicators PI-950, 951, 952, and 953 as essential instruments required for monitoring containment integrity.

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 containment functions strategies, 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.

On page 23 in its Integrated Plan in regards to maintaining core cooling and heat removal in Phase 3, the licensee stated in Modes 1 through 5, with SGs available, Phase 3 of the core cooling strategy will be expected to begin following exhaustion of the CSTs and RMWSTs at approximately 37 hours. The Phase 3 core cooling strategy with SGs available will be provided by a SW FLEX pump capable of providing the entire inventory of water from the SW Pond through RRC water treatment equipment and then to the CST. Prior to depletion of the UHS, there will be the capability to refill the UHS from the Chattahoochee River via temporary equipment from off-site. The subsequent Phase 3 core cooling strategy relies on heat removal equipment delivered from the RRC and a pump capable of removing heat from the reactor core in addition to removing heat from other loads from the SFP and containment. The flow paths for decay heat removal would use piping in the RHR system and CCW system. Establishing RHR cooling would require repowering the RHR pump via a DG delivered from the RRC to establish recirculation in the RCS. Heat removal would be through the RHR heat exchangers. The RHR heat exchangers would subsequently be cooled by flow from the CCW system. The CCW system would be cooled and circulated by an offsite heat exchanger and pump system powered from the RRC provided DG. The CCW system can be isolated so that a portable system can provide cooling to not only the RHR heat exchangers but the SFP heat exchangers and RHR pump seal coolers as well. The RRC heat exchanger would be sized to remove all decay heat from irradiated fuel located in the reactor cores and SFPs.

The Integrated Plan stated that prior to depletion of the CST and RMWST inventory at approximately 37 hours, a new source of water for feeding the SGs will be provided to supply the CST by processing water from the SW Pond through water treatment equipment provided by the RRC.

On page 41 in its Integrated Plan in regards to maintaining containment in Phase 3, the licensee stated the primary Phase 3 coping strategy required for maintaining containment integrity involves using containment coolers for indefinite containment cooling. This option will repower Train A containment cooling fans at low speed and supply a new source of cooling water. Cooling water flow through the containment coolers will be provided by a portable pump and heat exchanger skid from the RRC. Modification is required to provide connection points to the SW lines and this strategy provides a Train A electrical powered alternative.

On page 49 in its Integrated Plan in regards to maintaining spent fuel cooling in Phase 3, the licensee stated that the long-term phase of the FLEX cooling strategy is reliant on making use of the flow through the SFP heat exchanger that will be cooled by the portable RRC pump and heat exchanger skid.

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 51 in its Integrated Plan in regards to safety functions support for MCR accessibility, the licensee stated that MCR accessibility must be maintained for the duration of the ELAP. During the ELAP, some control room vital electronics, instrumentation and emergency lighting remain energized from emergency dc power sources. At one hour, extended load shedding will be complete and some instrumentation and the emergency lights are de-energized. The room heat-up calculations performed for SBO conditions need to be revised to envelop the effect of this de-energizing/reenergizing sequence on control room accessibility following an ELAP event. On the basis of similar studies for other plants, it is reasonable to assume that there will be sufficient sensible heat, heat from personnel and the limited electrical loads still active during Phase 1 of an ELAP to increase the main control room temperature above the 110 degrees F value assumed for the maximum temperature for efficient human performance as described in NUMARC 87-00. The Phase 1 strategy is thus to block open the MCR access doors open to the building exterior at plant grade level) and employ portable ventilation fans powered by electric generators or gas powered portable fans. The licensee stated that this strategy will provide enough ventilation to equalize the MCR temperature to approximately that of the outside air. During cold weather, the ventilation flow can be limited to keep the MCR at a habitable temperature. The Phase 1 strategy can be extended indefinitely or until long term Phase 3 strategies to restore plant HVAC equipment or provide portable HVAC for the MCR can be implemented. If the outside temperature is above 98 degrees F, then the doors will not be opened until the MCR temperature is in excess of the outside 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 equipment cooling – cooling water, if these requirements are implemented as described.

3.2.4.2 Ventilation – Equipment cooling

NEI 12-06, Section 3.2.2, Guideline 10 states in part:

> *Plant procedures/guidance should consider loss of ventilation effects on specific energized equipment necessary for shutdown (e.g., those containing internal electrical power supplies or other local heat sources that may be energized or present in an ELAP.*
>
> ELAP procedures/guidance should identify specific actions to be taken to ensure that equipment failure does not occur as a result of a loss of forced ventilation/cooling. Actions should be tied to either the ELAP/LUHS or upon reaching certain temperatures in the plant. Plant areas requiring additional air flow are likely to be locations containing shutdown instrumentation and power supplies, turbine-driven decay heat removal equipment, and in the vicinity of the inverters. These areas include: steam driven AFW pump room, HPCI and RCIC pump rooms, the control room, and logic cabinets. Air flow may be accomplished by opening doors to rooms and electronic and relay cabinets, and/or providing supplemental air flow.
>
> Air temperatures may be monitored during an ELAP/LUHS event through operator observation, portable instrumentation, or the use of locally mounted thermometers inside cabinets and in plant areas where cooling may be needed. Alternatively, procedures/guidance may direct the operator to take action to provide for alternate air flow in the event normal cooling is lost. Upon loss of

these systems, or indication of temperatures outside the maximum normal range of values, the procedures/guidance should direct supplemental air flow be provided to the affected cabinet or area, and/or designate alternate means for monitoring system functions.

