Mega-Tech Services, LLC

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

Revision 0

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NextEra Energy Seabrook, LLC
Seabrook Station
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Technical Evaluation Report

Seabrook Station
Order EA-12-049 Evaluation

1.0 BACKGROUND

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

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

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

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

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

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

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

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

2.0 EVALUATION PROCESS

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

- Spent Fuel Pool 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 stated 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 26, 2013, (ADAMS Accession No. ML13063A438), and as supplemented by the first six-month status report in letter dated August 28, 2013 (ADAMS Accession No. ML13247A178), NextEra Energy Seabrook, LLC (the licensee or NextEra Energy) provided the Overall Integrated Plan for Seabrook Station (Seabrook) for compliance with Order EA-12-049. The Integrated Plan describes the strategies and guidance under development for implementation by NextEra Energy for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the NRC staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the 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.

The licensee's plan for development and implementation of mitigating strategies relies on a pre-installed supplemental emergency power supply (SEPS) in the Initial Response Phase, or Phase 1, of an ELAP event to repower a 4160V emergency bus to provide power to installed systems and components. In its Integrated Plan, the licensee presented the use of SEPS as being in conformance with the guidance of NEI 12-06 as endorsed by JLD-ISG-2012-01.

The reviewer notes that reliance solely on the SEPS as described in the plan does not meet the guidance in NEI 12-06. During the audit, the licensee stated that it understands the use of SEPS as described is an alternate approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for compliance with EA-12-049. During the audit, the licensee stated that it intends to supplement the reliance on the SEPS with two portable diesel-driven pumps (PDDPs), which will be managed in conformance with the endorsed guidance of NEI 12-06 for mitigating strategies equipment, as well as identifying connection points that will be amenable to the standard connections for the off-site resources for fluid systems. This approach should be considered an acceptable alternative for compliance with EA-12-049, pending the resolution of Confirmatory and Open Items identified below, because it provides improvements in safety using installed structures, systems, and components (SSCs) coupled with the availability of portable equipment for the contingency of failure of those SSCs to perform their functions, such that the overall safety improvement is the equivalent of conformance to the endorsed guidance.

The reviewer notes that this approach places a greater reliance on the current knowledge of external hazards, which are being re-evaluated pursuant to the 10 CFR 50.54(f) request for additional information issued by the NRC March 12, 2012 for the seismic and flooding hazards as well as the re-evaluations to be conducted of other external hazards pursuant to Section 402 of Public Law 112-074, "Consolidated Appropriations Act," which mandates that the NRC require licensees to reevaluate the seismic, tsunami, flooding, and other external hazards at their sites against current applicable Commission requirements and guidance for such licenses as expeditiously as possible, and thereafter when appropriate. As a result, changes in the knowledge of the external hazards may warrant modifications to the level of protection afforded the SEPS.

3.1 EVALUATION OF EXTERNAL HAZARDS

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

3.1.1 Seismic Events.

NEI 12-06, Section 5.2 states:

> All sites will address BDB [beyond-design-basis] seismic considerations in the

implementation of FLEX strategies, as described below. The basis for this is that, while some sites are in areas with lower seismic activity, their design basis generally reflects that lower activity. There are large, and unavoidable, uncertainties in the seismic hazard for all U.S. plants. In order to provide an increased level of safety, the FLEX deployment strategy will address seismic hazards at all sites.

These considerations will be treated in four primary areas: protection of FLEX equipment, deployment of FLEX equipment, procedural interfaces, and considerations in utilizing off-site resources.

On page 1 of 60 of the Integrated Plan, the licensee stated that Seabrook screens in for seismic events and that the safe shutdown earthquake (SSE) has a peak ground accelerations of 0.25g horizontal and 0.167g vertical.

On page 58 of 60 of the Integrated Plan, in the list of pending actions, the licensee indicated that the new ground motion response spectrum (GMRS) data will not be available until the seismic hazard reevaluation is conducted in accordance with Recommendation 2.1 of the 10 CFR 50.54(f) letter of March 12, 2012.

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.

The licensee plans to utilize the 10 CFR 50.54(hh)(2), B.5.b portable diesel driven pump (PDDP) as a strategy to inject into the SGs and the RCS. However, the licensee's Integrated Plan did not include information on the protection of the PDDPs and hose trailers, as conforming to the FLEX equipment storage considerations listed above. During the audit, the licensee was requested to provide additional details to demonstrate protection of the PDDPs and hose trailers to show conformance to the FLEX equipment storage considerations listed above.

In response, the licensee stated that Seabrook has two PDDPs and associated hose trailers stored in the non-seismic, non-missile protected B.5.b building located outside the plant-protected area that is weather protected and above the flood plain. The licensee initially stated that the strategy for feeding the SGs and the RCS with a PDDP is a backup or secondary capability to the guidelines of NEI 12-06, and are governed by existing severe accident management guidelines (SAMGs) rather than responsive to EA-12-049. The licensee also initially stated that since the use of the PDDP is considered a backup or secondary strategy (i.e., the PDDP is neither N nor N+1 equipment), protection from the BDBEE is not required for conformance with NEI 12-06, Sections 11.3.2 and 11.3.3. After further audit discussions with the NRC staff on the requirements of EA-12-04 to include a capability to mitigate a loss of all ac power, the licensee stated that it would provide seismic protection for the PDDPs and hose trailers in conformance with NEI 12-06. This is identified as Confirmatory Item 3.1.1.1.A in Section 4.2.

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

As discussed in Section 3.1.1.1 of this technical evaluation report, the licensee relies on the 10 CFR 50.54(hh)(2) B.5.b PDDPs for a strategy to inject into the SGs and the RCS. However, the licensee's plan does not discuss the movement of the PDDPs, including the necessary support equipment (hoses, fittings, nozzles, etc.), from the storage location to its deployment location in regards to the potential for soil liquefaction following a severe seismic event. During the audit, the licensee was requested to provide additional information on deployment with regard to the potential for soil liquefaction. In response, the licensee stated that Seabrook is a bedrock site and soil liquefaction is not an issue with respect to identified deployment pathways for the PDDPs and hose trailers, as well as the regional response center (RRC) equipment.

On pages 22 and 23 of 60 of the Integrated Plan, with regard to the protection of connections for RCS cooling and heat removal during the final phase, the licensee stated that the connection points for portable diesel generators (DGs) from the offsite to the 4160V emergency buses are physically located inside the essential switchgear rooms which are part of the seismic category 1 control building.

The licensee's Integrated Plan did not discuss the protection of a connection for the PDDP, as well as access to the connection. Confirmation that at least one connection point for the PDDP is protected from a seismic event (includes access to the connection point and areas the operators will have to access to deploy or control the PDDP) is identified as Confirmatory Item 3.1.1.2.A in Section 4.2.

On page 60 of 60 of the Integrated Plan describing the service water cooling tower, the licensee stated that service water cooling tower is a safety-related standby UHS that is a seismic category 1 structure.

On pages 54 and 55 of 60 of the Integrated Plan, the licensee provided an extensive list of vehicles and heavy equipment available for BDBEE debris removal of which several could provide the means to move the PDDP and hose trailer, but did not discuss protection of this means from the seismic event. During the audit, the licensee was requested to provide additional information to show conformance with consideration 5 above for reasonable protection of the tow vehicle.

In response, the licensee stated that the vehicles listed in the Integrated Plan were stored at various locations outside the protected area, all at least 1200 feet from the SEPS. After further audit discussions with the NRC staff on the requirements of EA-12-04 to include a capability to mitigate a loss of all ac power, the licensee indicated that a means to move the FLEX equipment would be provided that is also reasonably protected from the event. Confirmation that a tow vehicle for FLEX equipment movement is reasonable protected from a seismic event is identified as Confirmatory Item 3.1.1.2.B in Section 4.2.

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

The Integrated Plan did not contain any information in regards to consideration 1 above. During the audit, the licensee was requested to provide a discussion on conformance to consideration 1.

In response, the licensee stated that they will develop a method for obtaining local readings for the 12 critical parameters identified on page 12 of 60 of the Integrated Plan and include the information in emergency operating procedures (EOPs), SAMGs, or flex support guidelines (FSGs) as appropriate. This action will be reflected in the February 2014 six-month update. This is identified as Confirmatory Item 3.1.1.3.A in Section 4.2.

The licensee's plan did not contain any information in regards to consideration 2 above on impacts from large internal flooding sources that are not seismically robust and do not require ac power. During the audit, the licensee was requested to provide a discussion on conformance to consideration 2.

In response, the licensee stated that large internal flooding sources are not an issue at Seabrook. The sources of concern such as the refueling water storage tank (RWST), boric acid storage tanks (BASTs), reactor makeup water storage tank (RMWST), and the spray additive tank, are contained in seismic category 1 structures, and any large bore piping connecting these water sources to safety-related equipment is seismically supported and contained within the seismic category 1 structure.

The licensee's plan did not contain any information in regards to consideration 3 above on whether the site utilizes ac power to mitigate groundwater in critical locations and the potential need to develop a strategy for this consideration. During the audit, the licensee was requested to discuss the applicability of consideration 3 to Seabrook.

In response, the licensee stated that site grade is at elevation 20 feet mean sea level (MSL) and anticipated elevation of flood water (ponding) during the standard project storm (SPS)/ probable maximum hurricane (PMH) storm is 20.6 feet MSL. Wave run-up that can accompany the combined SPS and PMH is estimated to achieve an elevation of 21.8 feet MSL on the east and south wall of specific site buildings for a short duration of approximately 1-2 hours. Given the short duration of both wave run-up and ponding for the Seabrook design basis flood, groundwater in-leakage from flood waters is not a concern with respect to the Seabrook design basis flood.

There are no downstream dams that could impact Seabrook. The licensee's Integrated Plan relies on the use of the service water cooling tower as a backup UHS. On page 60 of 60 of the Integrated Plan describing the service water cooling tower, the licensee stated that service water cooling tower is a safety-related standby UHS that is a seismic category 1 structure.

