Mega-Tech Services, LLC

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

Revision 2

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Entergy Operations, Inc.
River Bend Station Unit 1
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1.0 BACKGROUND

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

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

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

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

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

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

As described in Interim Staff Guidance (ISG), JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," the NRC staff considers that the development, implementation, and maintenance of guidance and strategies in conformance with the guidelines provided in NEI 12-06, Revision 0, subject to the clarifications in Attachment 1 of the ISG are an acceptable means of meeting the requirements of Order EA-12-049.

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

2.0 EVALUATION PROCESS

In accordance with the provisions of Contract NRC-HQ-13-C-03-0039, Task Order No. NRC-HQ-13-T-03-0001, Mega-Tech Services, LLC (MTS) performed an evaluation of each licensee's Integrated Plan. As part of the evaluation, MTS, in parallel with the NRC staff, reviewed the original Integrated Plan and the first 6-month status update, and conducted an audit of the licensee documents. The staff and MTS also reviewed the licensee's answers to the NRC staff's and MTS's questions as part of the audit process. The objective of the evaluation was to assess whether the proposed mitigation strategies conformed to the guidance in NEI 12-06, as endorsed by the positions stated in JLD-ISG-2012-01, or an acceptable alternative had been proposed that would satisfy the requirements of Order EA-12-049. The audit plan that describes the audit process was provided to all licensees in a letter dated August 28, 2013 from Jack R. Davis, Director, Mitigating Strategies Directorate (ADAMS Accession No. ML13234A503).

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

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

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

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

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

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

3.0 TECHNICAL EVALUATION

By letter dated February 28, 2013, (ADAMS Accession No. ML13066A738), and as supplemented by the first six-month status report in letter dated August 28, 2013 (ADAMS Accession No. ML13247A414), Entergy Operations, Inc. (the licensee or Entergy) provided River Bend Station Unit 1 (RBS) Integrated Plan for Compliance with Order EA-12-049. The Integrated Plan describes the strategies and guidance under development for implementation by the licensee for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the NRC staff in its review, leading to the issuance of an interim staff evaluation and audit report. The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the Order.

3.1 EVALUATION OF EXTERNAL HAZARDS

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

3.1.1 Seismic Events.

NEI 12-06, Section 5.2 states:

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

A review was made of the licensee's screening process for the seismic hazard. On page 1 of the Integrated Plan the licensee stated that seismic hazards are applicable to RBS and that the seismic design basis includes the Operating Basis Earthquake (OBE) and the Safe Shutdown Earthquake (SSE) the magnitudes of which are 0.05g and 0.10g, respectively.

On page 3 of the Integrated Plan, the licensee stated that the seismic re-evaluation pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 had not been completed and therefore was not assumed in the 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 screening for seismic hazards if these requirements are implemented as described.

3.1.1.1 Protection of FLEX Equipment – Seismic Hazard

NEI 12-06, Section 5.3.1 states:

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

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

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

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

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

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

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the seismic hazard.

On pages 10 and 22 of the Integrated Plan, the licensee stated that FLEX equipment will be stored in a structure that meets the specifications of NEI 12-06, Section 11. NEI 12-06 Section 11.3 addresses the programmatic controls for portable/FLEX equipment storage and direct the reader to NEI 12-06 Section 5 for detailed guidance for selecting storage locations and reasonable protection during the seismic hazard.

The licensee provided additional information during the audit process stating that planning for two pre-engineered metal buildings was in progress and that the buildings were being designed to the seismic criteria of NEI 12-06, Section 5.3.1.1.b, the American Society of Civil Engineers (ASCE) 7-10 and local building codes. The licensee also stated that soil borings were taken and a geotechnical report was generated to determine the appropriate foundation system and to evaluate soil liquefaction at each building site. The two buildings are to be separated by approximately 2,700 feet on a North-South axis.

On pages 19 and 20 of the Integrated Plan, the licensee stated that as part of the coping strategy to maintain core cooling one portable/FLEX pump, which is designated FLEX1, will be permanently staged but not connected, in the tunnel that is a seismic structure. That tunnel runs from the Standby Service Water (SSW) basin to the auxiliary building. This tunnel is designated the G-Tunnel. The FLEX1 pump will be permanently staged in G-Tunnel, 70 foot elevation level near the west end tunnel termination hatchway. The licensee stated that the pump would be adequately secured against seismic events.

The licensee provided additional information and discussed the tunnel design and equipment seismic protection during the audit process. The licensee stated that the G-Tunnel is a safety related Category 1 structure designed in accordance with the RBS design basis. The licensee also stated that the FLEX1 pump anchor system would be designed in accordance with the plant design basis to insure a robust installation as specified by NEI 12-06, Section 11.3.6 such that there is no seismic interaction or adverse effects between the FLEX1 pump and nearby equipment.

During the audit process the licensee discussed their design criteria for the protection of FLEX equipment in calculation ENTGRB125-PR-002. The licensee stated that FLEX equipment will be restrained and protected from interaction with non-seismically robust components and structures and that FLEX equipment will be secured from a SSE.

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

3.1.1.2 Deployment of FLEX Equipment - Seismic Hazard

NEI 12-06, Section 5.3.2 states:

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable/FLEX equipment during a seismic hazard, protection of connection points, water sources and the means and power requirements to deploy portable/FLEX equipment.

On page 1 of the Integrated Plan, the licensee stated that as discussed in Section 2.5.4.8 of the UFSAR, soil liquefaction analysis determined that adequate safety margin against liquefaction is present and therefore, soil liquefaction does not need to be considered for deployment of FLEX equipment. Specifically, liquefaction during a DBE with maximum vibratory acceleration of 0.10g had been analyzed for the yard area and several structures, including the Reactor, Radwaste and Control buildings. Results show a minimum factor of safety of 3 with respect to initial liquefaction for buried channel sands and gravels.

On page 3 of the Integrated Plan, the licensee stated that the hardened connections are protected against external events or are established at multiple and diverse locations. During the audit process the licensee stated that at least one FLEX connection point will require access through seismically robust structures. This includes both the connection point and the area that the plant operators will have to access to reach the connection point and also the area to deploy or control the strategy. The licensee also stated that connection points have been evaluated to ensure that a connection can be made by passing only through seismically rugged structures. The licensee uses the terms ‘rugged’ and ‘robust’ interchangeably in the Integrated Plan and during the audit process.

On page 9 of the Integrated Plan, the licensee stated that deployment pathways will be evaluated for applicable hazards including the liquefaction. The licensee provided a drawing depicting the on-site deployment paths for transportation of FLEX equipment. The licensee also stated on page 9 of the Integrated Plan that an administrative program will ensure pathways will be kept clear or will require actions to clear the pathways and that the pathways and deployment areas will be accessible during all modes of operation. Additionally, pathways will be evaluated for applicable hazards including the liquefaction for the non-power block areas utilized for the deployment path or storage locations.

On page 24 of the Integrated Plan, the licensee stated that 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. The licensee also stated that the connection points for the FLEX pump discharge and for FLEX electrical generator power will be designed to withstand applicable hazards.

On page 50 of the Integrated Plan, the licensee stated that two (2) trucks and trailers will be provided for the deployment and refueling of FLEX equipment. The trucks and trailers are included in the list of portable FLEX equipment stored on site for use during the transition phase. During the audit process the licensee stated that large portable equipment is secured in a manner to protect it from applicable external hazards.

The licensee also discussed the deployment of FLEX equipment during the audit process and stated that soil borings have been taken along the primary travel path from each of the two planned storage buildings to ensure that at least one pathway would not be susceptible to soil liquefaction and that a transportation vehicle and debris removal equipment would be stored in each of the two FLEX equipment storage locations.

During the audit process, the licensee stated that RBS FLEX strategies rely on water sources that are seismically robust. These include the suppression pool, the UCP and the SSW cooling tower basin.

During the audit process, the licensee stated that RBS does not require a power supply to move or deploy equipment.

During the audit process, the licensee stated that the FLEX equipment transportation equipment will be reasonably protected for the BDBEE.

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

3.1.1.3 Procedural Interfaces – Seismic Hazard

NEI 12-06, Section 5.3.3 states:

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

A review was made of procedural interface considerations for the seismic hazard. During the audit process, the licensee stated that FLEX Support Guidelines and the supporting procedures would contain references sources for operators to obtain necessary instrument readings to support implementation of the coping strategies. The reference source procedure would instruct personnel on obtaining the data using a portable instrument, critical actions that may be necessary to perform until the data is available and instructions on controlling critical equipment without control power. The licensee stated that information on these references sources would be provided during a future six-month update to the Integrated Plan.

The licensee stated that RBS is reviewing non-seismically robust piping that is connected to large flooding sources with the intention of identifying the sources and including the methods for isolating those sources in FLEX procedures. The licensee cited water sources including the Mississippi River, the Upper Containment Pool, the Condensate Storage tank and the Suppression Pool and fire suppression piping downstream of the diesel driven fire pump as potentially causing significant internal flooding. The licensee also stated that there are no non-seismic cooling basins, lakes or rivers above plant grade. The licensee stated their expectation to identify non-seismically robust piping and to include isolation measures in FLEX procedures. The licensee stated that the results of the evaluation will be included in a future six-month update.

The licensee also stated that RBS does not utilize a dewatering system to mitigate groundwater and that there are no permanent dewatering systems for the RBS site and that there are no downstream dams on the Mississippi River.

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

3.1.1.4 Considerations in Using Offsite Resources – Seismic Hazard

NEI 12-06, Section 5.3.4 states:

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

A review was made of the licensee's plans for the use of offsite resources. On page 11 of the Integrated Plan, the licensee stated that RBS will utilize the industry Regional Response Centers (RRC) for Phase 3 equipment. 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.

On page 27 of the Integrated Plan, the licensee stated that Phase 3 equipment will be provided by the Memphis, TN RRC and that equipment transported to the site will be either immediately staged at the point of use location for pumps and generators or temporarily stored at the lay down area shown on Figure 3 of the Integrated Plan until moved to the point of use area and that the deployment paths identified on Figure 3 will be used to move equipment.

During the audit process, the licensee stated that a severe seismic event can have far-reaching effects on the infrastructure in and around the RBS site. Delivery of RRC FLEX equipment may require alternative transportation such as the use of helicopters and that equipment can be airlifted to the Baton Rouge or the False River airports.

During the audit process, the licensee stated that on-site deployment routes have been identified. The licensee provided a drawing of the RBS site with those routes identified.

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

3.1.2 Flooding

NEI 12-06, Section 6.2 states:

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

NEI 12-06, Section 6.2.1 states in part:

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

A review was made of the licensee's screening process for the flood hazard.

On page 1 of the Integrated Plan, the licensee stated the design basis flood level (DBFL) at RBS is 96 feet mean sea level (MSL) which is limited by regional precipitation. The licensee also stated that the grade level at RBS is a minimum of 90 feet MSL and the average plant grade is 94.5 feet MSL. Therefore, RBS screens in for an assessment of external flooding. During the audit process the licensee stated that RBS is not limited by storm driven flooding.

During the audit process the licensee also stated that while the design basis flood may occur, RBS would have days to prepare for the flood and that the maximum flood level due to a probable maximum precipitation (PMP) event is only expected to persist for a short period of time and that there are no significant water currents associated with this type of flooding. The licensee also stated that the PMP level of flooding is expected to occur at RBS once every 4.5 E16 years or 2.22E-15 per year.

On page 3 of the Integrated Plan, the licensee stated that the flooding re-evaluation pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 had not been completed and therefore was not assumed in their Integrated Plan.

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

3.1.2.1 Protection of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.1 states:

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

A review was made of the licensee's plans for protecting portable/FLEX equipment during the flooding hazard.

On pages 10 and 22 of the Integrated Plan, the licensee stated that FLEX equipment will be stored in a structure that meets the specifications of NEI 12-06, Section 11. NEI 12-06 Section 11.3 addresses the programmatic controls for portable/FLEX equipment storage and direct the reader to NEI 12-06 Section 6 for detailed guidance for selecting storage locations and reasonable protection during the flooding hazard.

The licensee provided additional information during the audit process stating that planning for two pre-engineered metal buildings was in progress and that the buildings were being designed to the criteria of NEI 12-06, section 6.2.3.1.a, the American Society of Civil Engineers (ASCE) 7-10 and local building codes. The licensee stated that both buildings will be located above the flood elevation.

The licensee also discussed the design of the G-Tunnel during the audit process. A portable/FLEX pump, designated FLEX1, will be permanently staged in the G-Tunnel. The licensee stated that the G-Tunnel is protected from external flooding by sealing the shake-space between the tunnel and the adjoining structures using water stops and flexible seals and providing all below grade penetrations with air and water seals.

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

3.1.2.2 Deployment of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.2 states:

> There are a number of considerations which apply to the deployment of FLEX equipment for external flood hazards:
>
> 1. For external floods with warning time, the plant may not be at power. In fact, the plant may have been shut down for a considerable time and the plant configuration could be established to optimize FLEX deployment. For example, the portable pump could be connected, tested, and readied for use prior to the arrival of the critical flood level. Further, protective actions can be taken to reduce the potential for flooding impacts, including cooldown, borating the RCS, isolating accumulators, isolating RCP seal leak off, obtaining dewatering pumps, creating temporary flood barriers, etc. These factors can be credited in considering how the baseline capability is deployed.
>
> 2. The ability to move equipment and restock supplies may be hampered during a flood, especially a flood with long persistence. Accommodations along these lines may be necessary to support successful long-term FLEX deployment.
>
> 3. Depending on plant layout, the ultimate heat sink may be one of the first functions affected by a flooding condition. Consequently, the deployment of the FLEX equipment should address the effects of LUHS, as well as ELAP.
>
> 4. Portable pumps and power supplies will require fuel that would normally be obtained from fuel oil storage tanks that could be inundated by the flood or above ground tanks that could be damaged by the flood. Steps should be considered to protect or provide alternate sources of fuel oil for flood conditions. Potential flooding impacts on access and egress should also be considered.
>
> 5. Connection points for portable equipment should be reviewed to ensure that they remain viable for the flooded condition.
>
> 6. For plants that are limited by storm-driven flooding, such as Probable Maximum Surge or Probable Maximum Hurricane (PMH), expected storm

conditions should be considered in evaluating the adequacy of the baseline deployment strategies.

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

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

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable/FLEX equipment during the flood hazard. On page 9 of the Integrated Plan, the licensee stated that deployment pathways will be evaluated for applicable hazards. The licensee provided a drawing depicting the on-site deployment paths for transportation of FLEX equipment. The licensee also stated on page 9 of the Integrated Plan that an administrative program will ensure pathways will be kept clear or will require actions to clear the pathways and that the pathways and deployment areas will be accessible during all modes of operation.