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

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

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

On page 51 in its Integrated Plan in regards to safety functions support for MCR accessibility, the licensee stated that MCR accessibility must be maintained for the duration of the ELAP. The room heat-up calculations performed for SBO conditions need to be revised to envelop the effect of a de-energizing/reenergizing sequence of control room equipment following an ELAP event. This item is identified as Confirmatory Item 3.2.4.2A, in Section 4.2.

On the basis of similar studies for other plants, the Integrated Plan stated it is reasonable to assume that there will be sufficient sensible heat, heat from personnel and the limited electrical loads still active during Phase 1 of an ELAP to increase the MCR temperature above the 110 degrees F. The Phase 1 strategy is to block open the MCR access doors to the building exterior, at plant grade level and employ portable ventilation fans powered by electric generators or gas-powered portable fans. The licensee stated that this strategy will provide enough ventilation to equalize the MCR temperature to approximately that of the outside air. During cold weather, the ventilation flow can be limited to keep the MCR at a habitable temperature. The Phase 1 strategy can be extended indefinitely or until long term Phase 3 strategies to restore plant HVAC equipment or provide portable heating, ventilation, and air conditioning (HVAC) for the MCR can be implemented. If the outside temperature is above 98 degrees F, then the doors will not be opened until the MCR temperature is in excess of the outside temperature. In addition, the licensee's response to the EA-12-049 Mitigation Strategy Audit stated that preliminary calculations indicate that the MCR temperature can be maintained below 110 degrees F for 72 hours provided that operators take specified actions (such as blocking open doors and deploying a fan). The licensee stated that multiple conservatisms are used in this calculation, including no credit for MCR panels as heat sinks, an outside temperature at 95 degrees F, and an initial MCR temperature of 78 degrees F. The MCR heat load used in the calculation is the same as that used in the approved SBO head load analysis, and includes 20 people in the control room at an additional 550 British Thermal Units (Btu) per hour each.

The review questioned the licensee's plan for ventilation cooling as it relates to equipment protection and sought clarification on why opening an outside door to the control room during an extreme heat event constitutes adequate cooling. The licensee's response to the EA-12-049 Mitigation Strategy Audit the licensee stated that preliminary calculations indicate that the MCR temperature can be maintained below 110 degrees F for 72 hours, provided the operators take specified actions (such as blocking doors open and deploying a fan). The licensee stated the calculations contain many conservatisms. The review also questioned the potential effect on logic cabinets from high temperatures during an extreme heat event ELAP event. The issue of logic cabinets has been identified as Open Item 3.2.4.2C, in Section 4.1.

On page 52 in the FNP Integrated Plan, the licensee stated that during battery charging operations in Phases 2 and 3, ventilation will be required in the battery rooms and associated dc equipment rooms for cooling the rooms and venting hydrogen released from the batteries during charging. Until power can be provided to the normal room ventilation system, the doors will be manually propped open. If necessary, forced ventilation can then be established using portable fans (electric powered from the on-site FLEX DG powering the battery chargers).

The FNP Integrated Plan discussions on ventilation of battery rooms did not state if the ventilation path was different than the design basis path, did not discuss what criteria would be used to determine if hydrogen buildup required forced ventilation, and did not discuss how hydrogen concentrations would be measured during an ELAP event. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that during battery charging operations in Phases 2 and 3, ventilation may be required in the battery rooms and associated dc equipment rooms for cooling. If necessary due to extreme heat conditions, the doors will be manually propped open and forced ventilation can be established using portable electric powered fans, powered from the Phase 2 FLEX generator powering the battery chargers. For extreme cold temperatures, the battery rooms would be at normal operating temperature at the onset of the event. The temperature of the electrolyte in the cells would build up due to heat generated during discharging and during re-charging. The battery rooms are located substantially internal to the plant. The rooms should remain near pre-event temperatures during the period until the FLEX generators are deployed and have energized the battery chargers. A calculation is being prepared to evaluate the temperature profile of the battery and dc equipment rooms to determine if additional forced air flow for cooling is required. The NRC staff also sought information on criteria for determining if hydrogen buildup requires forced ventilation and how hydrogen concentrations would be measured during an ELAP event. These items are identified as Confirmatory Item 3.2.4.2B, in Section 4.2.

NEI 12-06, Section 3.2.1.8 states that the effects of loss of HVAC in an extended loss of ac power event can be addressed consistent with NUMARC 87-00 or by plant-specific thermal hydraulic calculations, e.g., GOTHIC calculations. NEI 12-06, Section 3.2.2 Item 2 states in part that plant procedures/guidance should recognize the importance of AFW during the early stages of the event and direct the operators to invest appropriate attention to assuring its initiation and continued, reliable operation during the transient.

On page 18 in the FNP Integrated Plan, the licensee stated that the main strategy for core cooling and heat removal during Phase 2 will be dependent on continued operation of the TDAFW pump. On page 8 in the FNP Integrated Plan, the licensee stated that the maximum environmental temperatures for habitability or equipment availability are based on NUMARC 87-00 guidance if other design information is not available. On pages 51 and 52 in the FNP Integrated Plan, the licensee stated that operation of the TDAFW pump without forced ventilation was evaluated for the SBO condition by calculation BM-96-1171-001. The licensee stated that the calculation determined that the room would heat up to 123 degrees F during the first hour of the SBO coping period and remain below 125 degrees F during the initial 24 hours. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that a computer run, separate from calculation BM-96-1171-001, was performed using a duration of the ELAP event of 20 days. From the results of the run, the licensee determined the temperature would stabilize at a temperature slightly higher than 125 degrees F. The licensee stated it knew of no "cliff-edge effects" for operating at this 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 subject to the successful closure of issues related to the Open Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to ventilation – equipment cooling, if these requirements are implemented as described.

