Mega-Tech Services, LLC

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

Revision 1

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Exelon Generation Company, LLC
LaSalle County Station, Units 1 and 2
Docket Nos. 50-373 and 50-374

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Technical Evaluation Report

LaSalle County Station, Units 1 and 2
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 (UHS) 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 six-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, Mitigation Strategies Directorate (ADAMS Accession No. ML13234A503).

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

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

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

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

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

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

3.0 TECHNICAL EVALUATION

By letter dated February 28, 2013 (ADAMS Accession No. ML13060A421), and as supplemented by the first six-month status report in a letter dated August 28, 2013 (ADAMS Accession No. ML13241A283) Exelon Generation Company, LLC (the licensee or Exelon) provided the LaSalle County Station, Units 1 and 2 (LSCS or LaSalle) Integrated Plan for compliance with Order EA-12-049**.** The Integrated Plan describes the guidance and strategies under development for implementation by Exelon for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the NRC staff in its review, leading to the issuance of an interim staff evaluation and audit report. The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the Order.

3.1 EVALUATION OF EXTERNAL HAZARDS

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

3.1.1 Seismic Events

NEI 12-06, Section 5.2 states:

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

On pages 1 and 2 of the Integrated Plan, in the section regarding the seismic hazard assessment, the licensee identified maximum horizontal ground acceleration at the free field foundation level, corresponding to above site response spectra, is .20g for the safe shutdown earthquake (SSE) and .10g for the operating basis earthquake (OBE).

On pages 3 and 4 of the Integrated Plan, the licensee stated:

> Flood and seismic re-evaluations pursuant to the 10CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.

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

In various sections of the Integrated Plan, the licensee stated:

> Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LSCS during a scheduled six-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

In various sections of the Integrated Plan, the licensee stated:

> Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LaSalle.

During the audit, the licensee stated that storage for the equipment will conform to all sections in NEI 12-06, Section 5.3.1 for seismic hazards. The licensee further stated:

> Anchor points, sufficient clearance or other applicable means will be used to ensure seismic interactions do not impact the station's ability to implement the FLEX equipment. The manner of securing the equipment has also not been determined but it most likely will include commercially available heavy duty ratchet tie-down straps which can secure the equipment but be removed quickly. All equipment stored within the building will be secured or within secured storage cabinets to assure that FLEX response equipment is not damaged during a seismic event.

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

3.1.1.2 Deployment of FLEX Equipment - Seismic Hazard

NEI 12-06, Section 5.3.2 states:

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

On page 4 of the Integrated Plan, the licensee stated in part:

- Primary and secondary storage locations have not been selected; once locations are finalized implementation routes will be defined.
- Storage locations will be chosen in order to support the event timeline.

The Integrated Plan does not address potential soil liquefaction that could impede movement following a severe seismic event. During the audit, the licensee stated that LSCS has not yet finalized the storage locations or the deployment paths; however, once those are finalized, an evaluation for potential soil liquefaction will be completed. The results of this evaluation will be provided in a future six-month update. This has been identified as Confirmatory Item 3.1.1.2.A in Section 4.2.

On page 23 of the Integrated Plan, in the section regarding protection of connections to support coping strategies that maintain core cooling during Phase 2, the licensee stated in part:

> FLEX pump piping connections will be protected in the existing [core standby cooling system] CSCS pump room structure in the lower elevation of the [emergency diesel generator] EDG building.
>
> Electrical connections for the FLEX 480 VAC generator are conceptually planned to be located in the corridor of the EDG buildings of each unit.
>
> New water pipe, and connections, will be protected with the new hardened containment vent chase.

On page 39 of the Integrated Plan, in the section regarding protection of connections to support coping strategies that maintain SFP cooling during the transition phase, the licensee stated the residual heat removal (RHR) spool piece that requires installation for SFP fill is in a protected structure (reactor building).

During the audit, the licensee was requested to provide additional information concerning the design and protection of connection points for portable/FLEX equipment. The licensee was also requested to provide a discussion of deployment pathways to access those connection points and verify a pathway through a seismically robust structure.