On page 21 of the Integrated Plan, the licensee discussed the deployment of a FLEX pump, which is referred to as FLEX2, to the SSW basin and the complications to the FLEX equipment deployment during the flood hazard. The licensee also discussed the deployment of the FLEX electrical generator used to power the FLEX1 pump during the flood hazard.

The licensee provided additional information on the deployment strategy of the FLEX2 pump and the FLEX1 pump electrical generator during the audit process. The licensee revised the original strategy and changed the FLEX2 pump from an electric motor driven pump with an accompanying electrical generator to a diesel engine driven pump. The deployment location of the pump is at an elevation of 94.5 ft. MSL. The maximum flood elevation caused by the PMP flooding event is 96 ft. MSL. The licensee stated that the FLEX2 pump is to be mounted on a trailer and will be above the flood level in the deployed location.

The licensee also provided additional information on the deployment of the FLEX electrical generator that will power the FLEX1 pump during the audit process. The licensee stated that the primary deployment location for the FLEX1 pump diesel generator is near the northwest corner of the Fuel Building. The grade level elevation at this location is also 94.5 ft. MSL. The licensee identified an alternate location where the pump may be deployed during a flood hazard west of the Auxiliary Building at a grade level of 96.5 ft. MSL. The licensee also stated that corporate personnel safety procedures would govern protective equipment to ensure personnel safety when making electrical connections. The licensee discussed the timing of the PMP event and stated that it is slowly evolving allowing time to pre-stage the FLEX equipment if deemed necessary. The licensee also stated that the maximum flood level due to a PMP is expected to persist for a short time.

During the audit process, the licensee stated that fuel oil would be transported to the deployed engine driven portable FLEX equipment using a trailer mounted tank towed by a super duty pickup truck. The licensee stated that the fuel haul path traverses the same area as the FLEX equipment haul path and that flooding concerns are addressed in the haul path feasibility evaluation.

During the audit process, the licensee stated that RBS will deploy FLEX equipment prior to the flood reaching the design basis flooding level and will take necessary steps to ensure FLEX equipment is able to perform its intended function and that no credit is taken for the plant shutting down prior to the flooding event.

During the audit process, the licensee stated that RBs will acquire vehicles and equipment with enough ground clearance to ensure that they can operate in 1.5 feet of water.

During the audit process, the licensee stated that the coping strategies consider the LUHS as well as an ELAP due to the flood hazard.

During the audit process, the licensee stated that fuel obtained from the below grade fuel oil storage tanks that are protected from the flood hazard.

During the audit process, the licensee stated that FLEX connection points will be higher than the design basis flood level of 96 feet referencing MSL.

During the audit process, the licensee stated that concerning the probable maximum surge or the probable maximum hurricane flood events that RBS is not limited by storm driven flooding.

During the audit process, the licensee stated that RBS does not have installed dewatering equipment and that structures required for deployment of equipment for FLEX strategies are protected from the design basis flood event.

During the audit process, the licensee stated that RBS will not rely on temporary flood barriers.

During the audit process, the licensee stated that FLEX equipment needed to move FLEX equipment will be sized and stored so that it is reasonable protected from the flood event.

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

3.1.2.3 Procedural Interfaces – Flooding Hazard

NEI 12-06, Section 6.2.3.3 states:

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

3. FLEX guidance should describe the deployment of temporary flood barriers and extraction pumps necessary to support FLEX deployment.

A review was made of the licensee's plans for the development of the mitigating strategies during a flood hazard. On page 21 of the Integrated Plan, the licensee discussed the deployment of portable/FLEX pumps and generators. During the audit process, the licensee stated that the FLEX2 pump deployed to the SSW cooling tower basin will now be a diesel driven pump. The licensee also stated that an alternate deployment location for the FLEX electrical generator associated with providing power to the FLEX1 pump had been designated. The primary deployment location for the FLEX1 pump diesel generator is near the northwest corner of the Fuel Building. The grade level elevation at this location is also 94.5 ft. MSL. The licensee identified an alternate location where the pump may be deployed during a flood hazard west of the Auxiliary Building at a grade level of 96.5 ft. MSL. The maximum flood elevation caused by the PMP flooding event is 96 ft. MSL.

During the audit process, the licensee stated that procedures will be written to support the deployment of FLEX equipment during the design basis flood.

During the audit process, the licensee stated that FLEX connection points will be above the design basis flood level or will be protected from external flooding.

During the audit process, the licensee stated temporary flood barriers and extraction pumps and not necessary to support FLEX equipment deployment.

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 procedural interfaces coping with the flooding hazard if these requirements are implemented as described.

3.1.2.4 Considerations in Using Offsite Resources – Flooding Hazard

NEI 12-06, Section 6.2.3.4 states:

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

A review was made of the licensee's plans for use of offsite resources from the RRC during the flood hazard.

On page 11 of the Integrated Plan, the licensee stated that RBS will utilize the industry Regional Response Centers (RRC) for Phase 3 equipment. 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.

On page 27 of the Integrated Plan, the licensee stated that Phase 3 equipment will be provided by the Memphis, TN RRC and that equipment transported to the site will be either immediately staged at the point of use location for pumps and generators or temporarily stored at the lay down area shown on Figure 3 of the Integrated Plan until moved to the point of use area and that the deployment paths identified on Figure 3 will be used to move equipment.

The licensee discussed the flooding hazard during the audit process and stated that the deployment locations for transition phase equipment was 94.5 ft. MSL and 96.5 ft. MSL. The maximum flood elevation caused by the PMP flooding event which is expected to be slowly evolving and to persist for a short time is 96 ft. MSL. The licensee has not yet discussed the access routes to the site.

During the audit process, the licensee stated that delivery of RRC FLEX equipment may require alternative transportation such as the use of helicopters and that equipment can be airlifted to the Baton Rouge or the False River airports.

During the audit process, the licensee stated that on-site deployment routes have been identified. The licensee provided a drawing of the RBS site with those routes identified.

During the audit process, the licensee stated that there are significant areas of the RBS site that are above the design basis flood level, that the flood level is 1.5 foot above plant grade and that one of the two staging areas is significantly higher than the design basis flood level.

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

3.1.3 High Winds

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

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

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

On page 2 of the Integrated Plan, the licensee stated that hurricane and tornado hazards are applicable to RBS.

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

3.1.3.1 Protection of FLEX Equipment - High Winds Hazard

NEI 12-06, Section 7.3.1 states:

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

that are adequately tied down to foundations or slabs to prevent protected equipment from being damaged or becoming airborne. (During a tornado, high winds may blow away metal siding and metal deck roof, subjecting the equipment to high wind forces.)

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

- Consistent with configuration b., the axis of separation should consider the predominant path of tornados in the geographical location.
- Consistent with configuration b., stored mitigation equipment should be adequately tied down.

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the severe storm with high winds hazard. On pages 10 and 22 of the Integrated Plan, the licensee stated that FLEX equipment will be stored in a structure that meets the specifications of NEI 12-06, Section 11. NEI 12-06 Section 11.3 addresses the programmatic controls for portable/FLEX equipment storage and directs the reader to NEI 12-06 Section 7 for detailed guidance for selecting storage locations and reasonable protection during the severe storms with high wind hazard.

The licensee provided additional information during the audit process stating that planning for two pre-engineered metal buildings was in progress and that the buildings were being designed to the criteria of NEI 12-06, section 7.3.1.1.c, ASCE 7-10 and local building codes. The licensee stated that the two buildings are to be separated by approximately 2,700 feet on a North-South axis and satisfy the intent of NEI Frequently Asked Question (FAQ) 2013-01 that specifies a minimum separation of 1,200 feet. However, the NRC has not endorsed FAQ 2013-01 as an acceptable method to use for compliance with the requirements of Order EA-12-049.

The site drawing provided by the licensee during the audit process depicted the two proposed storage locations diametrically opposite each other on the facility perimeter. The large spatial separation makes it unlikely that a single tornado will damage both storage locations so severely that both sets of portable FLEX equipment would not be available for use. Confirmation that the separation will be sufficient is dependent on the local tornado data and the actual separation distance and axis is identified as Confirmatory Item 3.1.3.1.A in Section 4.2.

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

3.1.3.2 Deployment of FLEX Equipment – High Wind Hazard

NEI 12-06, Section 7.3.2 states:

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

1. For hurricane plants, the plant may not be at power prior to the simultaneous ELAP and LUHS condition. In fact, the plant may have been shut down and the plant configuration could be established to optimize FLEX deployment. For example, the portable pumps could be connected, tested, and readied for use prior to the arrival of the hurricane. Further, protective actions can be taken to reduce the potential for wind impacts. These factors can be credited in considering how the baseline capability is deployed.

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

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

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

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during a severe storm with high wind hazard. On page 9 of the Integrated Plan, the licensee stated that deployment pathways will be evaluated for applicable hazards. The licensee provided a drawing depicting the on-site deployment paths for transportation of FLEX equipment. The licensee also stated on page 9 of the Integrated Plan that an administrative program will ensure pathways will be kept clear or will require actions to clear the pathways and that the pathways and deployment areas will be accessible during all modes of operation.

During the audit process the licensee stated that RBS is planning to have two pre-engineered metal buildings that are separated by approximately 2,700 feet on a North-South axis. The licensee also stated that a transport vehicle will be stored in each location along with heavy equipment with multiple attachments for debris removal. The licensee stated that debris removal analysis has been performed to ensure that FLEX equipment can be deployed in a timeframe that compliments the overall FLEX strategy.

During the audit process, the licensee stated that FLEX equipment will remain deployable for the high wind hazards such as a tornado or hurricane.

During the audit process, the licensee stated that the UHS, the SSW cooling tower basin is seismic Category I and is protected against flood, high wind and missiles.

During the audit process, the licensee stated that there will be sufficient FLEX equipment in each of the two storage locations to supply the required FLEX equipment for both the initial and transition phases.

Suring the audit process, the licensee stated that the regional impacts of hurricanes and tornados can impact the ability to receive offsite FLEX equipment. In the case of a hurricane the RBS site could be accessed from land or by helicopter.

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

3.1.3.3 Procedural Interfaces – High Wind Hazard

NEI 12-06, Section 7.3.3, states:

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

A review was made of the licensee's plans for the development of procedures and programs regarding the deployment of portable equipment during severe storms with high wind hazard. On page 9 of the Integrated Plan, the licensee stated that the RBS deployment strategy will be included within an administrative program procedures would 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 RBS.

The licensee has not addressed the interface between station procedures for hurricane and severe storm preparations and the FLEX implementation procedures. Although the licensee has not specifically addressed hurricane procedures, the licensee has committed to incorporating NEI 12-06 deployment considerations into the RBS procedures and there are no unresolved issues concerning procedural interface.

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

3.1.3.4 Considerations in Using Offsite Resources – High Wind Hazard

NEI 12-06, Section 7.3.4 states:

> Extreme storms with high winds can have regional impacts that could have a significant impact on the transportation of off-site resources.
>
> 1. Sites should review site access routes to determine the best means to obtain resources from off-site following a hurricane.

2. Sites impacted by storms with high winds should consider where equipment delivered from off-site could be staged for use on-site.

A review was made of the licensee's plans for the use of offsite resources during the severe storm with high wind hazard. On page 11 of the Integrated Plan, the licensee stated that RBS will utilize the industry Regional Response Centers (RRC) for Phase 3 equipment. 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.

On page 27 of the Integrated Plan, the licensee stated that Phase 3 equipment will be provided by the Memphis, TN RRC and that equipment transported to the site will be either immediately staged at the point of use location for pumps and generators or temporarily stored at the lay down area shown on Figure 3 of the Integrated Plan until moved to the point of use area and that the deployment paths identified on Figure 3 will be used to move equipment.

During the audit process, the licensee stated that delivery of RRC FLEX equipment may require alternative transportation such as the use of helicopters and that equipment can be airlifted to the Baton Rouge or the False River airports.

During the audit process, the licensee stated that on-site deployment routes have been identified. The licensee provided a drawing of the RBS site with those routes identified.

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 use of offsite resources during a severe storm with high winds hazard if these requirements are implemented as described.

3.1.4 Snow, Ice and Extreme Cold

As discussed in NEI 12-06, Section 8.2.1:

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

A review was made of the licensee's screening process for snow, ice, and extreme cold hazard.

On pages 1 and 2 Integrated Plan, the licensee stated that RBS is located at 30'45'26" N latitude and 91'19'54" W and therefore the capability to address hindrances caused by extreme snowfall with snow removal equipment need not be provided.

The licensee also stated that RBS is located within the region characterized by EPRI and NEI 12-06, Figure 8-2, as severity level 3 for ice. As such, RBS site is subject to the existence of considerable amounts of ice that could cause low to medium damage to electrical transmission lines. Therefore RBS screens in for an assessment for the snow, ice and extreme cold hazard for ice only.

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

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

NEI 12-06, Section 8.3.1 states:

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

A review was made of the licensee's plans for the storage and protection of portable equipment from an ice hazard. On pages 10 and 22 of the Integrated Plan, the licensee stated that FLEX equipment will be stored in a structure that meets the specifications of NEI 12-06, Section 11. NEI 12-06 Section 11.3 addresses the programmatic controls for portable/FLEX equipment storage and directs the reader to NEI 12-06 Section 8 for detailed guidance for selecting storage locations and reasonable protection during the ice hazard.

During the audit process, the licensee stated that equipment stored in the FLEX storage building will not be affected by exposure to ice.

The licensee provided additional information during the audit process stating that planning for two pre-engineered metal buildings was in progress and that the buildings were being designed to the criteria of NEI 12-06, section 8.3.1.1.b, ASCE 7-10 and local building codes for snow and ice. The licensee stated that the site's design basis temperature has been used for the extreme cold value. The licensee also stated that local block heaters, water jackets, etc. have been provided for equipment such that the entire storage building will not be required to be heated.

During the audit process the licensee stated that RBS would consider the temperatures in the area where equipment would be stored and operated and will procure FLEX equipment accordingly.

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

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

NEI 12-06, Section 8.3.2 states:

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during an ice hazard. On page 9 of the Integrated Plan, the licensee stated that deployment pathways will be evaluated for applicable hazards. The licensee provided a drawing depicting the on-site deployment paths for transportation of FLEX equipment. The licensee also stated on page 9 of the Integrated Plan that an administrative program will ensure pathways will be kept clear or will require actions to clear the pathways and that the pathways and deployment areas will be accessible during all modes of operation.

During the audit process, the licensee stated that FLEX equipment will remain deployable during the ice hazard with the use of vehicles capable of traversing ice.

During the audit process the licensee stated that procedures will address the effects of both high and low temperature extremes on FLEX equipment. The licensee stated that RBS would consider the temperatures in the area where equipment would be stored and operated and will procure FLEX equipment accordingly.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable

assurance that the requirements of Order EA-12-049 will be met with respect to deployment of portable equipment during a snow, ice and extreme cold hazard if these requirements are implemented as described.