3.2.4.3 Heat Tracing

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

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

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that lines that are heat traced normally and are required to support FLEX strategies with flow through the lines at initiation of the ELAP event do not require heat tracing since they are already heated and flow has been established. Any lines at FNP that are normally heat traced, with no flow in them after the onset of an ELAP event would be heated and the liquid would still be warm when Phase 2 equipment is deployed. The only line that is used and will be heat traced and does not have flow through it at the time of the event is the line being added to the RMWST as a redundant suction source. This line is stagnant and will require heat tracing in extreme cold weather. The heat tracing will be provided by an onsite FLEX generator with heat tracing stored with it.

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

3.2.4.4 Accessibility – Lighting and Communications

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

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

On page 9 in its Integrated Plan regarding sequence of events and technical basis when discussing time constraints, the licensee stated that at 35 minutes following an ELAP event, it will have staged portable control room lighting. This event is considered to be time critical at a time greater than 45 minutes. The time period of 5 minutes past ELAP entry was selected by the licensee to ensure that control room portable lighting is established prior to the extended load shed de-energizing the emergency control room lighting. The licensee stated a formal validation of the timeline will be performed once the procedure guidance is developed and related staffing study is completed.

By 40 minutes after an ELAP, the licensee stated that operators should have decided to declare an ELAP and begin taking actions that differ from those in a Station Blackout event, where ac power is expected to be recoverable in at most a few hours.

On page 51 in its Integrated Plan regarding safety functions support, the licensee stated regarding MCR accessibility that MCR accessibility must be maintained for the duration of the ELAP. During the ELAP, some control room vital electronics, instrumentation and emergency lighting remain energized from emergency dc power sources. At one hour, extended load shedding will be complete and some instrumentation and the emergency lights are de-energized. Battery powered emergency lighting will illuminate portions of the MCR once the extended load shedding is completed. Emergency lights and required instrumentation are reenergized in Phase 2 when the battery charger will be powered from the onsite FLEX DG.

On page 64 the Integrated Plan listed portable lighting as needed a component of Phase 3 response equipment/commodities.

The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that FNP is developing procedural guidance to address implementation of FLEX strategies. Operators will be trained to respond to an ELAP event, and part of the standard gear/equipment of operators with duties in the plant (inside and outside of the MCR) includes flashlights. Sufficient spare flashlights and batteries will be available to respond to an ELAP event. Additionally Farley has purchased portable dc lights to stage and use in the MCR. The portable lights have battery capacities to at least 12 hours, which will provide the necessary lighting until the FLEX generators are deployed. The portable lights can be moved or positioned to optimize lighting in the areas that require actions or observations. The batteries for the portable lights are rechargeable using either dc or ac power. When Phase 2 FLEX DGs are connected to the battery chargers, power will be available to restore essential lighting to the MCR. In addition, 10

CFR 50, Appendix R lighting provides for emergency lighting in select areas of the plant where operators or maintenance personnel may need to perform actions during loss of power conditions. The Appendix R lights have batteries that last a minimum of 8 hours. The licensee stated that since operators will be carrying flashlights and portable lighting is available, pathways do not need to be addressed.

On page 52 of the FNP Integrated Plan, the licensee stated that for Phase 1 communication coping, the plant Public Address System will be modified to provide reasonable protection and battery backup, and 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 offsite 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 62 of the FNP Integrated Plan, the licensee listed two rapidly deployable communications kits as part of the Phase 2 FLEX equipment.

On page 52 of the Integrated Plan, the licensee stated that a communications assessment was performed as a result of the information requested for NTTF Recommendation 9.3 in the March 12, 2012, NRC 10 CFR 50.54(f) letter. This Communications Assessment was provided by the licensee to the NRC in a letter dated October 31, 2012, and supplemented on February 22, 2013.

The NRC staff has reviewed the licensee communications assessment (ML12306A334 and ML13056A138) in response to the March 12, 2012, 10 CFR 50.54(f) request for information letter for FNP and, as documented in the staff analysis (ML13135A257), 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 3.2.4.4A, in Section 4.2 below 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 accessibility – lighting and communications, if these requirements are implemented as described.

3.2.4.5 Protected and Internal Locked Area Access

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

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

The FNP Integrated Plan stated that a Phase 1 action to open the SFP room door and the new fuel room missile door to ventilate the steam from the boiling SFP requires security and radiation protection personnel to open the door(s). The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that procedures exist and FLEX Support Guidelines will be developed to ensure that operators can access the required areas in the event of the loss of power. Additional details on procedural controls for access to security controlled or internal locked areas where an ELAP event would disable normal controlled access will be available later in the design/procedure development process. This item is identified as Confirmatory Item 3.2.4.5A, in Section 4.2.

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

3.2.4.6 Personnel Habitability – Elevated Temperature

NEI 12-06, Section 3.2.1.9, states that areas requiring personnel access should be evaluated to ensure that conditions will support the actions required by the plant-specific strategy for responding to the event.

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 8 of the FNP Integrated Plan regarding key site assumptions, the licensee stated that the maximum environmental room temperatures for habitability or equipment availability is based on NUMARC 87-00 guidance if other design basis information or industry guidance is not available. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that operators are trained on working in high temperature areas in the plant. Entry into high temperature environments is governed by FNP's industrial safety procedures with controls for work in heat stress situations. Current general site training includes a module on the recognition of dehydration along with methods to cope. Farley procedures already direct operators to use passive cooling technologies when having to operate in high temperature areas.