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

3.1.1.4 Considerations in Using Offsite Resources – Seismic Hazard

NEI 12-06, Section 5.3.4 states:

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

On page 9 of 60 of the Integrated Plan, the licensee stated that the Strategic Alliance for FLEX Emergency Response (SAFER) will be establishing RRCs for the acquisition, maintenance, and deployment of portable FLEX equipment for response to BDBEEs. As currently planned, each RRC will hold five (5) sets of equipment, four (4) of which will be fully deployable when requested. As part of Phase 3 event response, equipment will be moved from an RRC to a local assembly area established by the SAFER team and the utility. Communications will be established between Seabrook and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the site's SAFER Response Plan (playbook), will be delivered to the site's staging area within 24 hours from the initial request. Confirmation of RRC local staging area, evaluation of access routes, and method of transportation to the site is identified as Confirmatory Item 3.1.1.4.A in Section 4.2.

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

The licensee's screening for flooding hazards, as presented in their Integrated Plan, has screened in this external hazard. On page 2 of 60 of the Integrated Plan, the licensee stated that Seabrook screens in for external flooding events and that the current licensing basis for flood protection includes the ability to withstand the effects of a combined SPS and PMH. It also must consider the effects of wave run-up during the SPS / PMH storm.

On page 59 of 60 of the Integrated Plan, in the list of pending actions, the licensee indicated that the site flooding re-evaluation has not been completed in accordance with Recommendation 2.1 of the 10 CFR 50.54(f) letter of March 12, 2012.

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 flooding hazards, if these requirements are implemented as described.

3.1.2.1 Protection of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.1 states:

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

As previously mentioned, the licensee plans to utilize the 10 CFR 50.54(hh)(2), B.5.b portable diesel driven pump (PDDP) as a strategy to inject into the SGs and the RCS. However, the licensee's Integrated Plan did not include information on the protection of the PDDPs and hose trailers, as conforming to the FLEX equipment storage considerations listed above. During the audit, the licensee was requested to provide additional details to demonstrate protection of the PDDPs and hose trailers to show conformance to the FLEX equipment storage considerations listed above.

In response, the licensee stated that Seabrook has two PDDPs and associated hose trailers stored in the B.5.b building located outside the plant-protected area that is above the flood plain and therefore provides protection of the PDDPs during storage from the flooding hazard.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to protection of FLEX equipment from flooding hazards, 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 deployment. For example, the portable pump could be connected, tested, and readied for use prior to the arrival of the critical flood level. Further, protective actions can be taken to reduce the potential for flooding impacts, including cooldown, borating the RCS [reactor coolant system], isolating accumulators, isolating RCP [reactor coolant pump] seal leak off, obtaining dewatering pumps, creating temporary flood barriers, etc. These factors can be credited in considering how the baseline capability is deployed.
>
> 2. The ability to move equipment and restock supplies may be hampered during a flood, especially a flood with long persistence. Accommodations along these lines may be necessary to support successful long-term FLEX deployment.
>
> 3. Depending on plant layout, the ultimate heat sink may be one of the first functions affected by a flooding condition. Consequently, the deployment of the FLEX equipment should address the effects of LUHS, as well as ELAP.
>
> 4. Portable pumps and power supplies will require fuel that would normally be obtained from fuel oil storage tanks that could be inundated by the flood or above ground tanks that could be damaged by the flood. Steps should be considered to protect or provide alternate sources of fuel oil for flood conditions. Potential flooding impacts on access and egress should also be considered.
>
> 5. Connection points for portable equipment should be reviewed to ensure that they remain viable for the flooded condition.
>
> 6. For plants that are limited by storm-driven flooding, such as Probable Maximum Surge or Probable Maximum Hurricane (PMH), expected storm conditions should be considered in evaluating the adequacy of the baseline deployment strategies.
>
> 7. Since installed sump pumps will not be available for dewatering due to the ELAP, plants should consider the need to provide water extraction pumps capable of operating in an ELAP and hoses for rejecting accumulated water for structures required for deployment of FLEX strategies.
>
> 8. Plants relying on temporary flood barriers should assure that the storage location for barriers and related material provides reasonable assurance that the barriers could be deployed to provide the required protection.
>
> 9. A means to move FLEX equipment should be provided that is also reasonably protected from the event.

On page 10 of 60 of the Integrated plan, the licensee stated that for a BDBEE with significant warning such as a hurricane or severe winter storm it's also possible that the plant will already be shutdown in Mode 3 or Mode 4 in accordance with the abnormal operating procedure (AOP) for severe weather conditions, at the time the event occurs.

On page 38 of the Integrated Plan, in regards to Phase 2 portable equipment, the licensee lists a 500 – 1000 gallon capacity trailer-mounted fuel tank with an on-board suction pump with 75 feet of suction hose to transfer fuel from the emergency diesel generator (EDG) fuel oil storage tanks to the trailer-mounted tank.

During the audit, the licensee stated that another source of diesel fuel for the PDDP or other portable equipment not described in the Integrated Plan is the fuel oil day tanks for the EDGs. The 1500-gallon storage tanks can be used as a supply of fuel for portable diesel-driven equipment via 5-gallon fuel cans filled from the tank drain lines. This fueling strategy is described in emergency plan supplemental technical material.

On page 19 of 60 of the Integrated Plan in regards to protection of connections for RCS cooling and heat removal during the transition phase, the licensee stated that connection to the EDG fuel oil storage tank drain lines for transfer of fuel to a portable refueling trailer are protected by the seismic category 1, flood and missile-protected diesel generator building.

On pages 22 and 23 of 60 of the Integrated Plan, in regards to protection of connections for RCS cooling and heat removal during the final phase, the licensee stated that the connection points for portable DGs from the RRC to the 4160V emergency buses are physically located inside the essential switchgear rooms which are part of the control building. On page 19 of the Integrated Plan, the licensee stated that the control building was flood protected.

During the audit, the licensee was requested to discuss the PDDPs and hose trailers in regards to deployment considerations in a flooding hazard. In response, the licensee stated that Seabrook's design basis flood is a short duration event (1 – 2 hours) where some wave over-topping of the seawall on the south side of the plant is expected to occur with resultant wave run-up on the south wall of specific buildings. Additionally, the maximum ponding expected to occur is 6 inches above site grade and this amount of ponded water would not significantly impact the deployment of the portable equipment. The licensee stated that identified connection points for the PDDP are located above the design basis flood plain.

The licensee further stated that the design basis flood for Seabrook requires no mitigating actions (e.g., sandbag or stop log installation); consequently, no temporary flood barriers or de-watering pumps would be required to respond to the flooding event.

On page 60 of the Integrated Plan, the licensee stated that the service water cooling tower is a safety-related standby UHS that is flood protected.

On pages 54 and 55 of 60 of the Integrated Plan, the licensee provided an extensive list of vehicles and heavy equipment available for BDBEE debris removal, of which several could provide the means to move the PDDP and hose trailer, but did not discuss protection of this means from the flooding event. During the audit, the licensee was requested to provide additional information to show protection of the tow vehicle.

In response, the licensee the licensee stated that the vehicles listed in the Integrated Plan were stored at various locations outside the protected area, all at least 1200 feet from the SEPS. After further audit discussions with the NRC staff on the requirements of EA-12-04 to include a capability to mitigate a loss of all ac power, the licensee indicated that a means to move the FLEX equipment would be provided that is also reasonably protected from the event. Confirmation that a tow vehicle for FLEX equipment movement is reasonable protected from a flooding event is combined with Confirmatory Item 3.1.1.2.B in Section 4.2.

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

3.1.2.3 Procedural Interfaces – Flooding Hazard

NEI 12-06, Section 6.2.3.3 states:

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

The licensee failed to discuss consideration 1 above as it relates to the deployment of the PDDP. During the audit, the licensee was requested to discuss consideration 1 as it relates to deployment of the PDDP. In response, the licensee stated that response to the design basis flood for Seabrook requires no mitigating actions (e.g., sandbag or stop log installation) as defined in the AOP for severe weather conditions.

As discussed in Section 3.1.2.2 above, the connection points for FLEX equipment are located above the design basis flood plain and therefore connection points remain the same for flooded vs. non-flooded conditions.

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 flooding hazards, 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.

On page 9 of 60 of the Integrated Plan, the licensee stated that SAFER will be establishing RRCs for the acquisition, maintenance, and deployment of portable FLEX equipment for response to BDBEEs. As currently planned, each RRC will hold five (5) sets of equipment, four (4) of which will be fully deployable when requested. As part of Phase 3 event response, equipment will be moved from an RRC to a local assembly area established by the SAFER team and the utility. Communications will be established between Seabrook and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the site's playbook, will be delivered to the site's staging area within 24 hours from the initial request. Confirmation of RRC local staging area, evaluation of access routes, and method of transportation to the site is previously identified as Confirmatory Item 3.1.1.4.A in Section 4.2.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and subject to the successful closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the 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 1 of 60 of the Integrated Plan, the licensee stated that Seabrook screens in for high wind events with the potential for wind-driven missiles from hurricanes and tornados.

On page 2 of 60, in the section of its integrated plan regarding the determination of applicable extreme external hazards, the licensee stated:

High wind event design basis:
Seabrook is a coastal site and is subject to high wind hazards. Seabrook Station is situated near the 160 mph hurricane contour shown in Figure 7-1 of NEI 12-06. NEI 12-06 Figure 7-2 shows Seabrook to be in Region 2 with a recommended tornado wind speed of 170 mph.

High winds and tornado loadings are discussed in Seabrook Station UFSAR Chapter 3, Section 3.3, 'Wind and Tornado Loadings'. Per UFSAR Section 3.3.1.1, the design wind velocity is 110 mph. Wind loads are applied to all seismic Class 1 structures based on this design wind speed.

UFSAR Section 3.3.2 states that the design tornado has a maximum wind velocity of 360 mph (horizontal rotational wind speed of 290 mph plus translational speed of 70 mph).

The design tornado applied to Seabrook is conservative as NUREG/CR-4461 Rev. 2, Table 6-1, on which NEI 12-06 Figure 7-2 is based, lists Seabrook possible tornado wind speeds from 143 mph to 254 mph depending on the probability level used. Additionally, tornados in coastal New England are extremely rare and of much lower severity than assumed in the UFSAR.