The licensee responded by stating:

> The detailed designs for the FLEX connections are not yet complete. Conceptually, the water connections related to the Primary strategy will occur in the Division 2 CSCS pump rooms (suction and discharge for pre-staged FLEX pumps) on each unit. The CSCS pump rooms are safety-related and seismic. Access will be required on the Refuel Floor (843 elevation of the Reactor Building) to deploy hose for part of the Primary water supply strategy. The Reactor Building is safety-related and seismic. The electrical connections for the Primary electrical strategy will occur in the hallway of the safety-related and seismic [diesel generator] DG Building on the 710 elevation as well as the 710 and 731 elevations of the safety-related and seismic Aux Building. The electrical connection for the pre-staged FLEX pumps will occur in the safety-related and seismic CSCS pump rooms. A pathway to the Aux Bldg, Reactor Building, and CSCS pump rooms exists through seismically robust structure. To exit the power block buildings to travel to the FLEX storage building, egress will be required through portions of the Turbine Building. While this building is not safety-related

or seismic, multiple egress paths exist (exit to the north or south). These are travel paths only and equipment is not required to be deployed in the Turbine Building to support the FLEX strategies.

The licensee's response appears to provide an alternate approach to the guidance in NEI 12-06 by taking credit for multiple egress paths from the Turbine Building instead of identifying a path that is seismically robust. During the audit, the licensee stated that they will evaluate the egress path through the Turbine Building for seismic robustness and update a future six-month update as appropriate. The licensee needs to determine that there is an egress path from the Turbine Building that is seismically robust, or provide justification of the alternate approach that relies on availability of multiple egress paths that are not seismically robust. This has been identified Confirmatory Item 3.1.1.2.B in Section 4.2.

During the audit, the licensee identified that failure of the normal cooling lake dike would lower the elevation of lake water to 690 ft, which corresponds to the water elevation of the UHS. The UHS is an excavated portion of the cooling lake. This addresses consideration 3.

During the audit, the licensee identified that the storage building(s) will have the ability to manually open doors. This addresses consideration 4.

On page 56 of the Integrated Plan, the licensee listed a Ford F-750 truck to be used as a tow vehicle, portable refueling vehicle and a debris removal vehicle. During the audit, the licensee stated that the truck will be stored in a building that conforms to the criteria of NEI 12-06, section 5.3.1 for seismic hazards. This addresses consideration 5.

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

3.1.1.3 Procedural Interfaces – Seismic Hazard

NEI 12-06, Section 5.3.3 states:

> There are four procedural interface considerations that should be addressed.
>
> 1. Seismic studies have shown that even seismically qualified electrical equipment can be affected by 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.

In various sections of the Integrated Plan regarding procedures, strategies and guidelines for Phases 1, 2, and 3, the licensee stated:

> LaSalle will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs [Emergency Operating Procedures].

The Integrated Plan does not address NEI 12-06, consideration 1. During the audit, the licensee stated LSCS will develop guidance and resources to conform to the guidance in NEI 12-06, Section 5.3.3, consideration 1.

During the audit, the licensee was requested to discuss the impacts from large internal flooding sources or mitigation of ground water in critical locations.

The licensee responded by stating LSCS has not identified any large internal flooding sources that impact the implementation of the FLEX strategies. The reviewer notes the current licensing basis for internal floods is addressed in Chapter 3.4 of the LSCS UFSAR. Flooding caused by gravity drainage of the lake is addressed by water tight walls in the condenser pit to elevation 701 foot elevation (normal lake elevation is 700 feet). Piping that is not within the condenser pit confines was seismically evaluated and determined to not be subject to cracks.

The licensee identified the condenser tube cleaning system (Amertap System) is a potential flooding source via an approximately 3 inch water line. The licensee stated that UFSAR identifies, “The time available to isolate a leak in the Amertap lines is more than 48 hours, which is more than adequate for Operator actions to occur.” The reviewer notes this is well after the critical actions required for Phase 2 are completed, and personnel would be available to complete the require action within 48 hours. This addresses consideration 2.

During the audit, the licensee stated that LSCS does not rely on ac power to mitigate ground water in any critical locations. This addresses consideration 3.

The UHS is an excavation within the cooling lake that can provide water for 30 days without makeup from the Illinois River even if the main portion of the lake is lost due to failure of the three dikes that surround the lake.

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

3.1.1.4 Considerations in Using Offsite Resources – Seismic Hazard

NEI 12-06, Section 5.3.4 states:

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

On pages 12 and 13 of the Integrated Plan, in the section regarding the Regional Response Center (RRC), the licensee stated:

> LSCS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER).
>
> The industry will establish two (2) Regional Response Centers (RRC) to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. 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 the affected nuclear site 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 [SAFER Response Plan] playbook, will be delivered to the site within 24 hours from the initial request.

The licensee has not yet identified the local staging area(s) for the RRC FLEX equipment and has not yet described the logistics for delivery of RRC FLEX equipment transportation in the Integrated Plan. This has been 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 considerations in using offsite resources associated with a seismic hazard, if these requirements are implemented as described.