On pages 51 and 52 in its Integrated Plan regarding safety functions support, the licensee stated operation of TDAFW without forced ventilation was evaluated for the SBO condition by calculation. This conservative calculation (which ignored heat sinks and heat transfer out of the room) determined that with no ventilation, the room would heat up to 123 degrees F during the first hour of the Station Blackout coping period and remain below 125 degrees F during the initial 24 hours. Plant operations personnel determined that these conditions were satisfactory for intermittently accessing the TDAFW pump room. Site industrial safety procedures currently address activities with a potential for heat stress to prevent adverse impacts on personnel. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that manual operation of the TDAFW pump will be relatively light work with operators making occasional entry for minor manual adjustments to the Trip-Throttle Valve to control speed. Continuous standby in the room is not required, and operators can cycle in and out of the room, as necessary, to maintain the TDAFW pump operating. Manual operation of the TDAFW pump is controlled by existing procedures. The FLEX SG backup pump, which will be put into operation when the TDAFW pump no longer functions (e.g., there is inadequate steam from the SGs), will be connected and available for use no later than 10 hours after the beginning of an ELAP event. This would limit the period during which operators might need to operate the TDAFW pump in a high temperature environment.

The FNP Integrated Plan Phases 1 through 3 for SFP cooling rely on allowing the pool to heat up, boil, and have steam exit via an open door. On page 45 in the FNP Integrated Plan, the licensee stated that to ensure minimum SFP level will be maintained, makeup to the SFP will be implemented prior to the SFP water level reaching 15 feet above the active fuel as indicated by the installed SFP level instrumentation. Prior to SFP makeup being required, staging hoses for providing the makeup will be accomplished. This strategy consists of installing hoses for makeup and spray on each unit. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the Farley FLEX Support Guidelines will provide guidance for personnel to place the SFP makeup equipment. SFP heat up will not reach boiling until T=5.6 hours. Before SFP boiling occurs, personnel will be sent to deploy the pre-staged mitigating equipment (e.g., hoses, nozzles) so that if required later in the event, connections to the hoses can be made safely from a remote, non-hazardous location outside the SFP area. Once in place, makeup or spray to the SFP can commence.

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 personnel habitability – elevated temperature, 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.

…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 addressed water sources for coping strategies in its Integrated Plan for RCS cooling, RCS inventory control, SFP cooling, and safety function support. Makeup flow is immediately established to the SG during the initial phase of the ELAP strategies. The licensee stated that no specific Phase 3 strategies are identified for RCS core cooling, RCS inventory control, and SFP cooling as the Phase 1 and 2 strategies provide sufficient capability.

On page 10 and 11 in its Integrated Plan in regards to sequence of events and technical basis, the licensee stated that the time constraint for makeup to the CST from the RMWST is at approximately 12.5 hours after an ELAP event. Prior to depletion, the CST will be provided with makeup from the RMWST, which is Seismic Category I and missile protected. The licensee stated that the RMWST contains demineralized water with a minimum inventory of 160,000 gallons that is capable of providing an additional 24.5 hours to the 12.5 hours of available inventory in the CSTs. At approximately 37 hours, makeup to the CST from offsite water source becomes a time constraint. Prior to depletion of the initial CST inventory and supplemental RMWST inventory, the CST will require makeup from the service water pond through portable water treatment equipment (filtration/demineralizer plant) from the RRC that will furnish a makeup water source to the CST sufficient to remove decay heat from the SGs.

On page 23 in its Integrated Plan in regards to maintaining core cooling and heat removal, the licensee stated Phase 3 of the core cooling strategy during Modes 1 through 5 will be expected to begin following exhaustion of the CSTs and RMWSTs at approximately 37 hours. The Phase 3 core cooling strategy with SGs available will be provided by a SW FLEX pump capable of providing the entire inventory of water from the SW Pond (i.e., the UHS) through RRC water treatment equipment and then to the CST. Prior to depletion of the UHS, there will be the capability to refill the UHS from the Chattahoochee River via temporary equipment from off-site.

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.

The FNP Integrated Plan stated that in Phase 2 it will use 600V AC onsite FLEX DGs, and in Phase 3 it will use a 4160V AC offsite FLEX DG. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the loading calculations for the 600V DGs for Phase 2 and the 4160V DGs for Phase 3 have been completed and are awaiting site approval. The loads required for the FLEX strategies during the phases are included in the calculations. The final loading calculations are identified as Confirmatory Item 3.2.4.8A, in Section 4.2.

On page 54 in its Integrated Plan in regards to safety function support during the Phase 2, the licensee stated it will provide a 600V AC DG that will be staged and connected to power select loads to provide safety function support for the coping strategies following an ELAP event. The loads that will be powered by this onsite FLEX DG include a battery charger to each class 1E 125V DC Switchgear, accumulator discharge isolation valves, and RCS FLEX pump (Mode 1-4 or Mode 5-6, as needed). The 600 kW, onsite FLEX DG will be capable of starting without external equipment and has an installed fuel transfer pump. Other equipment provided for this strategy includes portable switchgear and quick connect power cables for connecting to multiple, separate loads concurrently. Diverse connection points are provided locally at the individual loads.

The review questioned how electrical isolation will be maintained such that Class 1E equipment is protected from faults in portable FLEX equipment and so that multiple sources do not attempt to power electrical buses simultaneously. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that regarding electrical isolation, appropriate controls for the equipment will be implemented in procedures to ensure compliance with NEI 12-06, Section 3.2.2.13. With respect to multiple sources powering electrical buses simultaneously, the licensee responded that at the point when ELAP mitigation activities require tie-in of FLEX generators, in addition to existing electrical interlocks, procedural controls, such as inhibiting DG start circuits and breaker rack-outs, will be employed to prevent simultaneous connection of both the FLEX generators and Class 1E DGs to the same AC distribution system or component. Should a Class 1E DG become available during the beyond design basis external event, it would be restarted to provide power to its associated buses to repower divisional loads, where safe and appropriate. This would be procedurally controlled. FLEX strategies, including the transition from installed sources to portable sources (and vice versa), will be addressed in the FLEX procedures and guidance, which are in the development stage.