3.1.4.3 Procedural Interfaces – Snow, Ice and Extreme Cold Hazard

NEI 12-06, Section 8.3.3, states:

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

A review was made of the licensee's plans for procedural enhancements that address the effects of snow and ice on transportation equipment. On page 9 of the Integrated Plan, the licensee stated that the RBS deployment strategy will be included within an administrative program and that 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 RBS.

On page 10 of the Integrated Plan, the licensee stated RBS will develop procedures and programs to address storage structure requirements and deployment/haul path requirements relative to the hazards applicable to RBS and that RBS will follow the current programmatic control structure for existing processes such as design and procedure configuration.

Although the licensee has not specifically addressed procedures for coping with the ice hazard, the licensee has committed to incorporating NEI 12-06 deployment considerations into the RBS procedures.

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

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

NEI 12-06, Section 8.3.4, states:

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

A review was made of the licensee's plans for the use of offsite resources during the snow, ice and extreme cold hazard. On page 11 of the Integrated Plan, the licensee stated that RBS will utilize the industry Regional Response Centers (RRC) for Phase 3 equipment. 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.

On page 27 of the Integrated Plan, the licensee stated that Phase 3 equipment will be provided by the Memphis, TN RRC and that equipment transported to the site will be either immediately staged at the point of use location for pumps and generators or temporarily stored at the lay down area shown on Figure 3 of the Integrated Plan until moved to the point of use area and that the deployment paths identified on Figure 3 will be used to move equipment.

During the audit process, the licensee stated that delivery of RRC FLEX equipment may require alternative transportation such as the use of helicopters and that equipment can be airlifted to the Baton Rouge or the False River airports.

During the audit process, the licensee stated that on-site deployment routes have been identified. The licensee provided a drawing of the RBS site with those routes identified.

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

3.1.5 High Temperatures

NEI 12-06, Section 9 states:

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

A review was made of the licensee's screening process for the high temperature hazard. On page 2 of the Integrated Plan, the licensee stated that in accordance with NEI 12-06, Section 9.2, all sites will address high temperatures. The licensee also stated that the climate of RBS can be described as humid subtropical, the Summer daily maximum temperatures average about 91 degrees Fahrenheit, with rare periods of extremely hot temperatures over 100 degrees Fahrenheit. The licensee also stated that an extreme high temperature of 110 degrees Fahrenheit was recorded in August 1909 at the old weather station located in the south end of the Baton Rouge business district. Thus the River Bend 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 for the high temperature hazard if these requirements are implemented as described.

3.1.5.1 Protection of FLEX Equipment – High Temperature Hazard

NEI 12-06, Section 9.3.1, states:

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

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the high temperature hazard. On pages 10 and 22 of the Integrated Plan, the licensee stated that FLEX equipment will be stored in a structure that meets the specifications of NEI 12-06, Section 11. NEI 12-06 Section 11.3 addresses the programmatic controls for portable/FLEX equipment storage and directs the reader to NEI 12-06 Section 9 for detailed guidance for selecting storage locations and reasonable protection during the high temperature hazard.

The licensee provided additional information during the audit process stating that the storage buildings have been designed to maintain the inside temperature within the FLEX equipment manufacturers' recommended storage temperatures to satisfy NEI 12-06, Section 9.3.1.

During the audit process the licensee stated that RBS would consider the temperatures in the area where equipment would be stored and operated and will procure FLEX equipment accordingly.

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

3.1.5.2 Deployment of FLEX Equipment – High Temperature Hazard

NEI 12-06, Section 9.3.2 states:

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

A review was made of the licensee's plans for deployment of FLEX equipment during a high temperature hazard. On page 3 of the Integrated Plan, the licensee stated that FLEX components will be designed to be capable of performing in response to "screened in" hazards and that FLEX components will be procured commercially.

On page 9 of the Integrated Plan, the licensee stated that deployment pathways will be evaluated for applicable hazards.

During the audit process the licensee stated that procedures will address the effects of both high and low temperature extremes on FLEX equipment and that procedures will meet the specifications of NEI 12-06, Section 9.3.2. The licensee stated that RBS would consider the temperatures in the area where equipment would be stored and operated and will procure FLEX equipment accordingly. The licensee also stated that RBS will have procedures in place to control the protection and operation of FLEX equipment and that heat and exhaust dissipated from the FLEX equipment during operation will be accounted for in the location where FLEX equipment will be operated and that the equipment procurement specifications will specify the extreme conditions. The licensee stated that the information concerning the effects of heat and exhaust dissipation would be included in a future six-month update report.

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

3.1.5.3 Procedural Interfaces – High Temperature Hazard

NEI 12-06, Section 9.3.3 states:

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

A review was made of the licensee's plans for procedural enhancements that address the effects of a high temperature hazard on portable/FLEX equipment. On page 3 of the Integrated Plan, the licensee stated that FLEX components will be designed to be capable of performing in response to "screened in" hazards and that FLEX components will be procured commercially.

During the audit process the licensee stated that procedures will address the effects of both high and low temperature extremes on FLEX equipment and that procedures will meet the specifications of NEI 12-06, Section 9.3.3. The licensee also stated that RBS will have procedures in place to control the protection and operation of FLEX equipment and that heat and exhaust dissipated from the FLEX equipment during operation will be accounted for in the location where FLEX equipment will be operated.

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

3.2 PHASED APPROACH

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

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

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

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

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

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

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

3.2.1.1. Computer Code Used for ELAP Analysis.

NEI 12-06, Section 1.3 states in part:

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

The licensee provided a Sequence of Events (SOE) Timeline on pages 53 and 54 of their Integrated Plan, which included the time constraints and the technical basis for the site. The time constraints, which were identified in the SOE Timeline, were discussed on pages 5 through 8 of the Integrated Plan. During the audit process the licensee stated that they have elected to perform a new containment and Reactor Coolant System (RCS) analysis utilizing the Modular Accident Analysis Program (MAAP) computer code. The licensee stated that for that new MAAP analysis they will utilize the appropriate assumptions from GE-Hitachi Nuclear Energy (GEH) report NEDO-33771/NEDC-33771P, “GEH Evaluation of the FLEX Implementation Guidelines,” Revision 1 (ADAMS Accession No. ML130370742).

MAAP4 was written to simulate the response of both current and advanced light water reactors to loss of coolant accident (LOCA) and non-LOCA transients for probabilistic risk analyses as well as severe accident sequences. The code has been used to evaluate a wide range of severe accident phenomena, such as hydrogen generation and combustion, steam formation, and containment heating and pressurization.

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

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

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

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

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

    a. Nodalization
    b. General two-phase flow modeling
    c. Modeling of heat transfer and losses

d. Choked flow
e. Vent line pressure losses
f. Decay heat (fission products / actinides / etc.)
This has been identified as Confirmatory Item 3.2.1.1.D in Section 4.2, below.

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

During the audit process, the licensee stated that the MAAP code was not originally used by RBS to develop the containment and RCS response analysis presented in the Integrated Plan. The core cooling and containment integrity evaluations were performed using the GOTHIC computer code. The licensee stated that RBS has elected to perform new containment and RCS analysis using the MAAP4 computer code and that in developing the new MAAP4 analysis, RBS will abide by the limitations stated in the NRC endorsement letter to NEI dated October 3, 2013. The licensee stated that the development of the new MAAP4 analysis and the assessment of its results for potential impacts on the FLEX strategies presented in the Integrated Plan will be available on the ePortal by a future six-month update.

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

3.2.1.2 Recirculation Pump Seal Leakage Models

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

A review was made of the RBS Integrated Plan to verify that the recirculation pump seal leakage models specified by NEI 12-06, Section 3.2.1.5 had been adopted by the licensee in their analysis.

The licensee had not discussed their assumptions for recirculation system and recirculation pump seal leakage in the Integrated Plan. During the audit process, the licensee stated RBS calculation G13.18.12.4-039, "Containment Conditions for Extended Loss of AC Power," assumes a leak rate of 66 gpm at normal operating pressure for the cases that consider RCS leakage. This is the same leak rate for the BWR/6, Mark III analysis of NEDC-33771P, Section 4.5.1.5 Assumption 8. The licensee stated that the RBS SBO licensing basis of the RBS UFSAR, Appendix 15C, is RCS pump seal leakage of 18 gpm per pump. The RBS Operating License Technical Specification 3.4.5 limits RCS operation leakage to 30 gpm. Therefore the assumed total leakage in ELAP calculations is 66 gpm.

As indicated above, the licensee states that recirculation pump seal leakage is included in the ELAP analysis of containment cooling, but the details of the seal qualification tests, the seal leakage rate models and supporting test data and any conservative margin are not described within the Integrated Plan or supplied with it. This has been identified as Confirmatory Item 3.2.1.2.A 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 recirculation pump seal leakage models and reactor coolant inventory loss in the ELAP analysis if these requirements are implemented as described.

3.2.1.3 Sequence of Events

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

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

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

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

A review was made of the sequence of events and the discussion of time constraints identified in the sequence of events. The sequence of events, Attachment 1A, Sequence of Events Timeline, was included on pages 53 and 54 by the licensee in the Integrated Plan. Additionally the time constraints identified in the sequence of events timeline are discussed on pages 5 through 8 and the coping strategies for maintaining core cooling during the initial, transition and final phases are discussed on pages 12 through 17, 19 through 22, and pages 25 and 26 of the Integrated Plan.

The licensee referenced NEDC-33771P on pages 4, 7, 13 and 28 when discussing initiatives undertaken by the Boiling Water Reactors Owners Group (BWROG) for issues such as analysis of suppression pool temperature.

During the audit process the licensee clarified that NEDC-33771P or MAAP had not been used directly to develop the coping strategies discussed in the Integrated Plan. The licensee stated that the GOTHIC computer code had been used for that purpose. The licensee also stated that the coping strategies would be evaluated using MAAP.

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

Steam will be drawn off through the main steam safety relief valves (SRVs), which discharge into the suppression pool. The SRVs will be manually controlled from the main control room (MCR). Reactor pressure control is accomplished by operating the main steam SRVs. In addition to main steam pressure, the SRVs require dc power and a pneumatic supply to operate. The steam turbine driven RCIC pump also exhausts into the suppression pool. In addition to the turbine steam supply, RCIC operation is dependent on direct current (dc) electric power for control, instrument and motor operated valve power.

On pages 5, 12 and 53 of the Integrated Plan, the licensee stated that at one (1) hour event time, MCR operators will reduce RPV pressure by manually opening the SRVs and will maintain RPV pressure in a range between 100 and 200 psig. The RPV will be depressurized to within this pressure range at approximately three (3) to four (4) hours event time.

On pages 12 and 53 of the Integrated Plan, the licensee stated that the RCIC pump suction path is normally aligned to the CST and that their analysis assumes that the suction path would automatically transfer to the suppression pool within 60 seconds event time based on low water level sensed in CST by level transmitters located on safety related piping. The licensee also stated that the instrument control power and suction valves are dc powered.

On page 13 of the Integrated Plan, the licensee stated that the analysis assumes that the CST is not available because it does not meet the NEI 12-06 requirements for seismic, wind and missile hazards.

The licensee also discussed the RCIC suction path transfer during the audit process adding that the level instruments are located in the F Tunnel and the valves are located in the Auxiliary Building which are Seismic Class 1 structures that are qualified for all of the BDBEE hazards including tornado high winds, flooding and missiles. The CST level instrumentation and the suction path valves are powered from the 1E UPS. The suction path switchover is automatic and is credited by the current licensing basis.

On page 54 of the Integrated Plan, the licensee stated that at five (5) hours event time the RCIC suction path would be re-aligned from the suppression pool to the UCP. This was discussed on pages 13 through 16 and pages 19 through 21 of the Integrated Plan. The licensee also discussed a plant modification to install a manual locally operated gate valve located in the E Tunnel that would cross-tie the Spent Fuel Pool Cooling lines from the UCP with the combined suction line for the RCIC and the High Pressure Core Spray (HPCS) pumps. This cross-tie would be opened before the suppression pool temperature reached 185 degrees Fahrenheit and would provide over 400,000 gallons of water at approximately 90 to 100 degrees Fahrenheit to the RCIC suction. The licensee stated that this water volume is sufficient for greater than 60 hours of RCIC operation. Information provided during the audit process categorizes the UCP structure as Category 1 Seismic.

The licensee discussed re-alignment of the RCIC suction to the UCP during the audit process and stated that since the RCIC suction path is transferred to the UCP before eight (8) hours event time, the RCIC pump will not experience suction temperature above 185 degrees Fahrenheit.

On pages 6, 19, 20 and 54 of the Integrated Plan, the licensee stated that at six (6) hours event time operators would start the alignment of the SSW FLEX pumps, FLEX1 and FLEX2, and one of the two Suppression Pool Cooling (SPC) pumps... Suppression pool cooling is accomplished by recirculation of the suppression pool water by either of the SPC pumps through the SPC heat exchanger. The SPC heat exchanger is cooled by recirculation of SSW water by either FLEX1 or FLEX2 from the cooling tower basin through the SPC heat exchanger and back to the basin through the cooling tower. The system would be aligned and in operation within eight (8) hours event time.

The licensee clarified changes to this strategy during the audit process. The FLEX2 pump that is to be deployed to the SSW basin is to be a diesel driven pump and will not require a generator for operation.

The licensee also stated that the two installed SPC pumps are the primary and alternate means of RPV makeup and containment heat removal during the transition phase. The pumps are powered by a portable/FLEX electrical generator that can be deployed to either of two locations. The licensee stated that the pumps are installed in a structure that is robust with respect to seismic, flood and high wind hazards. The SPC components are either seismically robust or are being evaluated to demonstrate their seismic robustness. This is discussed in Section 3.1.1.1, above.

On pages 28 and 31 of the Integrated Plan, the licensee stated that with the SPC in service at eight (8) hours, suppression pool temperature will peak at 210 degrees Fahrenheit event time and will be reduced to 170 degrees Fahrenheit when the UCP is empty at approximately 60 to 65 hours event time. The suppression pool level will reach approximately 98 feet once the UCP is depleted of water. Water is recirculated by the SPC pumps and is cooled in the SPC heat exchangers by water recirculated through the FLEX pumps from the SSW cooling tower basin. The SSW water is cooled as it flows through the cooling tower. Information provided during the audit process categorizes the UCP and the SSW cooling tower basin as Category 1 Seismic.

On pages 6, 16, 19 and 20 of the Integrated Plan, the licensee discussed deployment of the two 200 kW, 480 Vac FLEX electrical generators to power the FLEX1 pump and either of the two

SPC pumps. During the audit process the licensee stated a 500 kW, 480 Vac, FLEX generator is proposed to power FLEX1 pump and SPC Pump 1A or 1B.

On pages 7, 21 and 54 of the Integrated Plan, the licensee stated that at approximately 60 hours event time when the UCP is depleted and RCIC is no longer available, the RPV will be depressurized by opening five (5) SRVs and the SPC system will be aligned to feed the RPV. Water recirculated through the RPV by the SPC pumps is cooled in the SPC heat exchangers by water recirculated through the SSW system by the FLEX pumps. The SSW water is cooled as it flows through the cooling tower.