3.1.2 Flooding.

NEI 12-06, Section 6.2 states:

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

NEI 12-06, Section 6.2.1 states in part:

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

On page 2 of the Integrated Plan, in the section regarding the external flood hazard assessment, the licensee stated:

> Per the LaSalle Updated Final Safety Analysis Report (UFSAR) Section 2.4: Since there are no large bodies of water in the immediate vicinity of the site, surges, seiches, and tsunami floods are not relevant. A review of the literature has revealed no major dam failures affecting the surrounding region.
>
> Of the following flood events considered, Item 3 is the controlling event: (1) a postulated probable maximum flood (PMF) in the Illinois River, (2) a probable maximum precipitation (PMP) with antecedent standard project storm (SPS) on the cooling lake and its drainage area, and (3) a local PMP at the plant site. The station site is "floodproof" or "dry" with regard to a postulated PMF in the Illinois River, since the plant floor at elevation 710.5 feet MSL [mean sea level] is 188 feet higher than the probable maximum flood plus wave runup elevation of 522.5 feet MSL obtained by superimposing the maximum (1%) wave characteristics of sustained 40-mph overland winds on the probable maximum water level. Safety-related structures at the plant site are similarly unaffected by wave run-up due to winds coincident with a postulated probable maximum water level in the cooling lake.
>
> In the hydrologic design of the 2058-acre cooling lake, a standard project storm (SPS) is postulated to occur prior to the probable maximum precipitation (PMP), with three rainless days between them. The freeboard and riprap requirements for the peripheral dike are determined by superimposing significant wave characteristics of sustained 40-mph overland winds on the probable maximum water level in the lake. Wave run-up elevation at the plant site is obtained by superimposing the maximum (1%) wave characteristics of sustained 40-mph overland winds on the probable maximum water level in the lake. Safety-related facilities at the plant site are unaffected by the probable maximum water level in the lake with coincident wind wave activity.
>
> A conservative estimate of the water surface elevation near the plant buildings

due to local intense precipitation at the plant area would 710.3 feet. These elevations are below the plant grade elevation and would not cause flooding to the plant buildings. Therefore, the LSCS site is "floodproof" or "dry" and the External Flood Hazard is not applicable.

The reviewer noted that the LaSalle UFSAR, Section 2.4.4 provides a better description of the susceptibility of the site to flooding due to seismically induced dam failures as follows:

> Of all the dams on the Illinois River and on its tributaries upstream of the site, that at Lockport, Illinois is the highest, with a lift of 39.5 feet … and a dam height above the foundation of 51 feet ….
>
> In the event of a seismically induced dam failure, it is unlikely that the resulting flood stage would exceed the Illinois River PMF stage at the site.
>
> Breaching of the peripheral dikes of the cooling lake at the time of a postulated seismic event would cause the impounded water to discharge directly into local creeks that meet the Illinois River. Since the plant grade is set at elevation 710 feet MSL, and the plant floor is at elevation 710.5 feet MSL, there is no likelihood of flooding of the plant facilities due to this phenomenon.

On pages 3 and 4 of the Integrated Plan, under Key Assumptions to implement NEI 12-06 strategies, the licensee stated:

> Flood and seismic re-evaluations pursuant to the 10CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.

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

3.1.2.1 Protection of FLEX Equipment – Flooding Hazard

The licensee screened as a "dry site" and therefore does not need to address storage of FLEX equipment for protection in the context of a flooding hazard.

3.1.2.2 Deployment of FLEX Equipment – Flooding Hazard

The licensee screened as a "dry site" and therefore does not need to address deployment of FLEX equipment in context of a flooding hazard.

3.1.2.3 Procedural Interfaces – Flooding Hazard

The licensee screened as a "dry site" and therefore does not need to address procedural interfaces in the context of flooding hazard.

3.1.2.4 Considerations in Using Offsite Resources – Flooding Hazard

The licensee screened as a "dry site" and therefore does not need to address local staging area(s) for the RRC FLEX equipment in the context of a flooding hazard.

The licensee has not described the methods to be used to deliver the equipment to the site in the Integrated Plan. Therefore, there is insufficient information presented in the Integrated Plan, at this time, to conclude that the use of offsite resources will comply with Order EA-12-049. The confirmatory item tracking this issue has been combined with previously identified 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 use of off-site resources following flooding events, 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 the Integrated Plan, in the section regarding the determination of BDBEEs, the licensee provided the location of LSCS as 41°14'44" N, 088°40'06" W.

On page 3 of the Integrated Plan, the licensee stated LSCS is not susceptible to hurricanes due to location (Reference Figure 7-1 of NEI 12-06). LSCS is subject to tornados based on evaluation of Figure 7-2. It was determined that LSCS site is in Region 1 and will have winds exceeding 200 mph. Therefore, the high wind hazard is applicable to LSCS.