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 electrical power sources/ isolations and interactions, if these requirements are implemented as described.

3.2.4.9 Portable Equipment Fuel

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

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

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

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

On page 55 in its Integrated Plan regarding safety function support in the transition phase, the licensee stated that diesel fuel is available from the diesel fuel oil storage tanks and will be retrieved and transported using a portable fuel pump (battery powered or manual) and transfer carts. The Integrated Plan stated this stored quantity of fuel will meet the fuel demand for all of the FLEX equipment well into Phase 3. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that there are five underground fuel oil storage tanks. The tanks are seismically qualified and are required by the Technical Specifications to store at least 21,000 gallons each in four of the five tanks. A calculation to determine the fuel requirements of the FLEX equipment is in progress. This item is identified as Confirmatory Item 3.2.4.9A, in Section 4.2. Since fuel oil is obtained from the diesel fuel oil storage tanks, the licensee stated that no additional measures are necessary to ensure adequate fuel quality, since it is maintained by the site's Preventative Maintenance program according to the manufacturer's guidance and existing site maintenance practices. Fuel oil will be transferred from the diesel fuel oil storage tanks to portable fuel tanks. The tanks will be transported by truck to the portable diesel-driven FLEX equipment. The licensee stated that the method of transferring fuel from the diesel fuel oil storage tanks to portable fuel tanks is still being developed.

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

3.2.4.10 Load Reduction to Conserve DC Power

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

> *Plant procedures/guidance should identify loads that need to be stripped from the plant dc buses (both Class 1E and non-Class 1E) for the purpose of conserving dc power.*
>
> DC power is needed in an ELAP for such loads as shutdown system

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

On page 16 in the section of its Integrated Plan regarding maintaining core cooling and heat removal, which identifies modifications, the licensee stated it will label non-critical dc loads to allow operators to more readily identify the loads that will be shed during the Phase 1 extended load shedding activity.

On page 17 in the section of its Integrated Plan regarding maintaining core cooling and heat removal, the licensee stated the following instruments remain available following dc bus extended load shed:

- Steam Generator Pressure
- Steam Generator Level
- AFW Flow to SGs
- RCS T-cold
- RCS T-hot
- RCS WR Pressure
- DC Bus Voltage

The licensee stated that analysis indicates this strategy provides required instrumentation for at least eight hours.

NEI 12-06, Section 3.2.2 Item 6, in part states that credit for load-shedding actions should consider the other concurrent actions that may be required in such a condition.

On page 10 in the section of its Integrated Plan describing the sequence of events and time constraints, the licensee stated that at 50 minutes after an ELAP event, the dc extended load shed should be complete. This event is considered to be time critical at a time greater than 1 hour after an ELAP event. A period of 20 minutes past ELAP entry was selected to ensure that dc buses are available from battery sources. Phase 2 battery recharging is assumed to begin at 8 hours. The licensee stated that dc buses are readily accessible to the operator. Load stripping consists of opening 11 breakers on Unit 1 and 10 breakers on Unit 2 using local control switches. As an operator aid, the breakers/ control switches 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 20 minutes. A formal validation of the timeline will be performed once the procedure guidance is developed and related staffing study is completed.

On page 10 in the section of its Integrated Plan describing the sequence of events and time constraints, the licensee stated that at 8 hours, it will have powered up both trains of station Class 1E dc power via battery chargers powered by an onsite FLEX DG. This event is considered to be time critical after 8.5 hours. The licensee stated that current battery durations are calculated to be greater than 8.5 hours. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the FLEX strategy station battery run-time was calculated in accordance with the Institute of Electrical and Electronics Engineers (IEEE)-485 method using manufacturer discharge test data applicable to the licensee's FLEX strategy as outlined in the NEI white paper on Extended Battery Duty Cycles.

The NRC staff reviewed the licensee's Integrated Plan and determined that the Generic Concern related to battery duty cycles beyond 8 hours is applicable to the plant. This Generic Concern has been resolved generically through the NRC endorsement of NEI position paper entitled "Battery Life Issue" (ADAMS Accession No. ML13241A186 (position paper) and ML13241A188 (NRC endorsement letter)).

The purpose of the Generic Concern and associated endorsement of the position paper was to resolve concerns associated with Integrated Plan submittals in a timely manner and on a generic basis, to the extent possible, and provide a consistent review by the NRC staff. Position papers provided to the NRC by industry further develop and clarify the guidance provided in NEI 12-06 related to industry's ability to meet the requirements of Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for beyond Design Basis External Events."

The Generic Concern related to extended battery duty cycles required clarification of the capability of the existing vented lead-acid station batteries to perform their expected function for durations greater than 8 hours throughout the expected service life of the battery. The position paper provided sufficient basis to resolve this concern by developing an acceptable method for demonstrating that batteries will perform as specified in a plant's Integrated Plan. The methodology relies on the licensee's battery sizing calculations developed in accordance with the IEEE Standard 485, "Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations," load shedding schemes, and manufacturer data to demonstrate that the existing vented lead-acid station batteries can perform their intended function for extended duty cycles (i.e., beyond 8 hours).