On pages 5 through 7 and 53 and 54 of the Integrated Plan, the licensee discussed the strategy for maintaining power to the dc distribution system in order to maintain control power to RCIC and dc power to instrumentation and other critical electrical loads. The licensee stated that a deep load shed would be initiated at a one (1) hour event time and that operators could complete this task in approximately 15 minutes. The licensee stated that the Division I and II dc buses would be cross-tied at approximately six (6) hours event time and that this action needed to be taken before the Division I battery was depleted at approximately 7.9 hours event time. The licensee also stated that at eight (8) hours event time, a 480 Vac, 200 kW FLEX generator would be deployed and connected to power the Division I battery charger and that this action needed to be taken before battery depletion at approximately 12 hours event time. The licensee provided additional information including the calculation basis for the battery lifetime and generator sizing during the audit process.

On pages 7 and 54 of the Integrated Plan, the licensee stated that eight (8) hours event time plant operators would connect air cylinders for a backup pneumatic supply for the SRVs.

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

3.2.1.4 Systems and Components for Consequence Mitigation

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

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

And,

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

NEI 12-06, Section 3.2.1.12 states:

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

A review was made of the mitigation strategies discussed in the Integrated Plan. The licensee discussed the coping strategy for maintaining core cooling on pages 12 through 26 of the Integrated Plan and also provided additional information during the audit process. The RCIC pump provides water for core cooling during the initial and transition phases of the ELAP. The RCIC pump can take suction from either the CST or from the suppression pool. If the CST is unavailable due to low water level or because of tank failure, suction will be transferred to the suppression pool. In responding to a Mitigation Strategies Audit question, the licensee provided additional information concerning the CST to suppression pool switchover logic, instrumentation and motor operated valves.

At approximately five (5) hours event time, the RCIC suction path will be transferred from the suppression pool to the UCP. This action is expected to be taken before the suppression pool water temperature exceeds 185 degrees Fahrenheit. The temperature of the 400,000 gallons of water in the UCP is approximately 90 to 100 degrees Fahrenheit. Injection of UCP water is expected to be effective until UCP depletion, which will occur at approximately 64 hours event time.

On pages 41 and 43 of the Integrated Plan, the licensee stated that the RCIC Gland Seal Compressor will be deenergized to conserve station battery capacity. The licensee discussed the potential for RCIC Room flooding due to RCIC operation without the gland seal compressor. The licensee performed a calculation which conservatively determined that the approximate flooding level due to the inoperable Gland Seal Compressor would be approximately 5.5”. Furthermore, the licensee concluded that there were no essential components at this height which would be affected by the water.

The suppression pool will be cooled by connecting a portable FLEX electrical generator to either of the two SPC pump and recirculating the suppression pool water through the SPC heat exchanger. The SPC heat exchanger will be cooled by recirculating SSW water from the SSW cooling tower basin through the heat exchanger with either of two FLEX pumps, FLEX1 or FLEX2. The FLEX1 pump is to be permanently located in the G-Tunnel. The FLEX1 pump is motor driven; the motor will be powered by a portable FLEX generator. The FLEX2 diesel driven pump will be deployed to the SSW basin.

On page 19 of the Integrated Plan, the licensee discussed the design of the Suppression Pool Cleanup and Cooling and Alternate Decay Heat Removal System (SPC) system. The licensee plans to use a portion of the SPC system, the majority of which is not safety related, to support coping strategies to maintain core and containment cooling. The RBS UFSAR, Section 9.8.3.1, states that SPC piping and components located in the Auxiliary Building are seismically qualified and supported. The 10 CFR 50.59 Safety Evaluation for the installation of the SPC System, LAR-1996-0052, states that the Class 4 piping in the Auxiliary Building is seismically qualified and that the piping in the E-Tunnel, which is also a seismic structure, meets or exceeds Seismic I/II requirements.

The licensee provided additional information concerning the design of the SPC system during the audit process stating that the SPC system components credited for use in FLEX strategies are located in Seismic Category I structures that provide protection from BDBEEs. The piping, pumps and the heat exchanger associated with the SPC system are located in a Seismic Category I piping tunnel. The licensee stated that although SPC system components are designed to robust requirements, some of the FLEX-credited components require additional evaluation to demonstrate that the SPC components are seismically robust in accordance with NEI 12-06.

During the audit process, the licensee stated that an electrical cabinet that is used for a battery electrical bus crosstie is being evaluated to confirm that it is seismically robust. The licensee stated that their evaluation, which is in progress, would be based on the current RBS design basis earthquake.

During the audit process, the licensee stated that the non-safety related Spent Fuel Pool Cooling piping that is located in the containment and is part of the RCIC pump suction path from the Upper Containment Pool (UCP) is being evaluated to confirm that it is seismically robust.

NEI 12-06 Section 3.2.1.3 initial conditions 6 and 7 state:

> Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, and high winds, and associated missiles, are available.
>
> Other equipment, such as portable ac power sources, portable back up dc power supplies, spare batteries, and equipment for 50.54(hh)(2), may be used provided it is reasonably protected from the applicable external hazards per Sections 5 through 9 and Section 11.3 of this guidance and has predetermined hookup strategies with appropriate procedures/guidance and the equipment is stored in a relative close vicinity of the site.

NEI 12-06 Appendix A defines Robust as:

> …the design of an SSC either meets the current plant design basis for the applicable external hazards or has been shown by analysis or test to meet or exceed the current design basis.

The need to verify that the components of the SPC system, the Spent Fuel Pool Cooling piping and the battery bus crosstie cabinet that are used to support FLEX coping strategies to maintain core and containment cooling are robust as defined in NEI 12-06, Appendix A is identified as Confirmatory Item 3.2.1.4.A in Section 4.2, below.

On pages 7, 21 and 54 of the Integrated Plan, the licensee stated that at approximately 64 hours event time, the UCP water volume that is the RCIC suction source will be depleted. At that time, operators will realign the SPC system to pump suppression pool water through the SPC heat exchanger and return to the now depressurized RPV. Water will be injected into the RPV through the RHR-C injection valve, E12-MOV-042C. Water will overflow the full RPV back to the suppression pool through the five (5) open SRVs.

The licensee has not discussed the design allowable minimum system pressure required to open the SRVs in relation to the RPV pressure during the depressurization and the RPV fill evolution. This is identified as Confirmatory Item 3.2.1.4.B in Section 4.2, below.

The licensee has not discussed the effect of passing liquid phase water through the SRV tail pipe on the stresses allowed in the tail pipe, the tail pipe supports, the quencher and the quencher supports. This is identified as Confirmatory Item 3.2.1.4.C in Section 4.2, below.

On page 25 of the Integrated Plan, the licensee stated that in the final phase, 4160 Vac RRC FLEX electrical generators will power one loop of the Residual Heat Removal (RHR) system in the Shutdown Cooling (SDC) mode. SSW cooling water flow through the RHR heat exchanger will be provided by the FLEX pump and power will be supplied to the RRC cooling tower basin fan by the RRC FLEX generator.

The licensee stated during the audit process that newly revised recommendations provided by GE-Hitachi to the BWROG would be incorporated into FLEX related procedures. They include bypass of the RCIC high exhaust back pressure trip, bypass of the RCIC high area temperature isolation and bypass of the low reactor pressure isolation. The licensee stated that procedural guidance will be provided to maintain RCIC turbine speed at 4500 rpm if the suppression pool temperature reaches 215 degrees Fahrenheit with a delay in transferring the RCIC suction path from the suppression pool to the UCP. Additionally, the RCIC gland seal compressor loads will be stripped. The licensee stated that procedures will contain an operator action to evaluate a high area temperature for evaluating steam leakage and isolating the system by closing the steam supply valve, if necessary. The licensee also stated that RBS specific calculations would be developed to determine the height of water with the RCIC room flooded due to seal leakage.

The licensee provided a preliminary overview of the hydraulic calculations that support the coping strategy during the audit process. Calculation G13.18.12.0-084 provides the hydraulic analysis of the FLEX strategies.

The Integrated Plan identifies the SSW cooling tower basin as the water source for strategies for maintaining core and SFP cooling. On pages 25 and 51 of the Integrated Plan, the licensee stated that as heated water is returned to the UHS from the plant and the SSW cooling tower fans are repowered, evaporation of the basin water will increase. Makeup to the basin will eventually be required. This will be done via hauling of water from the Mississippi River using two water trucks to be provided by the RRC. During the audit process, the licensee stated that suction strainers are provided for the pumps drawing on the basin. The licensee also discussed the water quality from this source during the audit process and will provide additional information during a future six-month update.

The licensee discussed the heat removal capacity of the SSW cooling tower during the audit process. The licensee stated that no credit was taken for any heat removal from the tower during the first 72 hours of an ELAP and that the SSW basin can provide adequate cooling through that time without makeup water or repowering the cooling tower fans. The maximum cooling tower temperature is less than 150 degrees Fahrenheit.

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

3.2.1.5 Monitoring Instrumentation and Controls

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

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

- RPV Level
- RPV Pressure
- Containment Pressure
- Suppression Pool Level
- Suppression Pool Temperature
- SFP Level

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

A review was made of the identified instrumentation necessary for successful completion of mitigation strategies. The licensee listed the installed instrumentation credited for the coping evaluation for maintaining core cooling and containment during ELAP on page 18 of the Integrated Plan. The following instrumentation was included: RPV water level, RPV pressure, Primary Containment pressure and temperature, Suppression pool water level and temperature, Primary Containment temperature, SFP water level and Division 1 DC Voltage.

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

3.2.1.6 Motive Power, Valve Controls and Motive Air System

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

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

And,

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

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

A review was made of pneumatic systems associated with the mitigation strategies identified by the licensee in the Integrated Plan. The SRVs are used for the automatic depressurization (ADS) function at RBS. In addition to dc control power, operation of the SRVs requires a pneumatic pressure source and system pressure. The licensee discussed the operation of the SRVs with their associated air accumulators on pages 7, 15 and 54 of the Integrated Plan, during the audit process and in RBS UFSAR, Section 15C.2.5.3. The licensee stated that the accumulators are normally pressurized by the Instrument Air System (IAS) that will not be available during an ELAP. The SRVs have back-up air accumulators adequate for a four hour SBO. Automatic Depressurization System (ADS) SRV air accumulators are sized to provide 4 to 5 actuations per valve at atmospheric pressure in the drywell and a total of 28 to 35 ADS SRV actuations are available. The non-ADS SRV accumulators can provide a minimum of 37 valve-cycles. This is enough for a 4 hour SBO, which is predicted to require 22 SRV operations.

The licensee stated that high pressure air cylinders are used as a backup to the IAS compressor. The air cylinders are connected to the charging header in the auxiliary building and are seismically protected. The licensee stated that the air consumption for operation of the SRVs and also a bubbler suppression pool level transmitter for the initial 72 hours of an ELAP is approximately 2,396 standard cubic feet, which corresponds to 10 air cylinders. The license also stated that RBS has 16 air cylinders stored on site.

On pages 5 through 7 and 53 and 54 of the Integrated Plan, the licensee discussed the strategy for maintaining power to the dc distribution system in order to maintain control power to RCIC and dc power to instrumentation and other critical electrical loads. The licensee stated that a deep load shed would be initiated at a one (1) hour event time and that operators could complete this task in approximately 15 minutes. The licensee stated that the Division I and II dc buses would be cross-tied at approximately six (6) hours event time and that this action needed to be taken before the Division I battery was depleted at approximately 7.9 hours event time. The licensee also stated that at eight (8) hours event time, a 480 Vac, 200 kW FLEX generator would be deployed and connected to power the Division I battery charger and that this action needed to be taken before battery depletion at approximately 12 hours event time. The licensee provided additional information including the calculation basis for the battery lifetime and generator sizing during the audit process.

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

3.2.1.7 Cold Shutdown and Refueling

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

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

A review was made of the coping strategies discussed by the licensee on pages 15 and 16 of the Integrated Plan to maintain core cooling during an ELAP with LUHS that occurs when the reactor is in Cold Shutdown or Refueling.

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

The position paper describes how licensees will, by procedure, maintain equipment available for deployment in shutdown and refueling modes. The NRC staff concluded that the position paper provides an acceptable approach for demonstrating that the licensees are capable of implementing mitigating strategies in all modes of operation. The NRC staff will evaluate the licensee's resulting program through the audit and inspection processes.

During the audit process, the licensee stated that RBS will incorporate the supplemental guidance provided in the NEI position paper entitled “Shutdown / Refueling Modes” to enhance the shutdown risk process and procedures.

On pages 36 and 37 of the Integrated Plan, the licensee stated that water would be made up to the UCP by re-powering either SPC Pump 1A or 1B with a portable FLEX electrical generator and aligning the system to pump water from the suppression pool to the UCP. However, the UCP functions as a temporary spent fuel storage location during refueling. NEI 12-06, Table 3-1 and Appendix C, Table C-3 specifies the baseline capability and performance attributes to maintain spent fuel pool cooling. Although NEI 12-06 does not prohibit using the SPC pumps to maintain spent fuel pool cooling, the licensee has not identified the approach specified by NEI 12-06 as an alternate. This is identified as Confirmatory Item 3.2.1.7.A 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 the analysis of an ELAP during Cold Shutdown or Refueling if these requirements are implemented as described.

3.2.1.8 Use of Portable Pumps

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

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

NEI 12-06 Section 11.2 states in part:

> Design requirements and supporting analysis should be developed for portable equipment that directly performs a FLEX mitigation strategy for core,

containment, and SFP that provides the inputs, assumptions, and documented analysis that the mitigation strategy and support equipment will perform as intended.

A review was made of the use of portable pumps for FLEX mitigation strategies. On pages 6, 19 and 20 of the Integrated Plan and during the audit process, the licensee discussed the use of two portable pumps used for FLEX mitigation strategies. The two portable/FLEX pumps will recirculate cooling water from the SSW cooling tower basin through the SPC heat exchanger during the transition phase for suppression pool cooling. Water will return to the SSW cooling tower. During the final phase water will be recirculated through the RHR heat exchangers when the RHR system is operated in the SDC mode. As discussed in Section 3.1.1.1, above, the licensee stated that the motor driven pump designated as FLEX1 is to be permanently deployed to a protected location in the G-Tunnel. A FLEX electrical generator will be deployed to power this pump. The second, diesel engine driven pump will be deployed to the SSW cooling tower basin.

As discussed in Section 3.2.1.3, above, the licensee identified an alternate approach by using either of the two installed SPC pumps to recirculate suppression pool water through the SPC heat exchanger. The licensee also identified using either SPC pump to inject suppression pool water into the RPV through the SPC heat exchanger and the RHR-C injection valve when RCIC is no longer available. Water would overflow the RPV into the suppression pool through open SRVs. The SPC pump would be powered by a FLEX electrical generator.