The reviewer compared the location of Seabrook listed in its UFSAR, Section 2.1.1.1 (42° 53' 55.4" N, 070° 50' 58.7" W) with NEI 12-06, Figures 7-1 and 7-2 and verified the results of the licensee's screening.

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 screening for the high winds hazard, if these requirements are implemented as described.

3.1.3.1 Protection of FLEX Equipment - High Winds Hazard

NEI 12-06, Section 7.3.1 states:

These considerations apply to the protection of FLEX equipment from high wind hazards:

1. For plants exposed to high wind hazards, FLEX equipment should be stored in one of the following configurations:

   a. In a structure that meets the plant's design basis for high wind hazards (e.g., existing safety-related structure).

   b. In storage locations designed to or evaluated equivalent to ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures* given the limiting tornado wind speeds from Regulatory Guide 1.76 or design basis hurricane wind speeds for the site.

      - Given the FLEX basis limiting tornado or hurricane wind speeds, building loads would be computed in accordance with requirements of

ASCE 7-10. Acceptance criteria would be based on building serviceability requirements not strict compliance with stress or capacity limits. This would allow for some minor plastic deformation, yet assure that the building would remain functional.

- Tornado missiles and hurricane missiles will be accounted for in that the FLEX equipment will be stored in diverse locations to provide reasonable assurance that N sets of FLEX equipment will remain deployable following the high wind event. This will consider locations adjacent to existing robust structures or in lower sections of buildings that minimizes the probability that missiles will damage all mitigation equipment required from a single event by protection from adjacent buildings and limiting pathways for missiles to damage equipment.

- The axis of separation should consider the predominant path of tornados in the geographical location. In general, tornadoes travel from the West or West Southwesterly direction, diverse locations should be aligned in the North-South arrangement, where possible. Additionally, in selecting diverse FLEX storage locations, consideration should be given to the location of the diesel generators and switchyard such that the path of a single tornado would not impact all locations.

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

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

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

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

The licensee plans to utilize the 10 CFR 50.54(hh)(2), B.5.b PDDP as a strategy to inject into the SGs and the RCS. However, the licensee's plan did not provide any information on the protection of the PDDPs and hose trailers from a high wind event. During the audit, the licensee was requested to discuss protection of the PDDPs and hose trailers in a high wind event.

In response, the licensee stated its strategy for feeding the SGs and the RCS with a PDDP is an additional backup or secondary capability beyond the guidelines of NEI 12-06, and is governed by existing SAMGs. Since the use of the PDDP is considered a backup or alternate strategy (i.e., the PDDP is neither N nor N+1 equipment), protection of the PDDPs and hose trailers from the BDBEE is not required by NEI 12-06 Section 11.3.2 and 11.3.3. The licensee further stated that the PDDPs and associated hose trailers are stored in the B.5.b storage building located outside the protected area and is not designed to protect against wind-driven missiles. After further audit discussions with the NRC staff on the implications of NEI 12-06 relating to the protection of portable FLEX equipment, the licensee decided to consider missile protection for the PDDPs. Confirmation of missile protection of the PDDPs and hose trailers is combined with Confirmatory Item 3.1.1.1.A in Section 4.2.

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

3.1.3.2 Deployment of FLEX Equipment - High Winds Hazard

NEI 12-06, Section 7.3.2 states:

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

On page 10 of 60 of the Integrated Plan, the licensee stated that for a BDBEE with significant warning such as a hurricane or severe winter storm it's also possible that the plant will already be shutdown in Mode 3 or Mode 4 in accordance with OS1200.03, "Severe Weather Conditions," at the time the loss of offsite power occurs.

On page 60 of 60 of the Integrated Plan, the licensee describes the use of the service water cooling tower as a standby UHS that is part of the station design and is a seismic category 1 structure that is flood and missile-protected.

On pages 54 and 55 of 60 of the Integrated Plan, the licensee provided an extensive list of vehicles and heavy equipment available for BDBEE debris removal, of which several could provide the means to move the PDDP and hose trailer, but did not discuss protection of this means from the high wind event. During the audit, the licensee was requested to provide additional information to show protection of the tow vehicle.

In response, the licensee the licensee stated that the vehicles listed in the Integrated Plan were stored at various locations outside the protected area, all at least 1200 feet from the SEPS. After further audit discussions with the NRC staff on the requirements of EA-12-04 to include a capability to mitigate a loss of all ac power, the licensee indicated that a means to move the FLEX equipment would be provided that is also reasonably protected from the event. Confirmation that a tow vehicle for FLEX equipment movement is reasonable protected from a high wind event is combined with Confirmatory Item 3.1.1.2.B in Section 4.2.

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

3.1.3.3 Procedural Interfaces - High Winds Hazard

NEI 12-06, Section 7.3.3, states:

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

On page 10 of 60 in its Integrated Plan, the licensee stated that for a BDBEE with significant warning such as a hurricane or severe winter storm it's also possible that the plant will already be shutdown in Mode 3 or Mode 4 in accordance with procedure OS1200.03, 'Severe Weather Conditions', at the time the loss of offsite power occurs.

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 the high winds hazard, if these requirements are implemented as described.

3.1.3.4 Considerations in Using Offsite Resources – High Winds Hazard

NEI 12-06, Section 7.3.4 states:

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

resources from off-site following a hurricane.

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

On page 9 of 60 of the Integrated Plan, the licensee stated that SAFER will be establishing RRCs for the acquisition, maintenance, and deployment of portable FLEX equipment for response to BDBEEs. As currently planned, each RRC will hold five (5) sets of equipment, four (4) of which will be fully deployable when requested. As part of Phase 3 event response, equipment will be moved from an RRC to a local assembly area established by the SAFER team and the utility. Communications will be established between Seabrook and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the site's playbook, will be delivered to the site's staging area within 24 hours from the initial request. Confirmation of RRC local staging area, evaluation of access routes, and method of transportation to the site is previously identified as Confirmatory Item 3.1.1.4.A in Section 4.2.

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

3.1.4 Snow, Ice and Extreme Cold

As discussed in part in NEI 12-06, Section 8.2.1:

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

On page 1 of 60 of the Integrated Plan, the licensee stated that Seabrook screens in for snow, ice, and extreme cold events.

On page 2 and 3 of 60 of the Integrated Plan, regarding the determination of applicable extreme external hazards, the licensee stated that Seabrook UFSAR Section 2.3.2, 'Local Meteorology,' notes that extremes of temperature are uncommon due to the proximity of the site to the Atlantic Ocean. Winter arctic air masses can produce low minimum temperatures, but the frequency and persistence of such extreme values along the coast is less than inland locations. UFSAR Section 2.3.1 notes that the Seabrook site is subjected not only to storms that track across the continental United States, but also to intense winter storms, (i.e., "Nor'easters,") that move northeastward along the U.S. East coast. During the winter months Nor'easters can produce heavy rain or snowfall, and occasionally bring ice storm conditions to the area. Nor'easter winds are typically less severe than those of postulated hurricanes. Seabrook structures are designed for snow and ice loads.

The reviewer noted that Seabrook is located at latitude 42° 53' 55.4" N, which is north of the 35th

Parallel.

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 snow, ice, and extreme cold hazards, 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.).

As previously stated, the licensee plans to utilize the 10 CFR 50.54(hh)(2), B.5.b PDDP as a strategy to inject into the SGs and the RCS. However, the licensee's plan failed to provide any information on the storage/protection of the PDDPs and hose trailers. During the audit, the licensee was requested to discuss storage/protection of the PDDPs and hose trailers in a snow, ice, and extreme cold event.

In response, the licensee stated that the PDDPs and associated hose trailers are stored in the B.5.b storage building that offers weather protection for the equipment and is heated in the winter. The licensee further stated that the engine cooling systems for the PDDPs have anti-freeze protection down to minus 32 degrees F.

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

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

NEI 12-06, Section 8.3.2 states:

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

As noted in Section 3.1.4.1 above, the PDDPs are capable of operating to minus 32 degrees F.

On page 20 of 60 of the Integrated Plan, the licensee stated that if necessary, debris removal from the Phase 3 portable equipment deployment route will be accomplished using existing site equipment. This debris removal equipment is stored at various site locations, which ensures that an adequate cross-section of equipment will survive the BDBEE. Additionally, the station has a snow-melting machine that is stored inside the protected area during the winter months that can be used in the event that the BDBEE is caused by a severe winter storm. Two 500-gallon diesel fuel oil tanks are also pre-staged in the protected area during the winter to provide fuel for the snow-melting machine and snow removal equipment.

During the audit, the licensee stated that Seabrook also has a contract with an external vendor to assist with site snow removal. This vendor typically pre-stages their snow removal equipment on site during the winter months.

The licensee's Integrated Plan does not discuss the suction source for use of the PDDP. If the suction source comes from a hose taking suction from a water source where ice blocking or frazil icing may interfere with the operation, the strategy should consider this and the necessary equipment made available to ensure success. The licensee was requested to address these concerns during the audit.

In response, the licensee stated that the suction source for the PDDP for SG injection is the seismic category 1, flood and missile protected condensate storage tank (CST), and the suction source for the PDDP for RCS makeup is the fire main. The impact on the UHS as a PDDP suction source is not applicable to Seabrook.

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

3.1.4.3 Procedural Interfaces - Snow, Ice and Extreme Cold Hazard

NEI 12-06, Section 8.3.3 states:

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

The procedural enhancement considerations are addressed in Section 3.1.4.2 above for snow removal and in previous hazard deployment sections discussing towing capability.

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

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

NEI 12-06, Section 8.3.4, states:

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

On page 20 of 60 of the Integrated Plan, the licensee stated that if necessary, debris removal from the Phase 3 portable equipment deployment route will be accomplished using existing site equipment. This debris removal equipment is stored at various site locations, which ensures that an adequate cross-section of equipment will survive the BDBEE.