The NRC staff concluded that the position paper provides an acceptable approach for licensees to use in demonstrating that vented lead-acid batteries can be credited for durations longer than 8 hours. The NRC staff will evaluate a licensee's application of the guidance (calculations and supporting data) in its development of the final Safety Evaluation documenting review of the licensee's Integrated Plan. The licensee informed the NRC of its plan to abide by this generic resolution.

The licensee stated the on-site FLEX DG will be deployed during the 6-8 hour time frame to power the battery chargers by 8 hours. The onsite FLEX DG will also be connected to power the Mode 1-4 RCS FLEX pump within 14 hours or the Mode 5-6 RCS FLEX pump within 12 hours, dependent on ELAP initial conditions. The on-site FLEX DGs will be maintained in on-site FLEX storage structures. The on-site FLEX DGs will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards. Modifications to connect credited loads will be implemented to facilitate the connections and operational actions required to supply the battery chargers and RCS FLEX pumps from the on-site FLEX DGs. Programs and training will be implemented to support operation of on-site FLEX DGs.

In its response to the EA-12-049 Mitigation Strategy Audit question regarding hydrogen being released from the main generator if loads are shed, the licensee stated the loss of the generator seal oil pumps as a result of the event could lead to loss of hydrogen from the main generator creating a potential hazard. The power for the pumps is from a non-safety related battery located in the turbine building and it may not be possible to vent the hydrogen in a controlled manner. A procedure to address venting of the generator is being developed. This item is identified as Confirmatory Item 3.2.4.10B, in Section 4.2.

The licensee's approach described above, as currently understood by the NRC staff, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to 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[1] guidance provided in INPO AP 913, Equipment Reliability Process, to verify

proper function. The maintenance program should ensure that the FLEX equipment reliability is being achieved. Standard industry templates (e.g., EPRI) and associated bases will be developed to define specific maintenance and testing including the following:

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

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

d. 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.

Review of the Integrated Plan for FNP revealed that the Generic Concern related to maintenance and testing of FLEX equipment is applicable to the plant. This Generic Concern has been resolved generically through the NRC endorsement of the EPRI technical report on preventive maintenance of FLEX equipment, submitted by NEI by letter dated October 3, 2013 (ADAMS Accession No. ML13276A573). The endorsement letter from the NRC staff is dated October 7, 2013 (ADAMS Accession No. ML13276A224).

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

The licensee stated in its response to the EA-12-049 Mitigation Strategy Audit that they will use the EPRI developed FLEX Equipment and Testing Templates for developing programs for maintenance and testing of FLEX equipment.

The licensee’s approach described above, as currently understood by the NRC staff, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, 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 states:

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

On page 8 in the section of its Integrated Plan discussing key site assumptions to implement NEI 12-06 strategies, the licensee stated that pre-planned strategies developed to protect the public health and safety will be incorporated into the unit EOPs in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The licensee stated that the result of the beyond-design-basis event may place the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p).

On page 13 in the section of its Integrated Plan discussing programmatic controls, the licensee stated that FNP will follow the current programmatic control structure for existing processes such as design and procedure configuration.

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 provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to configuration control, if these requirements are implemented as described.

3.3.3 Training

NEI 12-06, Section 11.6, Training, states:

1. Programs and controls should be established to assure personnel proficiency in the mitigation of beyond-design-basis events is developed and maintained. These programs and controls should be implemented in accordance with an accepted training process.
2. Periodic training should be provided to site emergency response leaders on beyond- design-basis emergency response strategies and implementing guidelines. Operator training for beyond-design-basis event accident mitigation should not be given undue weight in comparison with other training requirements. The testing/evaluation of Operator knowledge and skills in this area should be similarly weighted.

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

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

5. Where appropriate, the integrated FLEX drills should be organized on a team or crew basis and conducted periodically; with all time-sensitive actions to be evaluated over a period of not more than eight years. It is not the intent to connect to or operate permanently installed equipment during these drills and demonstrations.

On page 14 in its Integrated Plan in regards to training, the licensee stated that new training of station staff and emergency response personnel will be performed in 2014, prior to the first FNP 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 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 in the section of its Integrated Plan regarding the RRC plan, the licensee stated it will use the industry RRC for Phase 3 equipment. FNP has contractual agreements in place with SAFER. The two industry RRC will be established to support utilities in response BDBEE. Each RRC will hold five sets of equipment: four of which will be able to be fully deployed when requested; the fifth set will have equipment in a maintenance cycle. 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.

Review of the licensee's use of off-site resources, as described above, provides reasonable assurance that the proposed arrangement will conform to the guidance found 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 (Guideline 1). However, the plan failed to provide any information as to how conformance with NEI 12-06, Section 12.2 Guidelines 2 through 10 will be met. This has been identified as Confirmatory Item 3.4A in Section 4.2.

NEI 12-06, Section 3.3 states that

> … the licensee will need to ensure standard connectors for electrical and mechanical equipment compatible with the site connections are provided [by off-site resources].

The licensee's response to the EA-12-049 Mitigation Strategy Audit clarified that Farley is using the guidance of NEI 12-06, Section 3.2.2 for electrical and fluid connections points and will use standardized connections that are compatible with the equipment that the RRC is providing or will supply adapters compatible with the standardized connections, as needed.

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 offsite resources, if these requirements are implemented as described.

4.0 OPEN AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

This section contains a summary of the Open Items identified as part of this evaluation.