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 high wind screening, if these requirements are implemented as described.

3.1.3.1 Protection of FLEX Equipment - High Wind Hazard

NEI 12-06, Section 7.3.1 states:

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

mitigation equipment such that at least N sets of FLEX equipment would remain deployable following the high wind event. (This option is not applicable for hurricane conditions).

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

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

In the various sections of the Integrated Plan, the licensee stated that protection of associated portable equipment from the severe storms with high wind hazard will be provided as follows:

> Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LaSalle.

The licensee has stated that LSCS storage building(s) for portable/FLEX equipment are being designed to conform to NEI 12-06, Section 11. During the audit, the licensee stated that the storage for the equipment will conform to NEI 12-06, Section 7.3.1 for severe storms with high wind but did not specify if it would be relying on separation of sets of equipment as described for configurations 1.b. and 1.c. If separation of storage sites is the strategy for addressing tornados, confirmation that the axis of separation and distance between storage locations will provide assurance that a single tornado would not impact all locations should the licensee use this approach is identified as Confirmatory Item 3.1.3.1.A in Section 4.2.

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

3.1.3.2 Deployment of FLEX Equipment - High Wind Hazard

NEI 12-06, Section 7.3.2 states:

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

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

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

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

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

Considerations 1, 2 and 5 are not applicable to LSCS because, as noted in section 3.1.1 above, LSCS is not subject to hurricanes.

On page 56 of the Integrated Plan, the licensee listed a Ford F-750 truck to be used as a tow vehicle, portable refueling vehicle and a debris removal vehicle. During the audit, the licensee stated that the truck will be stored in a building that conforms to the criteria of NEI 12-06, section 7.3.1 for severe storms with high wind.

On page 11 of the Integrated Plan, in the section regarding how strategies will be deployed in all modes, the licensee stated that:

> Deployment of FLEX is expected for all modes of operation. Transportation routes will be developed from the equipment storage area to the FLEX staging areas. An administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation. This administrative program will also ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes.
>
> Identification of storage areas and creation of the administrative program are open items. Closure of these items will be documented in a six-month update.

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

3.1.3.3 Procedural Interfaces - High Wind Hazard

NEI 12-06, Section 7.3.3, states:

> The overall plant response strategy should be enveloped by the baseline capabilities, but procedural interfaces may need to be considered. For example,

many sites have hurricane procedures. The actions necessary to support the deployment considerations identified above should be incorporated into those procedures.

In various sections of the Integrated Plan discussing procedures, strategies and guidelines for various phases, the licensee stated:

> LaSalle will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

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

3.1.3.4 Considerations in Using Offsite Resources – High Wind Hazard

NEI 12-06, Section 7.3.4 states:

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

On pages 12 and 13 of the Integrated Plan, in the section regarding the RRC, the licensee stated:

> LSCS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER).
>
> The industry will establish two (2) Regional Response Centers (RRC) to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. 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 the affected nuclear site 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 within 24 hours from the initial request.

The licensee has not identified the local staging area(s) for the RRC FLEX equipment and has not described the methods to be used to deliver the equipment to the site in the Integrated Plan. The confirmatory item tracking this issue has been combined with previously identified 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 considerations in using offsite resources associated with the high wind 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. Excluding Arizona and Southern California, all sites located above 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 the Integrated Plan, in the section regarding the determination of BDBEEs, the licensee provided the location of LSCS as 41°14'44" N, 088°40'06" W and stated that the annual average of snow at the LSCS site is 27 inches.

On page 3 of the Integrated Plan, in the section regarding the determination of applicable extreme external hazards, the licensee stated:

> Figure 8-1 from NEI FLEX Implementation Guide [NEI 12-06] was used for this assessment. Also, Figure 8-2, "Maximum Ice Storm Severity Maps [EPRI, Ice Storm Data Base and Ice Severity Maps, TR-106762, September 1996]," shows LSCS in an Ice Severity Level 5 zone. Therefore, snow, ice and extreme cold are applicable to LSCS.

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

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

NEI 12-06, Section 8.3.1 states:

> These considerations apply to the protection of FLEX equipment from snow, ice, and extreme cold hazards:
>
> 1. For sites subject to significant snowfall and ice storms, portable FLEX equipment should be stored in one of the two configurations.
>
>   a. In a structure that meets the plant's design basis for the snow, ice and cold conditions (e.g., existing safety-related structure).

b. In a structure designed to or evaluated equivalent to ASCE 7-10, *Minimum Design Loads for Buildings and Other Structures* for the snow, ice, and cold conditions from the site's design basis.

c. Provided the N sets of equipment are located as described in a. or b. above, the N+1 equipment may be stored in an evaluated storage location capable of withstanding historical extreme weather conditions such that the equipment is deployable.