On page 9 of 60 of the Integrated Plan, the licensee stated that as part of Phase 3 event response, equipment will be moved from an RRC to a local assembly area established by the SAFER team and the utility. Communications will be established between Seabrook and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's 'playbook', will be delivered to the site's staging area within 24 hours from the initial request.

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 off-site resources for snow, ice, and extreme cold hazards, if these requirements are implemented as described.

3.1.5 High Temperatures

NEI 12-06, Section 9.2 states:

All sites will address high temperatures. Virtually every state in the lower 48 contiguous United States has experienced temperatures in excess of 110˚F. Many states have experienced temperatures in excess of 120˚F.

In this case, sites should consider the impacts of these conditions on deployment of the FLEX equipment.

The licensee states on page 3 of its Integrated Plan that Seabrook 'screens out' of the extreme high temperature hazard based upon the following information:

• Contrary to the assertion in Section 9 of NEI 12-06 that "virtually all of the 48 contiguous states have experienced temperatures in excess of 110° F", the record high temperature for the State of New Hampshire is 106 degrees F which was recorded in Nashua, NH in 1911*. Nashua is located in the western part of the state away from the coast.

• Seabrook UFSAR Section 2.3.2, 'Local Meteorology', notes that extremes of temperature are uncommon due to the proximity of the site to the Atlantic Ocean. During the spring and summer a sea breeze usually moderates temperatures from reaching high extremes at the site.

• The highest recorded temperature for Portsmouth, NH, which is located on the seacoast 15 miles north of Seabrook Station, is 101 degrees F which occurred in both 1964 and 2011*.

• The highest average maximum temperatures in Portsmouth, NH during the Summer months of June, July and August from 1960 to 2012 are*:
- June: 80.8°F (1999)
- July: 83.5°F (1994)
- August: 83.7 °F (2002)

*NOAA National Weather Service historical data for the State of New Hampshire.

The licensee provided a reasonable justification for not exceeding the high temperatures stated in NEI 12-06, Section 9.2. However, the licensee should still evaluate the considerations for high temperature on FLEX for the procurement, protection, and deployment as described in Sections 3.1.5.1, 3.1.5.2, and 3.1.5.3 using the UFSAR maximum temperature for the design of equipment. This is identified as Open Item 3.1.5 in Section 4.2.

The reviewer noted that screening out of the high temperature hazard is not in conformance with the endorsed guidance of NEI 12-06, and that conformance with that guidance would merely entail confirming that the portable equipment procured for the mitigating strategies is maintained and will operate within the normal safety-related design limits for outside conditions. The reviewer further noted that the Seabrook UFSAR, Section 2.3.2.1 provides the maximum temperature to be used for the design of equipment at Seabrook as 89°F and documents the maximum 100-year return period temperature as described in the Integrated Plan at 101°F.

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

3.1.5.1 Protection of FLEX Equipment - High Temperature Hazard

NEI 12-06, Section 9.3.1, states:

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

The licensee's Integrated Plan did not address maintenance of storage temperatures within a range to ensure its likely function when called upon. This is identified in Open Item 3.1.5 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 subject to the successful closure of issues related to the Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to protection of FLEX equipment from high temperatures, if these requirements are implemented as described.

3.1.5.2 Deployment of FLEX Equipment - High Temperature Hazard

NEI 12-06, Section 9.3.2 states:

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

The licensee's Integrated Plan did not address procurement requirements on FLEX equipment. This is identified in Open Item 3.1.5 above.

The reviewer concludes that based on the stated maximum temperatures observed, and the UFSAR equipment design temperatures, that expansion of sheet metal or swollen door seals would not constitute an issue for 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 subject to the successful closure of issues related to the Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to deployment of FLEX equipment in high temperatures, 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.

The licensee's Integrated Plan did not discuss addressing the effects of high temperatures on the FLEX equipment. This is identified in Open Item 3.1.5 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 subject to the successful closure of issues related to the Open Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to procedural interfaces for high temperatures, if these requirements are implemented as described.

3.2 PHASED APPROACH

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

To meet these EA-12-049 requirements, licensees will establish a baseline coping capability to prevent fuel damage in the reactor core or SFP and to maintain containment capabilities in the context of a BDBEE that results in the loss of all ac power, with the exception of buses supplied by safety-related batteries through inverters, and loss of normal access to the UHS.

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

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

As discussed in Section 3.0 of this TER, the licensee's approach, as currently understood, constitutes an alternate approach to that found in NEI-12-06. The licensee's description of the approach in the Integrated Plan treats the SEPS as a pre-staged set of portable equipment rather than an installed system. As a result, the Transition Phase (or Phase 2) described in the Integrated Plan for responding to an ELAP does not reflect an actual transition to the use of portable equipment, but instead reflects the transition to the use of the SEPS to repower an Emergency 4160V emergency bus, then to restore various installed systems, such as an RHR pump, two Control Rod Drive Mechanism (CRDM) cooling fans and a Cooling Tower fan later in the response. The transition to the use of the SEPS is to take place within two hours. As Seabrook's SBO analysis demonstrates that they can cope with an SBO of at least four hours without taking credit for the use of the SEPS, the two-hour coping time needed for this event response is not limiting and is bounded by their SBO event response.

In the course of the audit process, the licensee stated that as a contingency for the failure of the SEPS, the PDDPs will be used to provide makeup to the SGs or the RCS as necessary, as is described further in Section 3.2.1.9 of this technical evaluation report. As described in the Memorandum "Supplemental Staff Guidance for Addressing Order EA-12-049 on Mitigation Strategies for Beyond-Design-Basis External Events," dated August 28, 2013 (ADAMS Accession No. ML13238A263), single failure criteria considerations do not apply to the event because of the necessity for prior single failures of safety-related equipment such as emergency power sources. As a result, the scope of review of analyses is limited to exclude the backup functionality provided by the PDDPs.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to RCS core cooling and heat removal, and RCS inventory control strategies.

3.2.1.1 Computer Code Used for the ELAP Analysis

As discussed in Section 3.2.1 of this technical evaluation report, the event response under consideration pursuant to Order EA-12-049 at Seabrook is bounded by the SBO event and no further analysis is needed; therefore no further consideration of the computer code used is required.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the computer code used for ELAP analysis.

3.2.1.2 RCP Seal Leakage Rates

As discussed in Section 3.2.1 of this technical evaluation report, the event response under consideration pursuant to Order EA-12-049 at Seabrook is bounded by the SBO event and no further analysis is needed; therefore no further consideration of RCP seal leakage rates is required.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the RCP seal leakage rates.

3.2.1.3 Decay Heat

As discussed in Section 3.2.1 of this technical evaluation report, the event response under consideration pursuant to Order EA-12-049 at Seabrook is bounded by the SBO event and no further analysis is needed; therefore no further consideration of the decay heat is required.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to decay heat.

3.2.1.4 Initial Values for Key Plant Parameters and Assumptions

As discussed in Section 3.2.1 of this technical evaluation report, the event response under consideration pursuant to Order EA-12-049 at Seabrook is bounded by the SBO event, no further analysis is needed; therefore no further consideration of the initial values for key plant parameters and assumptions is required.

The licensee’s approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the initial values for key plant parameters and assumptions.

3.2.1.5 Monitoring Instrumentation and Controls

NEI 12-06, Section 3.2.1.10 states in part:

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

On page 11 of 60, of the Integrated Plan regarding maintaining core cooling & heat removal, the licensee listed the installed instrumentation credited for the response strategies described in their plan. They included the following parameters:

> The response strategies described in this report ensure that at least one train of safety-related vital instrumentation is available to the control room operators at all times. This instrumentation includes the following:
>
> - Core Exit Thermocouples
> - Pressurizer Level
> - Reactor Vessel Level Indication System (RVLIS)
> - Steam Generator Pressure
> - Reactor Coolant System Wide Range Hot Leg Temperature
> - Reactor Coolant System Wide Range Cold Leg Temperature
> - Reactor Coolant System Wide Range Pressure
> - Steam Generator Narrow Range and Wide Range Level
> - Condensate Storage Tank Level
> - Containment Wide Range Pressure
> - Spent Fuel Pool Level (including new wide range level per NRC Order EA-12-051)
> - Emergency Feedwater Flow

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

3.2.1.6 Sequence of Events

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

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

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

On page 5 and 6 of 60 of the Integrated Plan, the licensee stated that refueling of the SEPS DGs is identified as a time constrained action in the SOE timeline from 36-48 hours into the event. Refueling of the SEPS is discussed in Section 3.2.4.9.

Seabrook has identified that Phase 1 lasts between 1 – 1.5 hours. During the audit, the licensee was requested to discuss how long Phase 1 could be delayed and what is the limiting factor that drives Seabrook into Phase 2.

In response, the licensee stated that the limiting factor that drives Seabrook into Phase 2 is the available water volume in the CST and vital dc battery capacity, both approximately 13 hours. For a seismic event this time is assumed to be 13 hours for CST volume. For other BDBEEs this time is extended to approximately 24 hours for CST volume. However, as indicated on pages 10 and 11 of the Integrated Plan, SEPS is assumed to auto-start and run in idle waiting to be manually connected to 4160V emergency bus E6. The estimate of 1 to 1.5 hours for closing the SEPS breaker is based on the assumed time delay for the operating crew to process through the loss of all ac power procedure. Once the 'B' train 4160V emergency bus is powered, the vital battery chargers and instrumentation inverters are also re-powered and start recharging the vital batteries.

On page 13 of 60, the licensee stated that Seabrook's Phase 2 coping response begins when an Emergency 4.16 KV Bus is re-powered from SEPS and is estimated to occur 1 to 1.5 hours following the event. On page 20 of 60, the licensee stated that Phase 3 coping begins when portable equipment received from the RRC is placed in service.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to sequence of events.

3.2.1.7 Cold Shutdown and Refueling

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

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

The NRC staff reviewed the licensee's Integrated Plan and determined that the generic concern related to shutdown and refueling requirements is applicable to the plant. This generic concern has been resolved generically through the NRC endorsement of NEI position paper entitled "Shutdown/Refueling Modes" (ADAMS Accession No. ML13273A514); and has been endorsed by the NRC in a letter dated September 30, 2013 (ADAMS Accession No. ML13267A382).