Item Number	Description	Notes
3.1.3.2A	The licensee's Integrated Plan did not address whether FNP intends to implement protective actions regarding deployment of FLEX equipment if hurricane force winds are expected in a short period.	
3.1.3.2C	The Integrated Plan did not discuss how it would mitigate the effects of a hurricane on the ability to move equipment from offsite and restock supplies.	
3.1.5.2A	The Integrated Plan did not address the potential effects of high temperature on deployment of FLEX equipment with respect to the expansion of sheet metal, swollen door seals, etc.	
3.2.1.2B	Some Westinghouse plants have installed or will install the SHIELD shutdown seals, or other types of low leakage seals, and have credited or will credit a low seal leakage rate (e.g., 1 gpm/seal) in the ELAP analyses for the RCS response. For those plants, information should be provided to address the impacts of the Westinghouse 10 CFR Part 21 report, "Notification of the Potential Existence of Defects Pursuant to 10 CFR Part 21," dated July 26, 2013 (ADAMS No. ML13211A168), on the use of the low seal leakage rate in the	

	ELAP analysis.	
3.2.1.7A	Review of the Integrated Plan revealed that the Generic Concern related to shutdown and refueling requirements is applicable to the FNP. This Generic Concern has been resolved generically through the NRC endorsement of the NEI position paper entitled "Shutdown/Refueling Modes," and has been endorsed by the NRC. The position paper describes how licensees will, by procedure, maintain equipment available for deployment in shutdown and refueling modes. The NRC staff concluded that the position paper provides an acceptable approach for demonstrating that the licensees are capable of implementing mitigating strategies in all modes of operation. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated in part that they are committed to the position paper as described in their previous audit question responses. However, from this response it is not clear, if the licensee is committed to the position paper in its entirety; therefore the NRC staff needs confirmation from the licensee that they accept and are committed to the entire position paper.licensee	
3.2.1.8A	Review of the Integrated Plan for FNP revealed that the Generic Concern associated with the modeling of the timing and uniformity of the mixing of a liquid boric acid solution injected into the reactor coolant system (RCS) under natural circulation conditions potentially involving two-phase flow was applicable to FNP. The Pressurized Water Reactor Owners Group submitted a position paper, dated August 15, 2013 (withheld from public disclosure for proprietary reasons), which provides test data regarding boric acid mixing under single-phase natural circulation conditions and outlined applicability conditions intended to ensure that boric acid addition and mixing would occur under conditions similar to those for which boric acid mixing data is available. During the audit process, the licensee informed the NRC staff of its intent to abide by the generic approach discussed above; however, the NRC staff concluded that the August 15, 2013, position paper was not adequately justified and has not endorsed this position paper.	
3.2.4.2C	The review also questioned the potential effect on logic cabinets from high temperatures during an extreme heat event ELAP event. The Integrated Plan did not address this issue.	
3.2.4.10A	The Generic Concern related to extended battery duty cycles required clarification of the capability of the existing vented lead-acid station batteries to perform their expected function for durations greater than 8 hours throughout the expected service life of the battery. The NRC staff concluded that the position paper provides an acceptable approach for licensees to use in demonstrating that vented lead-acid batteries can be	

	credited for durations longer than 8 hours. The licensee has not yet informed the NRC of its plans to abide by this generic resolution, and its plans to address potential plant-specific issues associated with implementing this resolution that was identified during the audit process.	

4.2 CONFIRMATORY ITEMS

This section contains a summary of the Confirmatory Items identified as part of this evaluation.

Item Number	Description	Notes
3.1.1A	The seismic re-evaluation, pursuant to the 10 CFR 50.54(f) letter of March 12, 2012, has yet to be completed. It is not possible to know if a higher severity earthquake might be proposed by the licensee when the re-analysis is complete. If new insights or a higher severity earthquake are determined, then the insights from the seismic re-evaluation will need to be incorporated into the plant-specific FLEX strategies at FNP. Confirm that this is done.	
3.1.1.2A	On page 41 in the FNP Integrated Plan, the licensee discussed that cooling water flow through the containment coolers will be provided by a portable pump and heat exchanger skid from the RRC. On page 49 in the FNP Integrated Plan, the licensee discussed that the long-term phase of the FLEX cooling strategy is reliant on moving from makeup/boil-off to making use of the flow through the SFP heat exchanger that will be cooled by the portable RRC pump and heat exchanger skid. The FNP Integrated Plan did not provide a description of where the portable pump and heat exchanger skid from the RRC will be staged and how they will then be deployed. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that The licensee is still evaluating the strategy and use of RRC heat exchangers. An updated response to this question will be provided no later than the August 2014 six-month update. Confirm when this response is completed.	
3.1.1.3A	The licensee's plan for the development of mitigating strategies with respect to the procedural interfaces did not address Guideline 2 in Section 5.3.3 of NEI 12-06 for seismic hazards. This guideline is associated with large internal flooding sources that are not seismically robust and do not require ac power. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the evaluation of large internal flood sources that are not seismically robust and do not require ac power has not been completed and will be provided no later than the August 2014 six-month update. The licensee stated that at this time, no internal flood sources of this nature have been identified.	
3.1.1.4A	On page 14 in the Integrated Plan, the licensee stated that FNP	