During the audit the licensee provided information describing how using the installed SPC pumps conforms to the guidance in NEI 12-06, Section 3.2.2, Guideline (13). The licensee stated that their proposed strategy is similar the strategy described in FAQ 2013-06 and that the RBS FLEX strategy uses two installed pumps as the primary and alternate strategies. However, the NRC has not endorsed FAQ 2013-06 as an acceptable method to use for compliance with the requirements of Order EA-12-049.

The licensee stated that the SPC pumps support the containment heat removal and RPV makeup functions and that the physical size of an equivalent pump would preclude its use near the optimal connection points inside the tunnel. In addition, the licensee stated that deploying a portable pump outside of the tunnel and the Auxiliary Building would require the routing of new piping and use multiple, lengthy hose runs for pump suction and discharge. However, NEI 12-06 Section 3.2.2 Guideline (13) states that regardless of installed coping capability, all plants will include the ability to use portable pumps to provide RPV/RCS makeup. The guidance does not stipulate the need for portables (regardless of installed equipment) for the use of containment cooling. Therefore, the SPC pumps could be utilized as a source for containment cooling and RPV makeup, with smaller, portable pumps providing a diverse means of RPV injection in accordance with NEI 12-06. Using portable pumps as a means to provide diverse capability beyond installed equipment provides an added measure of safety to cope with unforeseen complications arising from beyond-design-basis external events.

During the audit, the licensee stated that the RBS use of SPC pumps instead of portable pumps is a deviation from NEI 12-06. The licensee stated that the use of the SPC pumps is acceptable because the pumps provide a primary and alternate means to cool the core, are provide adequate protection from all design-basis external events and that the use of the SPC pumps will shorten the time needed to deploy Phase 2 strategies.

Although NEI 12-06 does not prohibit using the SPC pumps for RPV injection, the licensee did not identify the approach as an alternate to the provisions of NEI 12-06 in the original plan submittal, though it was recognized during the audit process. To evaluate the alternate approach, the reviewer notes that RBS included a strategy to use a portable pump for RPV makeup in the strategies developed pursuant to Order EA-02-026, the subsequently imposed license conditions, and 10 CFR 50.54(hh)(2). The extensive damage mitigation procedure, OSP-0066 provides several methods of injecting water into the RPV using a portable pump, FPW-P4, which can also be used for SFP makeup. The licensee further stated that a second pump will be purchased to meet the N+1 specification of NEI 12-06. However, the licensee has not provided a discussion of the pump's capacity to provide both RPV injection and makeup water to the SFP concurrently.

The need to determine if the FLEX strategy for RPV injection proposed by the licensee is amenable to use for conformance with NEI 12-06 Section 3.2.2 Guideline (13) is identified as Confirmatory Item 3.2.1.8.A 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 the use of portable pumps.

3.2.2 Spent Fuel Pool Cooling Strategies

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

As described in NEI 12-06, Section 3.2.1.7 and JLD-ISG-2012-01, Section 2.1, strategies that 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 conditions.

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

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

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

canals, etc.

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

A review was made of the discussions in the licensee's Integrated Plan for maintaining SFP cooling during an ELAP. The licensee discussed SFP cooling on pages 35 through 34 and page 54 of the Integrated Plan. The licensee also discussed details of the coping strategy to maintain SFP cooling during the audit process. The licensee stated that the design basis spent fuel load conditions would result in boiling in 9.8 hours event time and that the makeup rate to maintain the SFP volume is 34.5 gpm. The licensee also stated that during a refueling using the design basis heat load, the SFP could begin boiling at approximately 4.5 hours event time and that fuel would begin to uncover at 87.6 hours event time. Also, if fuel were being stored in the UCP, boiling in the UCP would begin at 2.3 hours event time and fuel would begin to uncover at 44.9 hours event time. A makeup rate of 54.7 gpm would be required to maintain the volume of the UCP and the RPV and an additional 34.5 gpm would be required for the SFP for a total makeup rate of 89.3 gpm.

On pages 36 and 37 of the Integrated Plan, the licensee discussed strategies for maintaining SFP cooling for two conditions, the SFP alone and during a refueling when irradiated fuel was located in the UCP and in the SFP. During the audit process and as discussed in Section 3.2.1.7, above, the licensee stated that RBS will incorporate the supplemental guidance provided in the NEI position paper to enhance the shutdown risk process and procedures.

The licensee discussed a primary and two methods of alternate strategies for SFP cooling. In the primary method a portable FLEX pump, designated FLEX3, is deployed to the SSW cooling tower basin and begins makeup to the SFP through a flexible hose within eight (8) hours event time. In the alternate strategy the flexible hose is connected either to a SFP cooling system hose connection that will feed directly into the SFP or the flexible hose will be run to a spray nozzle located on the refuel floor. These strategies are described in station procedure OSP-0066, Extensive Damage Mitigation Procedure, Revision 18, dated February 29, 2012 that was provided during the audit process.

The Integrated Plan identifies the SSW cooling tower basin as the water source for strategies for maintaining SFP cooling. On pages 25 and 51 of the Integrated Plan, the licensee stated makeup to the basin will eventually be required. This will be done via hauling of water from the Mississippi River using two water trucks to be provided by the RRC. During the audit process, the licensee stated that suction strainers are provided for the pumps drawing on the basin. The licensee also discussed the water quality from this source during the audit process and will provide additional information during a future six-month update.

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

A review was made of the discussions in the licensee's Integrated Plan for maintaining access to and habitability of the SFP area during an ELAP. On pages 36 and 44 of the Integrated Plan the licensee stated that to vent steam and condensate from the SFP area the double doors, F95-1, on the 95 foot elevation to the new fuel receiving area would be opened. Door F113-2 would be opened to a stairwell and door F171-1 will be opened to the roof. The licensee stated that cooler air would enter through the F95-1 doors and a chimney effect would be established through the stairwell to the roof.

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, Section 3.2.2 addresses the minimum baseline capabilities:

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

NEI 12-06, Section 3.2.2, Guideline (15)

> *Procedures/guidance for units with BWR Mark III and PWR Ice Condenser containments should address the deployment of portable power supplies for providing backup power to the containment hydrogen igniters, including a prioritization approach for deployment.*
>
> Hydrogen igniters support maintenance of containment integrity following core damage. While the FLEX strategies are focused on prevention of fuel damage, the igniters need to be in-service prior to significant hydrogen generation due to fuel damage in order to be effective. However, in the extreme conditions postulated in this guidance, a prioritization approach should be outlined to support on-site staff decision-making on whether resources should focus on deployment of FLEX capabilities for fuel damage prevention versus for containment protection following fuel damage. For example, if there are indications that installed equipment reliability is compromised by the beyond-design basis condition, then a priority might be placed on re-powering the hydrogen igniters. Similarly, if the plant staff determines that the installed plant equipment is functioning well, then priority could be given to deployment of coping equipment.

NEI 12-06, Table 3-1 and Appendix C provide a description of the safety functions and performance attributes for BWR containments which are to be maintained during an ELAP as defined by Order EA-12-049. The safety function applicable to a BWR with a Mark III containment listed in Table 3-1 is "Containment Integrity", and the method cited for accomplishing this safety function is “Hydrogen igniters.” The baseline capability is “Re-powering of hydrogen igniters with a portable power supply.” Furthermore, the performance attributes listed in Table C-2 denote the containment’s function is:

- Diverse power connection points are required to establish capability through separate divisions/trains, i.e., should not have both connections in one division/train.
- Procedures/guidance to prioritize deployment strategies.

A review was made of the discussions in the licensee’s Integrated Plan for maintaining containment cooling during an ELAP. As discussed in the Integrated Plan and the audit process, the licensee’s primary strategy for maintaining the containment function is to add a large volume of cool water from the Upper Containment Pool to the suppression pool and then to subsequently put the SPC heat exchangers back into service and use them to remove heat from primary containment. The licensee also stated that in the final phase an RRC FLEX electrical generator would be used to energize an RHR pump in the SDC mode.

Cooling water to the SPC heat exchanger and also to the RHR-B heat exchanger would be provided by the FLEX pump the water would return to the SSW cooling tower. A RRC FLEX generator would be used to power an SSW cooling tower fan. The suppression pool and the containment would cool through natural convection and conduction.

The licensee performed a preliminary GOTHIC analysis in calculation G13.18.12.4-039 to establish a timeline for necessary actions and to demonstrate the effectiveness of the proposed strategies to maintain containment. In the analysis, four cases were run which modeled 66 gpm of leakage from the RCS. The Results & Conclusions Table on page 9 of 93 showed that all f of these cases resulted in drywell temperatures in excess of the 330 degrees Fahrenheit drywell design temperature. Additionally, the licensee stated in the audit process that the GOTHIC code models the drywell control volume as a lumped-parameter volume where dependent variables are volume-averaged quantities. Thus, local temperatures in the drywell could exceed the design limit by an even greater margin than those specified in the table. The licensee also stated in the audit process that the licensee has elected to perform new containment and RCS analysis utilizing the MAAP code. The licensee stated that they anticipate the results from the forthcoming MAAP analysis will be in general agreement with the preliminary GOTHIC analysis results and will not results in significant changes to the strategies proposed in the original Integrated Plan. The completion of the new MAAP analysis which demonstrates that containment functions are maintained in all phases of an ELAP, with particular regard to the qualification of drywell penetrations and seals at elevated temperatures, is identified as Confirmatory Item 3.2.3.A in Section 4.2, below.

On pages 28 and 31 of the Integrated Plan and during the audit process, the licensee stated that the containment design pressure is 15 psig; the suppression pool design temperature is 185 degrees Fahrenheit. During the audit process and in calculation G13.18.12.4-039, Containment Conditions for Extended Loss of AC Power, the licensee added that the design basis of the containment and drywell, as stated in the RBS UFSAR Section 6.2.1.1.1, is: drywell internal positive pressure 25 psid, containment internal pressure 15 psig, drywell temperature 330 degrees Fahrenheit, containment and suppression pool temperature 185 degrees Fahrenheit and as stated in the RBS UFSAR Section 5.2.2.1.3, the RPV design basis is 1250 psig.

On pages 28 and 31 of the Integrated Plan and during the audit process, the licensee stated that the containment pressure would reach approximately 5 psig at eight (8) hours event time and will continue to increase to approximately 13 psig before decreasing. The licensee stated that the suppression pool design temperature would be exceeded within 5 hours event time. The suppression pool temperature will increase to approximately 209 degrees Fahrenheit at eight (8) hours event time before decreasing because of pool cooling coping strategies. The licensee stated that the suppression pool temperature was determined by calculation G13.18.12.4-039, Containment Conditions for Extended Loss of AC Power. The difference in predicted suppression pool temperature between this calculation and NEDC-33771P, Figure H-1 is due to the differences in initial conditions for reactor power and for suppression pool temperature. NEDC-33771P uses 4,408 megawatts thermal (MWt) initial power and 95 degrees Fahrenheit suppression pool temperature; the calculation G13.18.12.4-039 for RBS assumes 3,100 MWt initial power and 90 degrees Fahrenheit suppression pool temperature. Both calculations assumed a similar suppression pool volume. NEDC-33771P assumed 123,800 cubic feet, G13.18.12.4-039 for RBS assumes a slightly larger 124,732 cubic feet.

On page 4 of the Integrated Plan, the licensee stated that exceeding the suppression pool design temperature, the Heat Capacity Temperature Limit (HCTL), Pressure Suppression Pressure Limit (PSPL), and Safety Relief Valve (SRV) Tail Pipe Level Limit (SRVTPLL) as specified by Emergency Operating Procedures without performing emergency depressurization is acceptable.

During the audit process, the licensee stated that it would be acceptable to exceed the suppression pool design temperature of 185 degrees Fahrenheit because this limit was established for design basis events in which the containment integrity is challenged by design internal containment pressure. In the case evaluating containment response to an ELAP, the containment is at a lower pressure, the suppression pool is being cooled and the reactor can be depressurized to allow injection into the RPV using the SPC system without challenging containment integrity.

The licensee also stated that the HCTL is the highest suppression pool temperature at which initiation of RPV depressurization will not result in exceeding either the maximum temperature capability of the suppression chamber or the primary containment pressure limit. The licensee stated that calculation G13.18.12.4-039 demonstrates that the coping strategy does not challenge the containment pressure limit when the suppression pool temperature exceeds 185 degrees Fahrenheit. On page 28 of the Integrated Plan, the licensee stated that the Grand Gulf Nuclear station has had its suppression pool design limit increased to 210 degrees Fahrenheit by analysis. The licensee discussed that calculation, GGNS-ER-10-00075 Revision 2, GGNS EPU Containment System Response, during the audit process

The PSPL is the lesser of: 1) the highest suppression chamber pressure that can occur without steam in the airspace; 2) the highest suppression chamber pressure at which initiation of RPV depressurization will not result in exceeding containment design pressure before the RPV pressure drops to the decay heat removal pressure; or 3) the high suppression chamber pressure that can be maintained without exceeding the suppression pool boundary design load if the SRVs are opened. Regarding the first criterion, the licensee stated that NEI 12-06 does not require consideration of a LOCA, so a purge of non-condensable from the drywell to the suppression pool is not a concern. The second criterion, containment design limit breach after blow down, is also not a concern, since calculation G13.18.12.4-039 demonstrates that containment integrity is maintained throughout the ELAP. The third criterion, suppression pool boundary design load, is mitigated by controlling RPV pressure between 100 psig and 200 psig. The controlled reduction in RPV pressure significantly reduces the stress caused by opening SRVs.

The licensee stated that the SRVTPLL is the highest suppression pool water level at which opening an SRV will not result in exceeding the code allowable stresses in the SRV tail pipe, tail pipe supports, quencher or quencher supports. A higher water level results in higher stress to the SRV tail pipes and quenchers and supports. However, this increase is offset by controlling reactor pressure in the 100 psig to 200 psig band. Maintaining the RPV at lower pressure significantly reduces those stresses.

One aspect of the increased suppression pool temperature to 209 degrees Fahrenheit that was not addressed in the audit process is the issue of structural integrity. The licensee should confirm that the 209 degrees Fahrenheit suppression pool temperature over the 185 degrees Fahrenheit design limit does not adversely impact the structural integrity of the containment. This is identified as Confirmatory Item 3.2.3.B in Section 4.2, below.

On pages 6, 19, 20, 31 and 54 of the Integrated Plan and during the audit process, the licensee stated that the FLEX pump designated FLEX1 that is staged in the G-Tunnel would be connected to the SSW system, the FLEX pump designated FLEX2 would be deployed to the SSW cooling tower basin and connected to the SSW system. Additionally, FLEX electrical generators would be deployed to power the FLEX1 pump and either of the two SPC pumps. Suppression pool cooling would be before eight (8) hours event time. At that time water from the suppression pool would be recirculated through the SPC heat exchanger back to the suppression pool by the SPC pump. The SPC heat exchanger would be cooled by pumping SSW water through the heat exchanger using the FLEX pump. The water would return to the SSW cooling tower basin through the cooling tower.