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

In light of the alternate approach chosen for Seabrook (reliance on SEPS), during the audit the licensee was requested to identify whether the generic resolution to Shutdown/Refueling Modes was applicable, and if so, whether Seabrook will follow the generic resolution.

In response, the licensee stated that this generic issue is applicable to Seabrook and that Seabrook already complies with the risk management and contingency planning actions described in this document. The primary reason that SEPS was installed was to support a modification to the TS allowed outage time on the main EDGs from 72 hours to 14 days. This allows the conduct of online EDG maintenance outages. Whenever work is planned for online EDG outages or refueling outages, SEPS is classified as guarded equipment by procedure. This ensures that work is not scheduled on SEPS whenever work is being conducted on the EDGs or 345KV switchyard components.

The licensee did not include the portable FLEX equipment in their commitment to maintain equipment available for deployment in shutdown and refueling modes. This is identified as Confirmatory Item 3.2.1.7.A in Section 4.2.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, and closure of the issues related to the Confirmatory Item, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to cold shutdown and refueling.

3.2.1.8 Core Sub-Criticality

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

All plants provide means to provide borated RCS makeup.

On page 14 of 60 of the Integrated Plan, in regards to maintaining core cooling and heat removal, the licensee stated that prior to commencing an RCS cooldown, a rapid boration is required to achieve cold shutdown boron concentration. This requires opening the rapid boration valve (CS-V426), which provides 7000 ppm boric acid to the charging pump suction. CS-V426 is powered from a "B" Train motor control center (MCC), therefore it can be operated from the control room with SEPS powering Bus E6. If necessary, this valve can also be opened locally by a field operator in the BAST room. An alternate available borated water source is the RWST, which can be aligned to the charging pump suction.

The licensee's Integrated Plan did not indicate whether the BAST or the RWST would be protected from seismic or high winds/missiles hazards for a BDB event. During the audit, the licensee was requested to provide additional information on the hazard protection of these tanks. In response, the licensee stated that both the RWST and the two BASTs are contained within seismic category 1 flood and high wind/missile protected structures.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to core sub-criticality.

3.2.1.9 Use of Portable Pumps

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

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

NEI 12-06 Section 11.2 states in part:

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

analysis that the mitigation strategy and support equipment will perform as intended.

On page 16 of 60 of the Integrated Plan, in regards to maintaining core cooling and heat removal during the transition phase, the licensee stated that to meet NEI 12-06, Section 3.2.2, Guideline (13) for portable pumps to provide RCS and SG makeup in order to provide a diverse capability beyond installed equipment, Seabrook implements these strategies by use of the PDDP (Seabrook's designation for the B.5.b pump) as directed by SAMGs (SAG-1 for SG makeup and SAG-3 for RCS makeup). RCS injection connects the PDDP to the suction lines of the charging pumps, SI pumps, or RHR pumps. SG injection is via drain line connection of the main feedwater lines outside containment.

The licensee further stated that the existing rules of EOP usage do not invoke the SAMGs until core damage is imminent or has already occurred. Consequently, new FSGs may need to be developed for this purpose or transition points to these two SAMGs could be added to the applicable EOPs. Seabrook will review the guidance provided by the PWROG and determine which course of action is appropriate (see pending action #22 in Attachment #7 of the Integrated Plan). This is identified as Confirmatory Item 3.2.1.9.A in Section 4.2.

The licensee's Integrated Plan did not provide any details on the strategies employed to deploy the PDDP and implement the strategies. During the audit, the licensee was requested to provide a discussion of the plans for reactive transition to the use of the PDDP for RCS or SG injection to show conformance with Guideline (13) above. In addition, the licensee was requested to provide additional details on how the PDDP will be deployed, including number of pumps, capacities, suction source, and an analysis of flow rates provided for RCS and SG injection. Further, the licensee was requested to clarify whether the PDDP will be relied upon to provide RCS and SG injection simultaneously; identify the multiple connection points, and discuss their compatibility with the SAFER equipment.

In response, the licensee stated that Seabrook has two PDDPs and associated hose trailers. The licensee initially stated that the strategy for feeding the SGs and the RCS with a PDDP is a backup or secondary capability to the guidelines of NEI 12-06, and are governed by existing severe accident management guidelines (SAMGs) rather than responsive to EA-12-049. The licensee also initially stated that since the use of the PDDP is considered a backup or secondary strategy (i.e., the PDDP is neither N nor N+1 equipment), protection from the BDBEE is not required for conformance with NEI 12-06, Sections 11.3.2 and 11.3.3. After further audit discussions with the NRC staff on the requirements of EA-12-04 to include a capability to mitigate a loss of all ac power, the licensee stated that it would consider the PDDPs and hose trailers to be FLEX equipment and conform to the guidance of NEI 12-06 for FLEX equipment that supports the maintenance of key safety functions.

The licensee further stated that as a backup strategy it is not anticipated that SG feed and RCS feed via the PDDP would be required simultaneously. The licensee stated that the suction source for SG feed is the CST and the suction source for RCS makeup is the firemain. The two connection points for feeding the SGs are the suction flanges for the EFW pumps or directly to drain line connection of the main feed lines in the east pipe chase. SAG-1 directs depressurization of the SGs to between 200 and 300 psig to ensure a flowrate of greater than 200 gpm total to two SGs. As connection of the PDDP is a backup strategy, existing connectors and fitting for the PDDP can be utilized with portable pumps that may be supplied from offsite if necessary.

The licensee stated that the fire main would be the suction source for the PDDP to provide RCS makeup but did not provide a statement as to the availability of the fire main to provide a suction source for the PDDP for all of the hazards applicable to Seabrook. This is identified as Confirmatory Item 3.2.1.9.B in Section 4.2.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, and closure of the issues related to the Confirmatory Items, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the use of portable pumps to supply SG and RCS makeup.

3.2.2 Spent Fuel Pool Cooling Strategies

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

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

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

On page 7 of 60 of the Integrated Plan, the licensee stated that with the reactor in a de-fueled state (i.e., entire core is in the SFP) the SFP time to boil is significantly reduced (approximately 4-5 hours). Consequently, it is important to restore SFP cooling flow once power has been restored to an Emergency Bus from SEPS. OS1246.01, "Loss of Offsite Power – Plant Shutdown" should be revised to address loss of offsite power with the reactor defueled (pending licensee action item #11 in the Integrated Plan).

On Page 35 of the Integrated Plan, the licensee described Phase 2 SFP cooling as using the SEPS to power the SFP cooling pump to supply water from the service water cooling tower (backup UHS) to maintain SFP cooling. Additionally, Seabrook's below-grade SFP design facilitates gravity feed makeup to the SFP from the RWST if normal makeup from the chemical

& volume control system or the demineralized water system is unavailable. In response to an audit question on a backup means of providing SFP cooling, the licensee stated that an engineering evaluation show that gravity makeup can be maintained to the SFP for more than 1 week assuming that the RWST inventory is not required for RCS makeup.

On pages 35 and 36 of 60 of the Integrated Plan, the licensee stated that the SFP cooling system equipment is contained within the seismic category 1, wind-driven missile protected fuel storage building (FSB), which is also protected from the design basis flood, and protected from snow, ice, and extreme cold. The licensee's plan for maintaining SFP cooling in the final phase is to continue operation of the SFP cooling system; therefore protection is provided by the FSB as in the transition phase.

During the audit, the licensee committed to protection of the PDDPs and hose trailers for use to provide makeup to the SGs and RCS. The licensee did not discuss the use of the PDDPs for makeup and spray to the SFP, although the licensee currently has guidelines for using the PDDP for this purpose. Confirmation that the licensee will incorporate the use of the PDDPs and hose trailers into their FLEX guidelines for makeup and spray to the SFP is identified as Confirmatory Item 3.2.2.A in Section 4.2.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, and closure of the issues related to the Confirmatory Item, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to SFP cooling strategies.

3.2.3 Containment Functions Strategies

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

On page 30 of 60 of the Integrated Plan in regards to maintaining containment, the licensee stated that with power being provided to a 4.16KV Emergency Bus from SEPS early in the event, seal injection flow to the RCP seals is maintained and the thermal barrier cooling system is available as a backup cooling source if seal injection is lost. Consequently, there is no significant mass loss to the containment building during the event and no challenge to the containment safety function. On page 33 of 60 of the Integrated Plan in regards to maintaining containment during the final phase, the licensee stated that when Phase 3 coping is implemented the plant should already be in cold shutdown (Mode 5) with core cooling being maintained by the RHR system. This strategy eliminates a containment pressure challenge during the indefinite coping period. Once the second 4.16KV Emergency Bus is powered from the RRC generator(s) the Technical Support Center may direct the operating crew to start one or more containment fan coolers as necessary to control containment temperature for the duration of the coping period.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to the maintaining containment functions.

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.

As discussed in Section 3.0 of this TER, the licensee's approach, as currently understood, constitutes an alternate approach to that found in NEI-12-06. The licensee's description of the approach in the Integrated Plan treats the SEPS as a pre-staged set of portable equipment rather than an installed system. As a result, the Transition Phase (or Phase 2) described in the Integrated Plan for responding to an ELAP does not reflect an actual transition to the use of portable equipment, but instead reflects the transition to the use of the SEPS to repower an Emergency 4160V emergency bus, then to restore various installed systems, including cooling water systems required to support the mitigation strategies.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to equipment cooling – cooling water.