	will utilize the industry Regional Response Centers (RRC) for Phase 3 equipment. 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. Development of FNP's playbook is identified by FNP as an open item. Development of the playbook is identified as a Confirmatory Item.	
3.1.3.2B	On page 61 and 62 of the Integrated Plan in the section listing portable equipment for Phase 2, the licensee stated that it would have two vehicles capable of towing pumps and DGs, and would have multiple flatbed trailers to transport hoses, strainers, cables, etc. The Integrated Plan does not discuss the protection of these vehicles and trailers designed to transport FLEX equipment.	
3.1.3.3A	The licensee's Integrated Plan did not provide any information with regards to procedural interface considerations as they relate to tornados and hurricanes. This is identified as a Confirmatory Item.	
3.1.4.2A	Although tables on pages 61 and 62 and pages 63 and 64 in the Integrated Plan list required Phase 2 and Phase 3 equipment, respectively, there is no equipment identified for removing or mitigating extreme ice storms. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that protection of equipment from ice and cold weather, transportation of equipment during an ice storm and removal of ice will be specified in the response procedures; this will include identification of any needed equipment. Identification of how equipment will be protected, transportation will be accomplished, and ice removed, along with an evaluation of procured ice removal equipment has been identified as a Confirmatory Item.	
3.1.5.3A	The licensee's plan and the licensee's response to the EA-12-049 Mitigation Strategies Audit did not address procedural interfaces in the context of how extreme high temperatures could affect portable FLEX equipment.	
3.2.1A	During the NRC audit process the licensee was requested to specify which analysis performed in WCAP-17601 is being applied to Farley. Additionally, the licensee was asked to justify the use of that analysis by identifying and evaluating the important parameters and assumptions demonstrating that they are representative of Farley and appropriate for simulating the ELAP transient.	
3.2.1.1A	Reliance on the NOTRUMP code for the ELAP analysis of Westinghouse plants is limited to the flow conditions prior to reflux condensation initiation. This includes specifying an acceptable definition for reflux condensation cooling.	
3.2.1.2A	In some plant designs, such as those with 1200 to 1300 pounds per square inch absolute (psia) SG design pressures and no accumulator backing of the main steam system Power-Operated Relief Valve (PORV) actuators, the cold legs could experience temperatures as high as 580 degrees F before cooldown commences. This is beyond the qualification temperature (550	

	degrees F) of the O-rings used in the RCP seals. For those Westinghouse designs, a discussion of the information (including the applicable analysis and relevant seal leakage testing data) should be provided to justify that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate of 21 gpm/seal used in the ELAP is adequate and acceptable.	
3.2.1.2C	If the seals are changed to the newly designed Generation 3 SHIELD seals, or non-Westinghouse seals, the acceptability of the use of the newly designed Generation 3 SHIELD seals, or non-Westinghouse seals should be addressed, and the RCP seal leakages rates for use in the ELAP analysis should be provided with acceptable justification.	
3.2.3A	On page 36 of its Integrated Plan regarding maintaining containment during Phase 1, the licensee stated that analysis is being performed to demonstrate that containment response following a postulated ELAP/ LUHS event does not challenge design limits until well after availability of RRC equipment and implementation of long term strategies to control pressure and temperature.	
3.2.4.2A	On page 51 in its Integrated Plan in regards to safety functions support for main control room accessibility, the licensee stated that Main Control Room (MCR) accessibility must be maintained for the duration of the ELAP. The room heat-up calculations performed for SBO conditions need to be revised to envelop the effect of a de-energizing/reenergizing sequence of control room equipment following an ELAP event.	
3.2.4.2B	A calculation is being prepared to evaluate the temperature profile of the battery and dc equipment rooms to determine if additional forced air flow for cooling is required. In addition, discuss what criteria would be used to determine if hydrogen buildup required forced ventilation and how hydrogen concentrations would be measured during an ELAP event.	
3.2.4.4A	The NRC staff has reviewed the licensee communications assessment (ML12306A334 and ML13056A138) in response to the March 12, 2012, 10 CFR 50.54(f) request for information letter for FNP and, as documented in the staff analysis (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. This has been identified as a Confirmatory Item for confirmation that upgrades to the site's communications systems have been completed.	
3.2.4.5A	The FNP Integrated Plan discusses that a Phase 1 action to open the SFP room door and the new fuel room missile door to ventilate the steam from the boiling SFP requires security and radiation protection personnel to open the door(s). The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that procedures exist and FLEX Support Guidelines will be developed to ensure that operators can access the required areas in the	

	event of the loss of power. Additional details on procedural controls for access to security controlled or internal locked areas where an ELAP event would disable normal controlled access will be available later in the design/procedure development process.	
3.2.4.8A	The FNP Integrated Plan stated that in Phase 2 it will use 600V AC onsite FLEX diesel generators, and in Phase 3 it will use a 4160V AC offsite FLEX diesel generator. The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that the loading calculations for the 600V DGs for Phase 2 and the 4160V Generators for Phase 3 have been completed and are awaiting site approval. The loads required for the FLEX strategies during the phases are included in the calculations. The final loading calculations identified as a Confirmatory Item.	
3.2.4.9A	The licensee's response to the EA-12-049 Mitigation Strategy Audit stated that there are five underground fuel oil storage tanks. The tanks are seismically qualified and are required by the Technical Specifications to store at least 21,000 gallons each in four of the five tanks. A calculation to determine the fuel requirements of the FLEX equipment is in progress.	
3.2.4.10B	In its response to the EA-12-049 Mitigation Strategy Audit question regarding hydrogen being released from the main generator if loads are shed, the licensee stated the loss of the generator seal oil pumps as a result of the event could lead to loss of hydrogen from the main generator creating a potential hazard. The power for the pumps is from a non-safety related battery located in the turbine building and it may not be possible to vent the hydrogen in a controlled manner. A procedure to address venting of the generator is being developed. Confirmation that the hydrogen can be vented in a controlled manner is needed.	
3.4A	Review of the licensee's use of off-site resources noted the Integrated Plan failed to provide any information as to how conformance with NEI 12-06, Section 12.2 Guidelines 2 through 10 will be met. This has been identified as a Confirmatory Item.	