On pages 6, 28, 29 and 54 of the Integrated Plan the licensee stated that hydrogen igniter diesel generator would be deployed at three (3) hours event time. The licensee stated that the deployment of the generator at this time was a contingency action and becomes critical if core cooling is lost and fuel is damaged. Since NEI 12-06 does not specify reactor core damage is assumed, the generator will be deployed but not connected and not started. The licensee stated that in the event that adequate core cooling is lost as indicated by reactor vessel level falling to below the top of active fuel or if coolant injection is interrupted by more than 15 minutes, resources would be redirected to the igniter generator. Only one division of igniters would be energized because each division covers the entire containment.

On page 28 of the Integrated Plan, the licensee stated that SFP Cooling system valves SFC-MOV121 and SFC-MOV-139 are normally open ac powered, motor-operated containment isolation valves. The valves are in the RCIC pump suction flow path and will be verified to be open during implementation of ELAP coping strategies. The valves receive a containment isolation signal in the event of a RPV Level 2 or high drywell pressure.

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

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

On page 14 of the Integrated Plan, the licensee stated that the RCIC suction path would be transferred from the suppression pool to the UCP before the suppression pool reaches 185 degrees Fahrenheit. This will provide water to the RCIC suction at approximately 90 degrees Fahrenheit to 100 degrees Fahrenheit.

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

3.2.4.2 Ventilation – Equipment Cooling

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

> *Plant procedures/guidance should consider loss of ventilation effects on specific energized equipment necessary for shutdown (e.g., those containing internal electrical power supplies or other local heat sources that may be energized or present in an ELAP.*
>
> ELAP procedures/guidance should identify specific actions to be taken to ensure that equipment failure does not occur as a result of a loss of forced ventilation/cooling. Actions should be tied to either the ELAP/LUHS or upon reaching certain temperatures in the plant. Plant areas requiring additional air flow are likely to be locations containing shutdown instrumentation and power supplies, turbine-driven decay heat removal equipment, and in the vicinity of the inverters. These areas include: steam driven [auxiliary feed water] 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.

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.

A review was made of the RBS integrated Plan for discussions of coping strategies addressing the impact on critical equipment and components caused by the loss of ventilation and cooling during an ELAP.

On pages 41 through 43, the licensee discussed the habitability and the temperature profile of the RCIC room. The licensee stated that the RCIC room ambient temperature limit stated in the RBS Operating License Technical Specification 3.3.6.1 is 186.4 degrees Fahrenheit. The licensee stated that the RCIC room temperature was calculated to be 166 degrees Fahrenheit at eight (8) hours event time and 174 degrees Fahrenheit at 72 hours event time. Although the temperature at 72 hours event time is reduced to 167 degrees Fahrenheit if the door to the RCIC room is opened at event time one (1) hour, opening the door may lead to spread of radioactive contamination because the RCIC Gland Seal Compressor will not be maintained operating on the dc distribution system to conserve battery lifetime.

During the audit process, the licensee discussed calculation G13.18.12.4-040, Reactor Core Isolation Cooling Room Heatup for Extended Loss of AC Power, and stated that the qualified operating temperature for RCIC components during a SBO is 207 degrees Fahrenheit. The licensee also stated that procedures will contain a caution dealing with the potential for airborne contamination when the RCIC Gland Seal Compressor is not operating.

On page 12 of the Integrated Plan, the licensee stated that operators will have overridden RCIC high area temperature isolation interlocks as part of the operator immediate actions of AOP-0050, Station Blackout. Operators will also override the other RCIC trip signals and isolation signals that could possibly prevent operation when needed during the ELAP and that instructions are provided in plant procedure OP-0005, Emergency Operating and Severe Accident Management Procedures.

On pages 41, 43 and 48 of the Integrated Plan, the licensee discussed the Main Control Room (MCR) temperature during an ELAP and stated that during an ELAP some vital electronics and instrumentation remain energized. The licensee stated that the MCR temperature will reach approximately 88 degrees Fahrenheit at the end of the initial phase and 101 degrees Fahrenheit at 72 hours event time, as calculated by ETGRB125-CALC-006, River Bend Station MCR Heatup for Extended Loss of Offsite Power, Revision 0. The initial MCR temperature is assumed to be 75 degrees Fahrenheit. The licensee stated that the control room temperature limit is 120 degrees Fahrenheit. The licensee stated that the coping strategy for the MCR during an ELAP includes load shedding of non-vital loads, removing 80 ceiling tiles and to open the control room doors through the elevator corridor to the stairwell once the control room temperature exceeds the outdoor ambient temperature. The doors from the stairwell to the door on the roof will be propped open. Also, portable battery powered fans will be placed in the doorways to provide cool air, once the air in the control room exceeds the outside ambient temperature. Calculation ETGRB125-CALC-006 did not assume that the doors to the control room are opened in predicting the 88 degrees Fahrenheit MCR temperature.

During the audit process the licensee described a change to the coping strategy for the MCR during an ELAP and stated that a 2,500 cfm exhaust fan will be used to provide MCR ventilation. Two (2) fans will be stored with FLEX equipment. One (1) fan will be deployed at 30 hours event time. The licensee stated that the MCR exhaust fan will be powered by a FLEX electrical generator. The licensee discussed calculation G13.18.12.4-042, Revision 0, Main Control Room Heatup for Extended Loss of AC Power. That calculation includes a sensitivity study of MCR heat up using 1,000, 2,000 and 5,000 scfm exhaust fans that are deployed at between 4 and 72 hours event time. The calculation concluded that a 2,000 cfm fan deployed by 30 hours was sufficient to maintain the MCR temperature below 110 degrees Fahrenheit. The licensee stated that this update to the coping strategy will be provided during a future six-month update.

On page 48 Integrated Plan the licensee stated that in the final phase portable fans and ductwork will be provided by the RRC to effectively reduce the temperature in the MCR.

On pages 42 through 44 of the Integrated Plan, the licensee stated that the Standby Switchgear rooms were initially evaluated based on calculation ENTGRB125-CALC-002, River Bend Station

Switchgear Room Heatup for Extended Loss of Offsite Power, Revision 0. That calculation concluded that switchgear rooms' temperature increases to 130 degrees Fahrenheit at 72 hours event time.

During the audit process, the licensee discussed calculation G13.18.12.4-038, River Bend Station Standby Switchgear Rooms A, B and C Heat Up for Extended Loss of SC Power, Revision 0. Based on the results of this calculation, the licensee concluded that no additional actions, such as deploying portable fans, are needed other than opening the switchgear rooms' doors at 30 minutes event time. The licensee stated that the maximum temperature of approximately 130 degrees Fahrenheit after 72 hours event time and that there is a 60 minute margin in the time for the plant operators to open the doors. The licensee stated that the equipment in the switchgear rooms can be exposed to thermal environments of 150 degrees Fahrenheit to 300 degrees Fahrenheit for up to eight (8) hours. Therefore, the equipment within the switchgear rooms is expected not to be adversely affected by high area temperature during the duration of the ELAP. The licensee cited NUMARC 87-00 as a technical reference in making this determination.

During the audit process, the licensee discussed calculation G13.18.12.4-046, DC Equipment Room A Heat Up for Extended Loss of Power, Revision 0. The licensee concluded that based on the results of this calculation the switchgear room door should be opened at 30 minutes event time and a 2,500 cfm ventilation fan deployed when the Division I battery Charger is energized at eight (8) hours event time. This results in a maximum room temperature of 128 degrees Fahrenheit at 73 hours event time. The licensee stated that the equipment in the switchgear rooms can be exposed to thermal environments of 150 degrees Fahrenheit to 300 degrees Fahrenheit for up to eight (8) hours. Therefore, the equipment within the DC Equipment rooms is expected not to be adversely affected by high area temperature during the duration of the ELAP. The licensee cited NUMARC 87-00 as a technical reference in making this determination.

On page 44 of the Integrated Plan, the licensee stated that SPC Pump Room cooling would be provided by the SPC Pump Room Unit Cooler by water supplied to the SSW system. When SSW cooling water is establisher to the SPC heat exchanger, cooling water flow would also be supplied to the room cooler. The portable FLEX electric generator deployed to power the SPC pump would also energize the room cooler.

On page 44 of the Integrated Plan, the licensee stated that although calculation ENTGRB125-CALC-001, River Bend Station Battery Room Heatup for Extended Loss of Offsite Power, Revision 0 concluded that for the battery rooms show that the room temperatures do not exceed 125 degrees Fahrenheit through 72 hours event time, ventilation is required in the battery rooms due to hydrogen generation as a result of battery charging during the transition phase. The licensee stated that the Division I battery room fans are powered from bus EHS-MCC14A, which is powered by EJS-SWG1A and the Division II battery room fans are powered from bus EHS-MCC14B, which is powered by EJS-SWG1B. During the ELAP, the batteries would be charged in one of three ways: 1) connect FLEX diesel generator to EJS-SWG1A which powers battery charger ENB-CHGR1A which provides 125VCD to ENB-SWG01A that charges the Division I batteries; 2) connect FLEX diesel generator to EJS-SWG1B which powers battery charger ENB-CHGR1B which provides 125VDC to ENB-SWG01B that charges the Division II batteries; or 3) connect the FLEX diesel generator to the swing charger BYS-CHGR1D, which is capable of recharging either of the divisional batteries. Connecting the FLEX diesel to either EJS-SWG1A or EJS-SWG1B would not only charge the batteries, but would also provide power to the respective battery room fan. However, connecting the FLEX diesel generator to the swing charger, BYS-CHGR1D, would not repower the battery room fans. The battery room fans are efficient at removing sufficient hydrogen as to maintain the hydrogen concentration below the lower explosive limit (LEL) as determined by calculation G13.18.2.1-092, Control Building Division I and II Battery Rooms Hydrogen Concentration, Revision 0. If the swing charger were to be used, temporary battery powered fans and ductwork would be utilized to remove sufficient hydrogen to remain below the LEL. Calculation G13.18.2.1-092 determined that with 530 scfm of exhaust ventilation flow from each battery room is sufficient to keep hydrogen concentration below 1% in both Division I and II battery rooms. This is the normal ventilation flow.

During the audit process, the licensee stated that the battery room doors will be propped open during transition and final phase battery charging. The licensee discussed calculation G13.18.12.4-037, River Bend Station Standby Battery Rooms: A, B and C Heat Up for Extended Loss of AC Power, Revision 0. The calculation concludes that no additional actions are needed for cooling the battery rooms other than opening the doors. The licensee stated that this will result in a maximum temperature of approximately 130 degrees Fahrenheit at 72 hours event time. The licensee stated that the equipment in the battery rooms can be exposed to thermal environments of 150 degrees Fahrenheit to 300 degrees Fahrenheit for up to eight (8) hours. Therefore, the equipment within the battery rooms is expected not to be adversely affected by high area temperature during the duration of the ELAP. The licensee cited NUMARC 87-00 as a technical reference in making this determination.

During the audit process, the licensee also stated that the RBS is in the Deep South just north of Baton Rouge, LA and does not experience extreme cold temperatures. The licensee stated that during cold weather, the station battery rooms would be at their normal temperature at the onset of the event and the temperature of the electrolyte in the battery cells would increase due to the heat generated by the batteries during discharging and during re-charging. Additionally, the battery rooms are located in the interior of the Control Building; since the normal plant cooling systems are not running the battery rooms and batteries would not be exposed to extreme low temperatures.

The coping strategy for ventilating steam and condensate from the SFP area is discussed in Section 3.2.2, above.

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

3.2.4.3 Heat Tracing.

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

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

where heat tracing is needed to ensure control systems are available. If any such systems are identified, additional backup sources of water not dependent on heat tracing should be identified.

On page 2 of the Integrated Plan the licensee stated that RBS screens in for an assessment for extreme cold for ice only.

NEI 12-06, Section 8.2.1. 'Applicability of Snow, Ice and Extreme Cold,' states in part:

> All sites should consider the temperature ranges and weather conditions for their site in storing and deploying their FLEX equipment. That is, the equipment procured should be suitable for use in the anticipated range of conditions for the site, consistent with normal design practices. In general, the southern parts of the U.S. do not experience snow, ice, and extreme cold. However, it is possible at most sites, except sites in Southern California, Arizona, the Gulf Coast, and Florida, to experience such conditions. Consequently, all other sites are expected to address FLEX deployment for these conditions.

Therefore, NEI 12-06, Section 3.2.2, Guideline (12) concerning heat tracing and freeze protection is not applicable to RBS due to its location and climate and the applicability statement of NEI 12-06, Section 8.2.1.

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 heat tracing and freeze protection if these requirements are implemented as described.

3.2.4.4 Accessibility – Lighting and Communications.

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

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

A review was made of the Integrated Plan for coping strategies discussing plant lighting and communications systems during an ELAP that support personnel access for coping strategies that maintaining core, containment and SFP cooling.

On pages 41 and 43 of the Integrated Plan the licensee stated that MCR emergency lighting remain energized from emergency DC power sources and supplemental lighting will be provided to control room operators because Appendix R lighting is assumed to fail at eight (8) hours event time. Additionally, to charge the divisional batteries, a FLEX electrical generator will be connected to either EJS-SWG1A or EJS-SWG1B before eight (8) hours event time. These busses provide power two of the MCR backup lighting system receptacles.

During the audit process the licensee stated that lighting in the MCR will be maintained throughout the event by a safety related UPS powered Station Lighting System. Additionally battery powered lanterns are stored in the MCR and flashlights are part of the standard gear supplied to operators with duties in the plant. The licensee also stated that procedures will be revised if necessary to reflect the lighting requirements during ELAP events. The licensee stated that an Emergency DC lighting system powered by eight (8) hour battery packs is provided in the standby generator areas, standby switchgear rooms, SSW Pump house, Class 1E Battery Rooms, standby motor control centers and load centers, remote shutdown panel rooms and areas required for egress from buildings.

The licensee provided its communications assessment in letters dated October 31, 2012, and February 22, 2013 (ADAMS Accession Nos. ML12318A098 and ML13057A116) in response to the NRC March 12, 2012 10 CFR 50.54(f) request for information letter for RBS. As documented in the staff analysis provided by letter dated May 24, 2013 (ADAMS Accession No. ML13130A068), the NRC staff has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. The NRC staff will follow up to confirm that upgrades to the site's communication systems have been completed.

Therefore, there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.2 Guideline (8) regarding communications capabilities during an ELAP. In order to track confirmation of commitment completion, this has been identified as Confirmatory Item 3.2.4.4.A. 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 lighting and communications support for accessibility for operator actions if these requirements are implemented as described.