3.2.4.2 Ventilation – Equipment Cooling

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

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

> room, and logic cabinets. Air flow may be accomplished by opening doors to rooms and electronic and relay cabinets, and/or providing supplemental air flow.
>
> Air temperatures may be monitored during an ELAP/LUHS event through operator observation, portable instrumentation, or the use of locally mounted thermometers inside cabinets and in plant areas where cooling may be needed. Alternatively, procedures/guidance may direct the operator to take action to provide for alternate air flow in the event normal cooling is lost. Upon loss of these systems, or indication of temperatures outside the maximum normal range of values, the procedures/guidance should direct supplemental air flow be provided to the affected cabinet or area, and/or designate alternate means for monitoring system functions.
>
> For the limited cooling requirements of a cabinet containing power supplies for instrumentation, simply opening the back doors is effective. For larger cooling loads, such as … AFW pump rooms, portable engine-driven blowers may be considered during the transient to augment the natural circulation provided by opening doors. The necessary rate of air supply to these rooms may be estimated on the basis of rapidly turning over the room's air volume. Actuation setpoints for fire protection systems are typically at 165-180°F. It is expected that temperature rises due to loss of ventilation/cooling during an ELAP/LUHS will not be sufficiently high to initiate actuation of fire protection systems. If lower fire protection system setpoints are used or temperatures are expected to exceed these temperatures during an ELAP/LUHS, procedures/guidance should identify actions to avoid such inadvertent actuations or the plant should ensure that actuation does not impact long term operation of the equipment.

On page 11 of 60 of the Integrated Plan, the licensee listed control room ventilation as an ELAP load to be powered following reenergizing the 4160V emergency bus (bus E6).

In response to an audit question on TDEFW pump room ventilation, the licensee stated that once power is restored to the 4160V emergency bus, ventilation will be restored to the EFW pump room. The licensee stated that the 1 to 1.5 hours assumed time to reestablish ventilation cooling will not adversely affect TDEFW pump operation due to the large size of the room. The licensee performed an engineering calculation that indicates EFW pump room temperature will rise to 140°F approximately 24 hours into the event and 153°F 72 hours into the event, assuming no action is take to minimize the temperature rise such as opening room access doors and jacking open ventilation dampers. The licensee stated that these temperatures do not impact the functionality of the equipment in the room.

In response to an audit question on battery room high and low temperatures, the licensee stated that once power is restored to the 4160V emergency bus, ventilation will be restored to the battery room. The licensee stated that the assumed 1 to 1.5 hour delay in establishing battery room ventilation would not result in a significant rise or fall in temperature in the essential switchgear rooms. During cold weather events where the concern is low temperatures, the licensee stated that portable electric heaters can be powered from 120Vac receptacles powered from vital MCCs to provide heat to the battery rooms. The licensee stated that ample warning time is available for cold weather conditions so the electric heater could be pre-staged for this purpose.

In response to an audit question on the potential for hydrogen buildup in the battery rooms, the licensee stated that hydrogen is only a concern when the batteries are being charged. The battery room ventilation supply and exhaust fans and the battery charger are supplied from the same emergency bus.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to ventilation equipment cooling.

3.2.4.3 Heat Tracing

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

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

The licensee's Integrated Plan did not discuss the loss of heat tracing. During the audit, the licensee was requested to provide a discussion on heat tracing in regards to its impact on mitigation strategies during cold weather. In response, the licensee stated that loss of heat tracing systems is not an issue with respect to the strategies described in the Integrated Plan as all of the equipment and instrumentation relied upon is protected from snow, ice, and extreme cold weather by either Class 1 structures or weather-proof enclosures. The licensee further stated that if heat tracing or building heating was lost during the event, significant building and large tank thermal inertia is present to minimize and slow down any temperature decrease.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to heat tracing.

3.2.4.4 Accessibility – Lighting and Communications

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

> *Plant procedures/guidance should identify the portable lighting (e.g., flashlights or headlamps) and communications systems necessary for ingress and egress to plant areas required for deployment of FLEX strategies.*

Areas requiring access for instrumentation monitoring or equipment operation may require portable lighting as necessary to perform essential functions.

Normal communications may be lost or hampered during an ELAP. Consequently, in some cases, portable communication devices may be required to support interaction between personnel in the plant and those providing overall command and control.

On page 11 of 60 of the Integrated Plan, the licensee listed control room lighting as an ELAP load to be powered following reenergizing the 4160V emergency bus (bus E6).

In response to an audit question on the FLEX storage facility, the licensee stated that the hose trailers have their own diesel generators to provide power for integral pole lighting as well as electrical outlets for portable electric equipment such as lights.

The licensee's Integrated Plan did not provide any discussion about the availability of additional portable lighting such as flashlights and headlamps that may be needed for operators to implement FLEX strategies. Confirmation that the licensee has adequate portable lighting available for operator use is identified as Confirmatory Item 3.2.4.4.A in Section 4.2.

Communications

The NRC staff has reviewed the licensee communications assessment (ADAMS Accession Nos. ML12311A034 and ML13060A048) in response to the March 12, 2012 50.54(f) request for information letter for VEGP and, as documented in the staff analysis (ADAMS Accession No. ML13102A254) has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. Therefore, there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.2 (8) regarding communications capabilities during an ELAP. Further review is required to confirm any required communication updates have been installed. This has been identified as Confirmatory Item 3.2.4.4.B in Section 4.2 below.

The licensee's approach described above, as currently understood, provides an acceptable alternative to the guidance to NEI 12-06, and subject to the successful closure of issues related to the Confirmatory Items, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to lighting and communications, if these requirements are implemented as described.

3.2.4.5 Protected and Internal Locked Area Access

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

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

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

The licensee's Integrated Plan did not provide information on conformance to NEI 12-06, Section 3.2.2, Guideline (9) in regards to the effects of power loss on area access, as well as entry to the protected area and internal locked areas where remote equipment operation is necessary. During the audit, the licensee was requested to provide a discussion on the plans to conform to NEI 12-06, Section 3.2.2, Guideline (9).

In response, the licensee stated that the Seabrook strategy assumes that a 4160V emergency bus (Bus E6) is re-powered by SEPS within 1 to 1 ½ hours of event initiation. The need for local operation of installed equipment is not anticipated during this timeframe. However, every plant field operator has security keys on their watch key ring that allows them to access vital plant areas such as the EFW pump house during an ELAP event when the security keycard system eventually loses power (I.e., power is not needed for access to vital areas during an ELAP using the access keys). Site security can also provide support for field operator access to site locations if necessary.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to protected and internal locked area access.

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.

The licensee does not specifically address personnel habitability in the Integrated Plan. In response to audit questions on ventilation, the licensee stated that following repowering of the 4160V emergency bus, room ventilation will be established by powering existing HVAC systems. Monitoring and establishing cooling is controlled by procedure EAC-0.0, "Loss of All AC Power."

In response to an audit question on TDEFW pump room ventilation, the licensee stated that elevated temperatures in the EFW pump room due to a loss of ventilation would impact personnel stay times. Plant operators are trained on local operation of the TDEFW pump as well as the EFW flow control valves. In an ELAP event, entry into the EFW pump house would be administratively controlled to limit stay time at high temperatures and mitigation measures such as ice vests would be employed to protect personnel.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to personnel habitability – elevated temperature.

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/UHS at their nominal capacities. Water in robust UHS piping may also be available for use but would need to be evaluated to ensure adequate NPSH [Net Positive Suction Head] can be demonstrated and, for example, that the water does not gravity drain back to the UHS. Alternate water delivery systems can be considered available on a case-by-case basis. In general, all CSTs should be used first if available. If the normal source of makeup water (e.g., CST) fails or becomes exhausted as a result of the hazard, then robust demineralized, raw, or borated water tanks may be used as appropriate.
>
> Heated torus water can be relied upon if sufficient [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.

On pages 13 and 14 of 60 of the Integrated Plan in regards to maintaining core cooling and heat removal during the transition phase, the licensee stated that only the water volume contained in the lower half of the seismic category 1 CST is assumed to be available (approximately 212,000 gallons) due to the non-seismically rated connections that penetrate the upper half of the tank. This water volume is sufficient to support EFW flow to the SGs to maintain an RCS heat sink (i.e., maintain the plant in Mode 3), as well as supporting a cooldown and depressurization of the RCS to RHR operating conditions within 8 to 9 hours of event initiation. ECA-0.0 and ES-0.1 direct the operating crew to begin makeup to the CST early in the procedure to preclude low inventory conditions. However, the strategy described is not CST inventory limited. As noted previously, a plant cooldown to RHR system operating conditions can be accomplished within 8-9 hours of the plant trip, which is within the inventory available in the bottom half of the tank even if CST makeup is not initiated. However, to achieve additional margin, a seismic evaluation of the connections to the upper half of the CST will be conducted to determine what, if any, modifications are required to allow taking credit for the entire tank water volume. This would increase the available water volume in the CST by approximately 200,000 gallons and extend SG heat sink coping time to approximately 24 hours.

The licensee further stated that the NEI 12-06 assumption of the loss of normal access to the UHS means that the ocean service water pumps are assumed to be unavailable for the duration of the event. Consequently, Seabrook will rely on the service water cooling tower as a backup UHS. The backup UHS will be restored by starting the 'B' cooling tower pump to restore flow in the 'B' train service water system. This action can also be accomplished by manual actuation of a tower actuation signal from the control room.

On page 60 of 60 of the Integrated Plan describing the service water cooling tower, the licensee stated that service water cooling tower is a safety-related standby UHS that is a seismic category 1 structure.

During the audit, the licensee was requested to describe additional protected water sources to be use for SG makeup. In response, the licensee stated that there are two additional protected water sources that can be used for CST makeup to include the 4 million gallons of water contained in the service water cooling tower basin, and the service water pump forebays. The licensee also stated that the demineralized water storage tanks with a combined capacity of 750,000 gallons, while not protected against seismic or missiles, would be the preferred source of CST makeup, followed by the fire main.

During the audit, the licensee was requested to describe how makeup to the service water cooling tower will be provided. In response, the licensee stated that makeup is not required for the service water cooling tower basin until approximately a week into the ELAP response. In the unlikely event that fresh water makeup to the tower basin from the potable water system or firemain cannot be implemented during that time, the portable diesel-driven cooling tower makeup pump would be deployed from its storage location in the category 1 flood and missile-protected service water pump house. Deployment and operation of the makeup pump is governed by plant procedure. The required suction and discharge hoses are contained on rolling hose racks, which are stored adjacent to the pump in the SW pumphouse.

The licensee response did not provide the source of water to be used for makeup to the service water cooling tower basin. Confirmation of the suction source for the portable diesel-driven cooling tower makeup pump is identified as Confirmatory Item 3.2.4.7.A in Section 4.2.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, and closure of the issues related to the Confirmatory Item, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to water sources availability during an ELAP event.

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.

Order EA-12-049 states, in part:

> The transition phase requires providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site. …
>
> These strategies must be capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink…

During the audit, the licensee was requested to provide justification for reliance on the SEPS as an alternate approach considering such factors as location, margin, protection (protection against seismic, flooding, high winds, tornadoes etc.), and common cause failure (that addresses diversity in location of the equipment proposed as part of alternate ac source and its usage), as compared to the advantages that flexible portable equipment may offer. In addition, it appears that the 480VAC MCC is common for both SEPS and it appears to feed the auxiliary systems for both the SEPS (Figure 2 on page 46 of 60 of the Integrated Plan). In addition, the licensee was requested to identify any common components in the electrical distribution system that could constitute a single failure vulnerability and address how the SEPS will be capable of functioning in an ELAP event.

In response to the audit request, the licensee stated that as described in Attachment 8 of the Integrated Plan, Seabrook does not credit SEPS as an 'alternate ac source' or 'site blackout diesel'. Consequently, Seabrook's 4 hour coping time is unaffected by the functionality of SEPS and SEPS is not credited in the UFSAR.

The licensee provided the following response for location and protection.

> SEPS is located just south of the service water cooling tower in the southwest corner of the site (refer to Figure 9 of Attachment 3 to the Integrated Plan) and is approximately 500 feet from the 345KV switchyard on the north side of the plant and the EDGs located in the center of the site adjacent to the control building. This location provides protection from seismic interactions as well as wind-driven missile protection to the north. SEPS and its associated auxiliary equipment is located above the site design basis flood plain and the DGs and switchgear are contained in weather-proof enclosures resistant to hurricane force wind up to 110 mph. The existing equipment enclosures are heated in the winter and provide adequate protection against snow, ice, and extreme cold conditions. In order to provide comparable protection to a seismic category 1 building, Seabrook will

improve SEPS seismic anchorage to meet the new EPRI GMRS as well as build a missile shield around the DGs and switchgear enclosure to provide protection from wind-driven missiles.

The licensee provided the following information in regards to margin.

As redundant air-cooled 4160V generators, SEPS provides optimal response to an ELAP event by restoring power to an emergency 4160V bus early in an event, thus minimizing the duration of Phase 1 event response, which ensures that event response is not limited by the capacity of the vital batteries or the volume of water contained in the CST. Powering an emergency bus early in the event also allows restoration of UHS using Seabrook's safety-related backup UHS (service water cooling tower). Based on these advantages, Seabrook feels the combination of SEPS and the service water cooling tower provides better assurance of maintaining the core cooling, containment, and SFP cooling safety functions. Seabrook's Integrated Plan strategy provides maximum margin towards maintenance of those safety functions when compared to the use of portable equipment of more limited capacity and capability. Additional margin is provided by the secondary or backup strategy of using portable diesel driven pumps for feeding the SGs and RCS as directed by three existing SAMGs.

The licensee provided the following information in regards to diversity and common mode failures.

Both SEPS DGs feed a common switchgear bus (see Figure 2 in Attachment 3 of the Integrated Plan). This common switchgear (SEPS-SWG-1) is a passive component protected by the SEPS switchgear enclosure. This switchgear feeds the input side of the bus selector switch (SEPS-CP-1) located in the 'B' train essential switchgear room. This switch is normally aligned for SEPS to provide power to Bus E6 ('B' train vital power) and has a key interlock to manually switch the output to Bus E5 ('A' train vital power). SEPS-SWG-1 also provides high side power to SEPS stepdown transformer SEPS-X-1. This transformer provides 480V power to auxiliaries to support engine operation such as motor-driven engine cooling fans. SEPS-X-1 is a single passive component protected by its own weather-resistant housing. Breakers that connect the output of SEPS-SWG-1 with the input to SEPS-CP-1 and SEPS-X-1 are normally closed along with the breakers that supply each of the motors for the SEPS cooling fans. Normally closed breakers are less susceptible to component active failures. 480V power from non-vital MCC-152 in the waste processing building provides power to SEPS-PP-2 through automatic bus transfer switch SEPS-CP-3. This power feed is used to provide power to non-vital SEPS auxiliaries such as SEPS enclosure heating and lighting, which are not necessary for SEPS operation.

The licensee also stated that following construction activities for improving SEPS seismic robustness and installation of a missile shield, SEPS-SWG-1 and SEPS-X-1 will be provided with comparable protection to the emergency 4160V busses in the essential switchgear rooms.

On page 10 of 60 of the Integrated Plan, the licensee describes loading of the SEPS DGs following an event as follows:

The operating crew will implement Attachment 'A' of ECA-0.0 to ensure emergency bus loading is within the capacity of one SEPS DG (2640 KW net). This ensures that if one genset automatically shuts down for some reason, the remaining unit will not be overloaded. Extended Loss of Offsite Power loads currently listed in Attachment 'A' include the following:

- Service Water Cooling Tower Pump - 609 KW
- Primary Component Cooling water pump - 576 KW ('B' Train), 549 KW ('A'. Train)
- The motor-driven EFW pump (as backup to the steam-driven pump during Phase 2 coping) - 669 KW
- Centrifugal Charging Pump - 554 KW
- Residual Heat Removal pump - 343 KW

Extended Loss of Offsite Power loads not currently listed in ECA-0.0, Attachment 'A' include:

- Spent Fuel Pool Cooling pump - 17 KW
- Thermal Barrier Cooling Water pump - 18 KW
- Vital 480 VAC Unit Substations that provide power to the vital battery chargers, vital instrumentation inverters, and control room lighting and ventilation - approximately 300 KW.

On page 58 of 60 in its integrated plan in regards to the pending actions, the licensee indicated that ECA-0.0 will be revised to include the additional ELAP loads not currently listed.

On page 60 of 60 of the Integrated Plan, describing the SEPS, the licensee stated that both SEPS DGs are seismically robust.

On page 58 of 60 of the Integrated Plan, the licensee stated that the 'seismic robustness' of SEPS will be evaluated to determine if enhancements are needed with respect to the new GMRS data for the site following seismic hazard re-evaluation in accordance with Recommendation 2.1 of the 10CFR50.54(f) letter of March 12, 2012.

On page 19 of 60 of the Integrated Plan in regards to protection of connections for RCS cooling and heat removal during the transition phase, the licensee stated that connections to the SEPS DGs are protected from a BDBEE as they are located within the seismic category 1, flood and missile protected control building.

On page 18 of 60 of the Integrated Plan, the licensee stated that the SEPS DGs and associated controls and auxiliary equipment are installed above the current design basis flood plain.

On page 19 of 60 of the Integrated Plan, regarding the strategies for maintaining core cooling and heat removal in the transition phase, the licensee stated that the SEPS have hurricane weather protection enclosures. An evaluation of the current wind-driven missile protection for SEPS will be conducted to determine if the existing enclosures are adequate or if additional missile protection is required. Confirmation of the adequacy of missile protection for SEPS is identified as Confirmatory Item 3.2.4.8.A in Section 4.2.

On page 19 of 60 of the Integrated Plan regarding the strategies for maintaining core cooling and heat removal in the transition phase, the licensee stated that the SEPS are protected from the elements by weatherproof enclosures and the engine cooling system contains the required amount of glycol anti-freeze to protect the engines to minus 32 degrees F. The SEPS DGs are also included in the site snow removal plan to ensure the engine air intake system is clear of snow and ice. The impact of missile protection barriers that may be installed to protect the SEPS on the capability to implement the snow removal plan will be evaluated and revisions to the plan will be made as necessary. Confirmation of snow removal capability following missile barrier installation is identified as Confirmatory Item 3.2.4.8.B in Section 4.2.

During the audit, the licensee was requested to provide additional details to demonstrate the SEPS equipment will not be damaged by any non-seismically robust components or structures, including the missile barriers. In response to the audit, the licensee stated that there is no permanent or temporary plant equipment in the vicinity of SEPS or the SEPS switchgear that could seismically interact with SEPS equipment. The licensee further stated that the proposed SEPS missile barriers will be seismically robust and restrained such that an adverse seismic interaction with SEPS will not occur.

During the audit, the NRC requested the licensee describe how electrical isolation will be maintained such that (a) Class 1E equipment is protected from faults in portable equipment, and (b) multiple sources do not attempt to power electrical buses. In response, the licensee stated that proper separation and protection of the class 1E 4160V emergency buses is maintained by the installed SEPS switchgear connected to each 4160V emergency bus. ECA-0.0 places the EDG output breakers in the pull-to-lock position (disable breaker closure) prior to closing the SEPS breaker to an emergency bus. This prevents the SEPS and the EDG from being simultaneously connected to the emergency bus.

The licensee describes the connection of the RRC generators on page 20 of 60 of the Integrated Plan, to include proper electrical isolation prior to connection. The licensee stated that fault protection to be provided with the RRC generator has yet to be finalized by SAFER. This information will be included in a future six-month update.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01, for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, and closure of the issues related to the Confirmatory Items, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to electrical power sources/isolations and interactions.

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.

The licensee's Integrated Plan describes various sources of fuel oil for SEPS and the PDDP. These sources include the following:

- The primary source is a fuel supplier located greater than 25 miles from Seabrook to deliver fuel oil within 48 hours.
- Each SEPS DGs has a 6050 gallon fuel oil storage tank, with a Technical Requirement minimum level of 4775 gallons.
- 75,000 gallon EDG fuel oil storage tanks with a TS minimum of 62,000 gallons in each tank.
- 6000 gallon diesel fuel tank at the vehicle maintenance shop.
- Two 30,000 gallon auxiliary boiler fuel oil storage tanks.

During the audit, the NRC questioned the fueling strategy for the SEPS described in the Integrated Plan, which indicates that action to refuel SEPS DGs should be initiated within 36 hours of the event.