3.2.4.5 Protected and Internal Locked Area Access

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

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

A review was made of the Integrated Plan for coping strategies discussing personnel access to plant protected and locked areas during an ELAP to support strategies for maintaining core, containment and SFP cooling.

During the audit process, the licensee stated that procedures exist and FLEX Support Guidelines (FSGs) will be developed to ensure that operators can access the required areas in the event of a loss of power. Additional details of controls for access to security controlled or internal locked areas where an ELAP would disable normal controlled access will be contained in FSGs or associated procedures.

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

3.2.4.6 Personnel Habitability – Elevated Temperature

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

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

Section 9.2 of NEI 12-06 states,

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

A review was made of the Integrated Plan for coping strategies discussing habitability of plant locations during an ELAP to allow personnel access to support strategies for maintaining core, containment and SFP cooling.

On pages 41, 43 and 48 of the Integrated Plan, the licensee discussed the Main Control Room (MCR) temperature during an ELAP and stated that during an ELAP some vital electronics and instrumentation remain energized. The licensee stated that the MCR temperature will reach approximately 88 degrees Fahrenheit at the end of the initial phase and 101 degrees Fahrenheit at 72 hours event time, as calculated by ETGRB125-CALC-006. The initial MCR temperature is assumed to be 75 degrees Fahrenheit. The licensee stated that the coping strategy for the MCR during an ELAP includes load shedding of non-vital loads, removing 80 ceiling tiles and to open the control room doors through the elevator corridor to the stairwell once the control room temperature exceeds the outdoor ambient temperature. The doors from the stairwell to the door on the roof will be propped open. Also, portable battery powered fans will be placed in the doorways to provide cool air, once the air in the control room exceeds the outside ambient temperature. Calculation ETGRB125-CALC-006 did not assume that the doors to the control room are opened in predicting the 88 degrees Fahrenheit MCR temperature.

During the audit process the licensee described a change to the coping strategy for the MCR during an ELAP and stated that a 2,500 cfm exhaust fan will be used to provide MCR ventilation. Two (2) fans will be stored with FLEX equipment. One (1) fan will be deployed at 30 hours event time. The licensee stated that the MCR exhaust fan will be powered by a FLEX electrical generator. The licensee discussed calculation G13.18.12.4-042. That calculation is a sensitivity study of MCR heat up using 1,000, 2,000 and 5,000 scfm exhaust fans that are deployed at between 4 and 72 hours event time. The calculation concluded that a 2,000 cfm fan deployed by 30 hours was sufficient to maintain the MCR temperature below 110 degrees Fahrenheit. The licensee stated that this update to the coping strategy will be provided during a future six-month update.

On page 48 Integrated Plan the licensee stated that in the final phase portable fans and ductwork will be provided by the RRC to effectively reduce the temperature in the MCR.

On pages 41 through 43, the licensee discussed the habitability and the temperature profile of the RCIC room. The licensee stated that the RCIC room temperature was calculated to be 166 degrees Fahrenheit at eight (8) hours event time and 174 degrees Fahrenheit at 72 hours event time. Although the temperature at 72 hours event time is reduced to 167 degrees Fahrenheit if the door to the RCIC room is opened at event time one (1) hour, opening the door may lead to spread of radioactive contamination because the RCIC Gland Seal Compressor will not be maintained operating on the dc distribution system to conserve battery lifetime.

During the audit process, the licensee discussed calculation G13.18.12.4-040, Reactor Core Isolation Cooling Room Heatup for Extended Loss of AC Power, and stated that habitability of the RCIC Room is not considered in calculation G13.18.12.4-040 because there are no credited operator actions that take place in the RCIC Room. The licensee stated that room entry is only necessary if a failure of RCIC equipment occurs during an ELAP and that according to NEI 12-06 guidance, failure of RCIC equipment does not need to be considered. However, if RCIC Room entry were required during an ELAP, plant operators would use the guidance stated in the licensee's corporate Management Manual procedure EN-IS-108 for protection while working in hot environments. Than procedure, EN-IS-108, Working in Hot Environments, Revision 10, states the required practices and precautions necessary to enter and work in hot environments including, determination of stay and recovery times and the use of protective equipment including ice-based garments such as ice-vests.

During the audit process, the licensee stated that procedures will contain a caution dealing with the potential for airborne contamination when the RCIC Gland Seal Compressor is not operating.

The coping strategy for ventilating steam and condensate from the SFP area is discussed in Section 3.2.2, above.

The licensee also provided additional information during the audit process and stated that no engine driven FLEX equipment would be operated inside buildings and structures.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable

assurance that the requirements of Order EA-12-049 will be met with respect to accessibility for operator actions if these requirements are implemented as described.

3.2.4.7 Water Sources.

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

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

A review was made of the Integrated Plan for discussion of water sources used for mitigating strategies for core, containment and SFP cooling.

The Integrated Plan identifies the SSW cooling tower basin as the water source for strategies for maintaining core and SFP cooling. On pages 25 and 51 of the Integrated Plan, the licensee stated that as heated water is returned to the UHS from the plant and the SSW cooling tower fans are repowered, evaporation of the basin water will increase. Makeup to the basin will eventually be required. This will be done via hauling of water from the Mississippi River using two water trucks to be provided by the RRC. During the audit process, the licensee stated that suction strainers are provided for the pumps drawing on the basin. The licensee also discussed the water quality from this source during the audit process and will provide additional information during a future six-month update.

The licensee discussed coping strategies for maintaining core cooling on pages 12 through 26, 18 and 19 of the Integrated Plan and during the audit process. The coping strategies for maintaining SFP cooling were discussed on pages 36 and 37 of the Integrated Plan and during the audit process. As discussed in the Integrated Plan and in Sections 3.2.1.3, 3.2.1.4, 3.2.1.8 and 3.2.2, above, the normal RCIC pump suction source is the CST and will automatically transfer to the suppression pool on low level or unavailability of the CST. The RCIC suction path will be transferred to the UCP at five (5) hours event time. The cooler water in the UCP will preserve RCIC operability as the suppression pool water temperature increases. The UCP volume is sufficient to provide water to the RCIC pump until approximately 60 hours event time. At that time, core cooling will be transferred to a direct injection method using the SPC pump to recirculate suppression pool water through the SPC heat exchanger, the RPV and the open SRVs. In the final phase, the RHR system will be operated in the SDC mode.

Cooling water for the SPC heat exchanger and for the RHR heat exchanger will be provided from the SSW cooling tower basin and the FLEX portable pumps. A FLEX pump will also supply makeup cooling water to the SFP. Makeup water to the SSW cooling tower basin will be from the Mississippi River using two water tankers. The licensee discussed the water quality of SSW cooling water and river water during the audit process and stated that pump suction strainers are provided for pumps drawing on the SSW basin and that additional information will be provided during a future six-month update.

The licensee discussed the automatically transfer of the RCIC suction path from the CST to suppression pool on low level in the CST. The licensee discussed the instrumentation, logic and power to motor operated valves that perform the automatic transfer during the audit process on pages 12 through 14 of the Integrated Plan and during the audit process. The instrumentation, logic and motor operated valves are classified as safety related, seismically qualified and powered by the dc distribution system.

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

3.2.4.8 Electrical Power Sources/Isolations and Interactions

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

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

A review was made of the Integrated Plan for coping strategies and discussion of electrical isolations, interactions and protection of station electrical distribution equipment. The licensee discussed deployment of portable/FLEX electrical generators during the transition phase on pages 6, 7, 16, 19 of the Integrated Plan and during the audit process; discussed the use of portable/FLEX RRC generators during the final phase on page 25 of the Integrated Plan; and discussed deployment of the hydrogen igniter generator on page 19 of the Integrated Plan. The licensee also provided preliminary information detailing the portions on the electrical distribution system that would be reenergized using portable/FLEX electrical generators to be used during the transition and the final phases of the ELAP. The licensee discussed preliminary information of the electrical loads that were intended to be reenergized by those generators.

On pages 6 and 7 of the Integrated Plan the licensee stated that at eight (8) hours event time the FLEX electrical generator would be deployed and connected to the Division I battery charger through installed connection point to begin recharging of Division I batteries and provide dc power. The only actions required are to deploy the FLEX diesel generator, plug it into a receptacle, and start the diesel generator and that the current SBO procedure demonstrates that a similar action can be performed in four hours. The licensee stated that this action becomes critical at approximately 12 hours event time when the batteries reach the point of depletion.

On pages 43 and 44 of the Integrated Plan the licensee discussed providing power to MRC lighting and also to Battery Room ventilation exhaust fans using the FLEX electrical generator supplying the battery charger and the dc distribution system.

On page 19 of the Integrated Plan, the licensee stated the SPC pumps will be powered directly from a FLEX electrical generator positioned at grade outside the Auxiliary Building and that should this the preferred connection be inaccessible, an alternate connection will be established by routing cables through doors on the east side of the Auxiliary Building. The motors are to be powered directly and not through the normal starting logic. The licensee stated that the SPC pump motors require 227 amps at 100% load and 1195.2 amps locked rotor. These conditions have been assumed in determining the DG size of 200 kW with a peak motor starting of at least 994 kVA.

On pages 6, 19 and 20 of the Integrated Plan and during the audit process, the licensee discussed the deployment of a FLEX electrical generator to power the FLEX pump motor that will be permanently staged in the G-Tunnel. That pump has been designated FLEX1. The licensee discussed a change to the coping strategy during the audit process, the FLEX pump to be deployed to the SSW tooling tower basin, FLEX2, will be a diesel engine driven pump and not the electric motor driven pump discussed in the Integrated Plan.

On page 25 of the Integrated Plan the licensee stated that in the final phase the pump motor for the B RHR pump, the Division II SSW cooling tower fans, system valves and support equipment would be powered from the ENS-SWGO1B bus utilizing a 4160 Vac FLEX electrical generator. The licensee stated that FLEX generator with a capacity greater than 1,000 kW is required.

During the audit process, the licensee discussed methodology used to determine the sizes of the FLEX electrical generators and included calculation G13.18.3.6-023, FLEX Strategy – Portable Diesel Generator Sizing, Revision 0. That calculation presented the results of the sizing calculations for the FLEX electrical generators supporting the transition and final phase strategies. The three 480 Vac generators used during the transition phase power the SPC pump, the station battery chargers and dc distribution system and FLEX pump FLEX1 and one 480 Vac generator and one 4,160 Vac generator during the final phase. The licensee stated that calculation G13.18.3.6-023 develops the critical performance characteristics that must be met for each electrical generator. These include the running and motor starting kW, kVA and reactive loads including margin for each generator. The licensee stated that an additional 15 kVA at 0.8 power factor was added to each generator capacity to account for accessories, lighting and fans that may be added by operators. The licensee stated that the final sizing of FLEX electrical generators would be included in a future six-month update. The licensee needs to provide supporting analyses relating to the final size/loading of FLEX generators. This has been identified as Confirmatory Item 3.2.4.8.A in Section 4.2.

During the audit process, the licensee stated appropriate controls for equipment will be implemented to ensure conformance with NEI 12-06, Section 3.2.2, Guideline (13). However, the primary goal of FLEX generators is to power components credited for the coping strategy and not to protect Class 1E equipment. The licensee stated that at the onset of the ELAP, Class 1E emergency diesel generators (EDG) are assumed to be unavailable and that portable FLEX generators are used for transition and final phases. At the point when ELAP mitigation strategies require tie-in of FLEX generators, in addition to existing electrical interlocks, procedural controls such as inhibiting EDG start circuits and circuit breaker rack outs will be employed to prevent simultaneous connection of both the FLEX generators and the Class 1E EDGs to the same ac distribution system or component. These circuit breakers include the EDG breakers and offsite feeder breakers. Additionally, repowering the Class 1E electrical busses from either FLEX generators or subsequently the Class 1E EDGs will be accomplished manually and controlled by procedure; no automatic sequencing or automatic repowering of the busses will be utilized. The licensee stated that coping strategies, including the transition from installed sources to portable sources and vice versa will be addressed in FLEX procedures and guidance that are in the development stage.

The licensee provided single line electrical diagrams of the 480 Vac and the Start Up Electrical Distribution during the audit process. The licensee has not yet provided the final single line diagrams showing the proposed connections of FLEX transition and final phase electrical equipment to the permanent plant equipment. This has been identified as Confirmatory Item 3.2.4.8.B in Section 4.2, below.

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

3.2.4.9 Portable Equipment Fuel.

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

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

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

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

A review was made of the Integrated Plan for the coping strategies addressing the fuel supply for portable/FLEX equipment.

On page 50 of the Integrated Plan, the licensee stated that two (2) fuel trailers would be provided for the transportation for fuel for FLEX pumps and electrical generators.

During the audit process, the licensee stated that the main source of fuel oil for FLEX equipment is the EDG Fuel Oil Storage Tanks. The total diesel fuel consumption for all FLEX equipment during the initial 72 hours is 10,146 gallons. As stated in the RBS Operating License Technical Specification, Limiting Condition for Operation 3.8.3 Condition A, the minimum volume of fuel oil available in each of the three underground fuel oil storage tanks is 38,996 gallons. The licensee stated that fuel oil will be transported in 200 gallon fuel tanks mounted on a trailer. The primary strategy involves repowering the installed fuel oil transfer pump, EGF-P1B, to fill the 200 gallon trailer mounted tank from underground storage. The licensee identified an alternate strategy utilizing an electric-driven portable pump and hose to fill the trailer mounted tank. The trailer will be towed using a super duty pickup truck to the refueling staging area. Fuel will be pumped from the trailer mounted tank to the diesel engine driven FLEX equipment by an electric fuel pump on the trailer. The licensee stated that the fuel haul path traverses the same area as the FLEX equipment haul path and that flooding concerns are addressed in the haul path feasibility evaluation. Fuel is provided by the RRC after existing on-site sources of fuel are exhausted, which coordinates delivery.

The licensee stated that the quality of fuel oil in the EDG Fuel Oil Storage Tanks is maintained in accordance with the Diesel Fuel Oil Testing Program required by RBS Operating License Technical Specification Administrative Program 5.5.9. The licensee stated that the fuel oil in the fuel tanks of the portable engine driven FLEX equipment will be maintained in the Preventive Maintenance Program in accordance with the manufacturer's guidance and existing site maintenance practices.

During the audit process, the licensee discussed the rate of fuel consumption by FLEX diesel engine driven pumps and by FLEX electrical generators. The licensee stated that the total hourly rate fuel consumption is 55.7 gallons per hour. The licensee also stated that, given the size of their associated fuel tanks, the three (3) FLEX diesel driven electrical generators used to provide power to the dc distribution system, provide power to the SSW FLEX pump designated FLEX1, and to provide power to the SPC pump would each need to be refueled approximately every 14 hours. The diesel engine driven FLEX pump used to pump water from the SSW cooling tower basin to the SFP would need to be refueled approximately every 16 hours; and containment hydrogen igniter diesel generator would need to be refueled every 33 hours.