In response, the licensee stated that the 36 hour timeframe was based on the assumption that both SEPS DGs would be functional and operate in parallel as designed sharing the ELAP loads for up to 60 hours. If only a single SEPS genset is assumed to function, refueling should begin within 24 hours of event initiation. The licensee stated that this change would be reflected in the next six-month update report in February 2014. Verification that the refueling strategy is changed to begin refueling within 24 hours of the event is identified as Confirmatory Item 3.2.4.9.A in Section 4.2.

During the audit, the licensee stated that another source of diesel fuel for the PDDP or other portable equipment not described in the Integrated Plan is the fuel oil day tanks for the EDGs. The 1500 gallon storage tanks can be used as a supply of fuel for portable diesel-driven equipment via 5 gallon fuel cans filled from the tank drain lines. This fueling strategy is described in emergency plan supplemental technical material.

On page 19 of 60 of the Integrated Plan in regards to protection of connections for RCS cooling and heat removal during the transition phase, the licensee stated that connection to the emergency diesel generator (EDG) fuel oil storage tank drain lines for transfer of fuel to a portable refueling trailer are protected by the seismic category 1, flood and missile-protected diesel generator building.

During the audit, the licensee was requested to explain how fuel quality will be assured if stored for extended periods of time.

In response, the licensee stated that the chemistry department's surveillance procedures govern sampling and analysis of the EDG fuel oil storage tanks, the EDG fuel oil day tanks, and the SEPS generator fuel tanks.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to portable equipment fuel.

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.

During the audit, the licensee was requested to discuss how long Phase 1 could be extended. In response in regards to the batteries, the licensee stated that an engineering analysis determined that each train of vital dc power, consisting of two vital dc buses and their associated batteries and battery chargers, will last for approximately 6 hours assuming no dc load shedding is implemented. The licensee stated that if the load shedding strategy that currently exists in procedure ECA-0.0, "Loss of AC Power", is implemented within 1 hour of the ELAP event, battery runtime is extended to approximately 8.5 hours for the 'A' train dc bus and 7.5 hours for the 'B' train dc bus. The licensee stated that battery life can be extended further to approximately 13 hours in each dc train if the battery bus in each train is cross-tied per existing plant procedures. The licensee further stated that battery rundown times are based on a minimum voltage of 105Vdc.

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to load reduction to conserve dc power.

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

[1] Testing includes surveillances, inspections, etc.

plant equipment which supports FLEX strategies becomes unavailable, then the FLEX strategy affected by this unavailability does not need to be maintained during the unavailability.

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

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

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

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

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

The licensee's Integrated Plan provides an extensive list of surveillance test procedures and preventative maintenance actions that are performed on the SEPS and various cooling tower equipment. However, the plan does not include discussion of how maintenance and testing on equipment, including the SEPS and PDDP, will conform to the guidance of NEI 12-06, Section 11.5. During the audit, the licensee was requested to explain how existing maintenance and testing (M&T) programs and unavailability controls, (such as those for the SEPS), conform with this guidance. In addition, the licensee was requested to confirm Seabrook's intention to commit to the generic EPRI industry program for maintenance and testing of FLEX electrical equipment such as batteries, cables, and diesel generators. [See NRC endorsement letter dated October 7, 2013; ADAMS Accession No. ML13276A224].

In response, the licensee stated that SEPS and associated equipment falls under the Maintenance Rule at Seabrook. As noted in the Integrated Plan, SEPS maintenance and testing requirements are extensive as those for TS required safety-related equipment. Consequently, any equipment issue that renders SEPS non-functional is addressed as priority 1 in the work control system and is worked 24/7 until system functionality is restored.

The licensee further stated that the PDDP is also governed by the site preventative maintenance (PM) and surveillance programs as it is credited as part of Seabrook's B.5.b response. The existing PMs and surveillance testing for the PDDP meet the criteria of the EPRI guidance document. Should the PDDP become unavailable for any reason, station work control processes provides a limit of 30 days to restore the equipment to functional status. The licensee also stated that since the PDDP is considered a backup or secondary strategy, it is not required to meet the N or N+1 criteria of NEI 12-06 and therefore the unavailability criteria of Section 11.5 do not apply. During the audit, the licensee stated that it intends to supplement the reliance on the SEPS with two PDDPs, which will be managed in conformance with the endorsed guidance of NEI 12-06 for mitigating strategies equipment. Confirmation that the PDDPs will be included in the M&T program is identified as Confirmatory Item 3.3.1.A in Section 4.2.

The licensee further stated that the developed PMs and surveillance tests for the portable refueling trailer used as backup or secondary strategy for refueling SEPS and other diesel-driven equipment will meet the EPRI developed program for the 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 subject to the closure of issues related to the Confirmatory Item, provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to equipment M&T, if these requirements are implemented as described.

3.3.2 Configuration Control.

NEI 12-06, Section 11.8 states:

1. The FLEX strategies and basis will be maintained in an overall program document. This program document will also contain a historical record of previous strategies and the basis for changes. The document will also contain the basis for the ongoing maintenance and testing programs chosen for the FLEX equipment.

2. Existing plant configuration control procedures will be modified to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies.

3. Changes to FLEX strategies may be made without prior NRC approval provided:
   a) The revised FLEX strategy meets the requirements of this guideline.
   b) An engineering basis is documented that ensures that the change in FLEX strategy continues to ensure the key safety functions (core and SFP cooling, containment integrity) are met.

The licensee's Integrated Plan did not provide a discussion of configuration control as it relates to conformance with NEI 12-06, Section 11.8. Confirmation that configuration control for FLEX is in conformance with NEI 12-06, Section 11.8 is identified as Open Item 3.3.2.A in Section 4.1,

The licensee's approach described above, as currently understood, is an alternative approach to the guidance of NEI 12-06, as endorsed by JLD-ISG-2012-01 for meeting the requirements of Order EA-12-049. Subject to the acceptability of the alternate approach to the NRC, and closure of the issues related to the Open Item, this provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to configuration control.

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.

On page 8 and 9 of 60 of the Integrated Plan in regards to training, the licensee stated:

> A Systematic Approach to Training (SAT) will be used to evaluate training requirements for station personnel based upon changes to plant equipment, implementation of FLEX portable equipment, and new or revised procedures that result from implementation of the strategies described in this report.
>
> Training modules for personnel that will be responsible for implementing the FLEX strategies, and Emergency Response Organization personnel, will be developed to ensure personnel proficiency in the mitigation strategies for BDBEEs.
>
> The training will be implemented and maintained per existing Seabrook Station training programs. The details, objectives, frequency, and success measures will follow the Station's SAT process. FLEX training will ensure that personnel assigned to direct the execution of mitigation strategies for BDBEEs will achieve

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

the requisite familiarity with the associated tasks, utilizing available procedures, job aids, instructions, and mitigating strategy time constraints.

Training will be completed prior to final implementation of the requirements of this Order in the Fall of 2015.

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

3.4 OFFSITE RESOURCES

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

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

On page 9 of 60 of the Integrated Plan, the licensee stated that the PIM and AREVA were awarded the Industry contract to establish the SAFER. SAFER will be establishing RRCs for the acquisition, maintenance, and deployment of portable FLEX equipment for response to BDBEEs. As currently planned, each RRC will hold five (5) sets of equipment, four (4) of which will be fully deployable when requested. As part of Phase 3 event response, equipment will be moved from an RRC to a local assembly area established by the SAFER team and the utility. Communications will be established between Seabrook and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's 'playbook', will be delivered to the site's staging area within 24 hours from the initial request.

The implementation of Guidelines 2 through 10 above is identified as Confirmatory Item 3.4.A, in Section 4.2

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

4.0 OPEN AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

Item Number	Description	Notes
3.1.5	High Temperature – Confirm that the licensee evaluates the considerations for high temperature on FLEX for the procurement, protection, and deployment as described in Sections 3.1.5.1, 3.1.5.2, and 3.1.5.3 using the UFSAR maximum temperature for the design of equipment.	
3.3.2.A	The licensee's Integrated Plan did not address configuration control of FLEX strategies.	

4.2 CONFIRMATORY ITEMS

Item Number	Description	Notes
3.1.1.1.A	Protection of seismic and high wind hazards – Confirm the licensee has conducted evaluation for protection of B.5.b PDDPs and hose trailers from seismic and high wind hazards.	
3.1.1.2.A	Confirm that at least one connection point for the PDDP is protected from a seismic event (includes access to the connection point and areas the operators will have to access to deploy or control the PDDP).	
3.1.1.2.B	Confirm that a tow vehicle for FLEX equipment movement is reasonable protected from a seismic event, flooding event and high wind event.	
3.1.1.4.A	Off-Site Resources – Confirm RRC local staging area, evaluation of access routes, and method of transportation to the site.	
3.2.1.9.A	Use of portable pumps – Address entry into SAMGs for use without fuel damage for operation of the PDDPs for SG and RCS injection.	
3.2.1.9.B	Confirm availability of the fire main to provide a suction source for the PDDP for all of the hazards applicable to Seabrook.	
3.2.1.7.A	Confirm that portable FLEX equipment is included in the	

	licensee's program to maintain equipment available for deployment in shutdown and refueling modes.	
3.2.2.A	Confirm that the licensee will incorporate the use of the PDDPs and hose trailers into their FLEX guidelines for makeup and spray to the SFP.	
3.2.4.4.A	Confirm that the licensee has adequate portable lighting available for operator use during an event.	
3.2.4.4.B	Confirm that required upgrades to communications systems have been implemented in accordance with the NRC staff analysis of the licensee's communications assessment.	
3.2.4.8.A	Confirm the licensee has evaluated wind-driven missile protection of SEPS DGs and switchgear SEP-SWG-1.	
3.2.4.8.B	Confirm any SEPS missile barrier modifications do not interfere with the ability to remove snow from the DGs air intake system.	
3.2.4.9.A	Portable equipment fuel – Confirm refueling strategy for SEPS has been changed to require refueling to begin within 24 hours of the event.	
3.3.1.A	Confirm that the PDDPs will be included in the M&T program in conformance with the EPRI report on M&T.	
3.4.A	Offsite resources – Confirm implementation of NEI 12-06, Section 12.2, Guideline 2 through 10.	