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

3.2.4.10 Load Reduction to Conserve DC Power.

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

> *Plant procedures/guidance should identify loads that need to be stripped from the plant dc buses (both Class 1E and non-Class 1E) for the purpose of conserving dc power.*
>
> DC power is needed in an ELAP for such loads as shutdown system instrumentation, control systems, and dc backed AOVs and MOVs. Emergency lighting may also be powered by safety-related batteries. However, for many plants, this lighting may have been supplemented by Appendix R and security lights, thereby allowing the emergency lighting load to be eliminated. ELAP procedures/guidance should direct operators to conserve dc power during the event by stripping nonessential loads as soon as practical. Early load stripping can significantly extend the availability of the unit's Class 1E batteries. In certain circumstances, AFW/HPCI /RCIC operation may be extended by throttling flow to

a constant rate, rather than by stroking valves in open-shut cycles.

Given the beyond-design-basis nature of these conditions, it is acceptable to strip loads down to the minimum equipment necessary and one set of instrument channels for required indications. Credit for load-shedding actions should consider the other concurrent actions that may be required in such a condition.

A review was made of the coping strategies to extend station battery lifetime or coping time by reducing dc bus electrical load.

On pages 5 and 53 of the Integrated Plan, the licensee stated that a load shedding from dc busses would be started at one (1) hour event time to extend station battery life. The load shedding requires opening 25 circuit breakers in the MCR and 19 breakers in the Diesel Generator Building. The panels are readily available for operator access in the Control Room and the Diesel Generator Building since it is adjacent to the Control Building. The licensee stated the assumption that operators can perform this action in 15 minutes. Battery life calculations are made in calculation ENTGRB125-CALC-007, Station Division I Battery ENB-BAT01A and Division II Battery ENB-BAT01B Discharge Capacity during Extended Loss of AC Power, Revision 0. The calculation indicates that additional time for this task could be allowed and that a formal validation of the timeline will be performed once the procedural guidance is developed and staffing study is completed.

On pages 6 and 54 of the Integrated Plan, the licensee stated that approximately six (6) hours event time actions would be taken to cross-tie the Division I and II dc bus using new circuit breakers on installed on BYS-SWG01D. The licensee stated that this action is critical to perform before station batteries are depleted at approximately 7.9 hours event time as discussed in calculation ENTGRB125-CALC-007. The licensee discussed the battery cross-tie operation during the audit process stating that before the Division I battery is fully discharged, the Division II battery will be connected to the Division I dc buss and the Division I battery will be disconnected. The licensee stated that a calculation will provide the basis for the extended battery life after the cross-tie evolution.

On pages 7 and 54 of Integrated Plan, the licensee stated that at eight (8) hours event time the portable FLEX electrical generator would be deployed and connected to Division I battery charger through installed connection point to begin recharging of station batteries and to provide power to the dc distribution system. The licensee stated that the actions required are to deploy the FLEX diesel generator, plug it into a receptacle, and start the diesel generator. The current SBO procedure demonstrates that a similar action can be performed in four (4) hours and that this action becomes critical when the Division II batteries, which are aligned to the Division I bus deplete at approximately 12 hours event time. The licensee stated that a formal validation of the timeline will be performed once the procedure guidance is developed, required modifications are implemented and related staffing study is completed.

During the audit process, the licensee discussed the required dc loads for coping strategies to maintain core, containment and SFP cooling, the sequence of adding loads onto the dc distribution system and dc load profiles. The licensee discussed calculations G13.18.3.6*021, DC System Analysis, Methodology & Scenario Development, Revision 1, E-143, Standby Battery ENB-BAT01A Duty Cycle, Current Profile and Size Verification, Revision 11 and E-144, Standby Battery ENB-BAT01B Duty Cycle, Current Profile and Size Verification, Revision 7. The licensee stated that the station battery chargers are current limiting and according to the calculations E-143 Revision 11 and E-144 Revision 7, the recharge time for the battery ENB-

BAT01A is 10.74 hours and ENB-BAT01B is 10.39 hours with normal dc loads on the battery charger.

The licensee also stated that the minimum dc bus voltage has not yet been finalized but will be provided in a future six-month update. This has been identified as Confirmatory Item 3.2.4.10.A in Section 4.2, below.

The licensee provided the minimum switchgear and battery voltages for the current design basis, calculated based on minimum bus voltage of 105.0 Vdc at ENB-MCC1 per calculation G13.18.2.3*327 Revision 0 as follows: The minimum bus voltage at switchgear ENB-SWG01A is 105.836 Vdc, the minimum terminal voltage at ENB-BAT01A is 106.742 Vdc and the minimum terminal voltage at ENB-BAT01B is 111.070 Vdc. The licensee also stated that the draft calculation is based on the calculated voltages of ENB-MCC1, ENB-SWG01A and ENB-BAT01A during a simultaneous actuation of RCIC MOVs E51-MOVF013 and E51-MOVF045 in conjunction with the minimum voltage of 105.0 Vdc at ENB-MCC1 to determine the minimum voltage at switchgear ENB-SWG01A and the minimum Division I battery ENB-BAT01A terminal voltage. Likewise the same methodology is used to determine the minimum Division II battery ENB-BAT01B terminal voltage and switchgear ENB-SWG01B bus voltage.

During the audit process, the licensee stated that in regard to the Extended Battery Duty Cycle Generic Concern (ADAMS Accession No. ML13241A188), RBS confirms that the FLEX strategy station battery run-time was calculated in accordance with IEEE-485 methodology using manufacturer discharge test data applicable to the licensee's FLEX strategy as outlined in the NEI white paper on Extended Battery Duty Cycles (ADAMS Accession No. ML13241A186). The detailed RBS calculations, supporting vendor discharge test data, FLEX strategy battery load profile and other inputs and initial conditions required by IEEE-485 will be available on the RBS ePortal. The licensee stated that the time margin between the calculated station battery run-time for the FLEX strategy and the expected deployment time for FLEX equipment to supply the dc loads has not yet been finalized.

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

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and 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 load reduction to conserve power if these requirements are implemented as described.

3.3 PROGRAMMATIC CONTROLS

3.3.1 Equipment Maintenance and Testing.

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

> In order to assure reliability and availability of the FLEX equipment required to meet these capabilities, the site should have sufficient equipment to address all functions at all units on-site, plus one additional spare, i.e., an N+1 capability, where "N" is the number of units on-site. Thus, a two-unit site would nominally have at least three portable pumps, three sets of portable ac/dc power supplies,

three sets of hoses & cables, etc. It is also acceptable to have a single resource that is sized to support the required functions for multiple units at a site (e.g., a single pump capable of all water supply functions for a dual unit site). In this case, the N+1 could simply involve a second pump of equivalent capability. In addition, it is also acceptable to have multiple strategies to accomplish a function (e.g., two separate means to repower instrumentation). In this case the equipment associated with each strategy does not require N+1. The existing 50.54(hh)(2) pump and supplies can be counted toward the N+1, provided it meets the functional and storage requirements outlined in this guide. The N+1 capability applies to the portable FLEX equipment described in Tables 3-1 and 3-2 (i.e., that equipment that directly supports maintenance of the key safety functions). Other FLEX support equipment only requires an N capability.

NEI 12-06, Section 11.5 states:

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

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

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

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

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

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

    a. The unavailability of installed plant equipment is controlled by existing plant processes such as the Technical Specifications. When installed plant equipment which supports FLEX strategies becomes unavailable,

[1] Testing includes surveillances, inspections, etc.

then the FLEX strategy affected by this unavailability does not need to be maintained during the unavailability.

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

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

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

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

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

A review was made of the licensee's plans for development and implementation of a program for equipment maintenance, testing and unavailability control.

On page 10 of the Integrated Plan, the licensee stated that RBS will implement an administrative program for implementation and maintenance of the FLEX strategies in accordance with NEI 12-06 guidance and that RBS will utilize the standard EPRI industry Preventative Maintenance (PM) process for establishing the maintenance and testing actions for FLEX components. The administrative program will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines. The equipment for mitigation of an ELAP will have unique identification numbers. Installed structures, systems and components pursuant to 10CFR50.63(a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout and that RBS will follow the current programmatic control structure for existing processes such as design and procedure configuration.

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

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

During the audit process, the licensee stated that RBS will utilize the EPRI Report entitled "Nuclear Maintenance Applications Center: Preventive Maintenance Basis for FLEX Equipment" and will utilize 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, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01 and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to maintenance and testing, if these requirements are implemented as described.

3.3.2 Configuration Control.

NEI 12-06, Section 11.8 provides that:

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

A review was made of the licensee's plans for development and implementation of a program for configuration control.

On page 10 of the Integrated Plan, the licensee stated that RBS will implement an administrative program for implementation and maintenance of the FLEX strategies in accordance with NEI 12-06 guidance. The equipment used for mitigation of an ELAP will have unique identification numbers. Installed structures, systems and components pursuant to 10CFR50.63 (a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout. RBS will follow the current programmatic control structure for existing processes such as design and procedure configuration.

The licensee's plans for development and implementation of a configuration control process for the strategies and bases provides reasonable assurance that it will conform to NEI 12-06 guidance for configuration control.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable

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

3.3.3 Training.

NEI 12-06, Section 11.6 provides that:

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

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

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

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

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

A review was made of the licensee's plans for development and implementation of a training program addressing FLEX.

On page 11 of the Integrated Plan, the licensee stated training of station staff and emergency response personnel will be performed in 2015, prior to the RBS design implementation and that the training will be implemented in accordance with the Systematic Approach to Training.

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

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

3.4 OFF SITE RESOURCES

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

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

A review was made of the licensee's plans for interface with the RRC during the final phase of an ELAP.

On page 11 of the Integrated Plan, the license stated that the industry will establish two RRCs to support utilities in response to BDBEEs. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. The licensee states that communications will be established between the SSES and the SAFER team and required equipment will be mobilized as needed. The licensee stated that equipment initially will be moved from an RRC to a local staging area, established by the SAFER team and the utility and that the equipment will be prepared at the staging area prior to transportation to the site. The licensee states that first arriving equipment will be delivered to the site within 24 hours from the initial request.

On page 25 of the Integrated Plan, the licensee discussed the equipment provided by the RRC for maintaining core and containment cooling during the final phase. The licensee listed this equipment and commodities on pages 51 and 52 of the Integrated Plan. The licensee also discussed the calculations used to size the FLEX RRC equipment during the audit process.

On page 27 of the Integrated Plan the licensee stated that Phase 3 equipment will be provided by the Regional Response Center (RRC) which is to be located in Memphis, TN. Equipment such as pumps and generators transported to the site will be either immediately staged at the point of use location or temporarily stored at lay down area until moved to the point of use area and that identified deployment paths will be used to move equipment as necessary.

However, the licensee does not address Considerations 2 thru 10 of NEI 12-06, Section 12.2. Therefore the information available at this time is not sufficient to conclude that the specifications of NEI 12-06, Section 12.2 will be met. This has been identified as Confirmatory Item 3.4.A 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 offsite resources if these requirements are implemented as described.

4.0 OPEN AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

Item Number	Description	Notes
none		

4.2 CONFIRMATORY ITEMS

Item Number	Description	Notes
3.1.3.1.A	Confirmation that the 2,700 foot separation distance between FLEX storage facilities will be sufficient is dependent on the local tornado data and the actual separation distance and axis that a single tornado would not impact both locations	
3.2.1.1.A	From the June 2013 position paper, benchmarks must be identified and discussed which demonstrate that MAAP is an appropriate code for the simulation of an ELAP event at RBS.	
3.2.1.1.B	MAAP Analysis - collapsed level must remain above Top of Active Fuel (TAF) and the cool down rate must be within technical specification limits.	
3.2.1.1.C	MAAP must be used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper.	
3.2.1.1.D	In using MAAP, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP Application Guidance, Desktop Reference for Using MAAP Software, Revision 2" (EPRI Report 1020236). This should include response at a plant-specific level regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested	

	key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included. a. Nodalization b. General two-phase flow modeling c. Modeling of heat transfer and losses d. Choked flow e. Vent line pressure losses f. Decay heat (fission products / actinides / etc.)	
3.2.1.1.E	The specific MAAP analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan must be identified and should be available on the ePortal for NRC staff to view. Alternately, a comparable level of information may be included in the supplemental response. In either case, the analysis should include a plot of the collapsed vessel level to confirm that TAF is not reached (the elevation of the TAF should be provided) and a plot of the temperature cool down to confirm that the cool down is within technical specifications limits.	
3.2.1.2.A	During the audit process, the licensee stated that 66 gpm recirculation pump seal leakage was assumed in the ELAP analysis, but the details of the seal qualification tests, the seal leakage rate models and supporting test data and any conservative margin were not described within the Integrated Plan or otherwise provided.	
3.2.1.4.A	Complete the seismic evaluation of SPC system components, the Spent Fuel Pool cooling piping and the battery bus crosstie electrical cabinet that are used to support FLEX coping strategies.	
3.2.1.4.B	The licensee has not discussed the design allowable minimum system pressure required to open the SRVs in relation to the RPV pressure during the depressurization and the RPV fill evolution.	
3.2.1.4.C	The licensee has not discussed the effect of passing liquid phase water through the SRV tail pipe on the allowable stresses in the tail pipe, the tail pipe supports, the quencher and the quencher supports.	
3.2.1.7.A	The licensee has not identified the approach specified by NEI 12-06 Table 3-1 and Appendix C, Table C-3 for supplying makeup to the UCP when it is being used for fuel storage during refueling.	
3.2.1.8.A	RBS has not included the ability to use portable pumps to provide RPV makeup as a means to provide diverse capability beyond installed equipment.	
3.2.3.A	The licensee has not yet completed the MAAP analysis which demonstrates that containment functions are maintained in all phases of an ELAP, with particular regard to the qualification of drywell penetrations and seals at elevated temperatures.	
3.2.3.B	Confirm that the 209 degrees Fahrenheit suppression pool temperature over the 185 degrees Fahrenheit design limit does not adversely impact the structural integrity of the containment.	

3.2.4.4.A	Plant communications during an ELAP was not discussed in the Integrated Plan or the audit process. Follow-up of commitments made in the communications assessment (ADAMS Accession No. ML13130A068) is required.	
3.2.4.8.A	Confirm that supporting analyses related to the final size/loading of FLEX generators is provided.	
3.2.4.8.B	Confirm that Final Single Line Diagrams showing the proposed connections of FLEX Phase 2 and 3 electrical equipment to the permanent plant equipment are provided.	
3.2.4.10.A	Confirm that the final minimum dc bus voltage is provided.	
3. 4.A	Considerations in Using Offsite Resources – The licensee has not yet confirmed that the final strategies for receiving offsite resources conform to the guidance in NEI 12-06, Sections 5.3.4, 6.2.3.4, 7.3.4, 8.3.4, and 12.2.	