2. Storage of FLEX equipment should account for the fact that the equipment will need to function in a timely manner. The equipment should be maintained at a temperature within a range to ensure its likely function when called upon. For example, by storage in a heated enclosure or by direct heating (e.g., jacket water, battery, engine block heater, etc.).

In various sections of the Integrated Plan, the licensee stated that protection of associated portable equipment from the snow, ice and extreme cold hazard would be provided as follows:

> Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LaSalle.

The licensee has stated that LSCS storage building(s) for portable/FLEX equipment are being designed to conform to NEI 12-06, Section 11. During the audit, the licensee stated that storage for the equipment will conform to NEI 12-06, Section 8.3.1 for snow, ice and extreme cold.

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

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

NEI 12-06, Section 8.3.2 states:

> There are a number of considerations that apply to the deployment of FLEX equipment for snow, ice, and extreme cold hazards:
>
> 1. The FLEX equipment should be procured to function in the extreme conditions applicable to the site. Normal safety-related design limits for outside conditions may be used, but consideration should also be made for any manual operations required by plant personnel in such conditions.

2. For sites exposed to extreme snowfall and ice storms, provisions should be made for snow/ice removal, as needed to obtain and transport FLEX equipment from storage to its location for deployment.

3. For some sites, the ultimate heat sink and flow path may be affected by extreme low temperatures due to ice blockage or formation of frazil ice. Consequently, the evaluation should address the effects of such a loss of UHS on the deployment of FLEX equipment. For example, if UHS water is to be used as a makeup source, some additional measures may need to be taken to assure that the FLEX equipment can utilize the water.

On page 12 of the Integrated Plan, in the section regarding programmatic controls, the licensee stated that equipment associated with these strategies will be procured as commercial equipment with design as outlined in JLD-ISG-2012-01, Section 6, and NEI 12-06, Section 11.

The reviewer notes that working in extreme cold is not an unusual working condition in northern Illinois.

On page 11 of the Integrated Plan, in the section regarding how strategies will be deployed in all modes, the licensee stated that:

> An administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation. This administrative program will also ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes.
>
> Identification of storage areas and creation of the administrative program are open items. Closure of these items will be documented in a six-month update.

On page 56 of the Integrated Plan, in the section regarding portable/FLEX equipment available during the Phase 2, the licensee identified a Ford F-750 truck with a snow plow.

On page 20 of the Integrated Plan, the licensee described a primary and an alternate method to maintain core cooling. The primary method is to use prestaged FLEX pumps that take suction from the UHS via lines installed in the basement of the Lake Screen House. The alternate method is to use submersible pumps can take suction from the UHS and provide water to portable diesel driven pumps that can inject to the reactor pressure vessel (RPV), suppression pool and SFP.

During the audit, the licensee addressed the effect of ice blockage or formation of frazil ice on the UHS. The primary method of the access to the UHS is through a trash rack and then through traveling screens. Prior to the ELAP, warm water is recirculated to prevent ice blockage or frazil problems. During the ELAP, the traveling screens stop, however, the velocity of water through the trash racks and traveling screens would be low and buildup should not prevent passing the small percentage of water that normally flows through them. The alternate access to the UHS will be by low pressure submersible pumps installed in floating screened boxes. If frazil ice becomes an issue, the licensee stated they would just pull the boxes from the lake, knock the ice off, and put the boxes back in the lake.

The reviewer noted that the LSCS UFSAR identifies in Section 9.2.1.3 that there is a 54 inch pipe that bypasses the traveling screens. The 54 inch pipe is located a minimum of 10 feet below the UHS surface to prevent blockage by ice.

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

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

NEI 12-06, Section 8.3.3, states:

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

On page 11 of the Integrated Plan, in the section regarding how strategies will be deployed in all modes, the licensee stated that:

> An administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation. This administrative program will also ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes.
>
> Identification of storage areas and creation of the administrative program are open items. Closure of these items will be documented in a six-month update.

In various sections of the Integrated Plan discussing procedures, strategies and guidelines for various phases, the licensee stated:

> LaSalle will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

On page 56 of the Integrated Plan, in the section regarding portable/FLEX equipment available during the Phase 2, the licensee identified a Ford F-750 truck with a snow plow.

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

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

NEI 12-06, Section 8.3.4, states:

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

On pages 12 and 13 of the Integrated Plan, in the section regarding the RRC, the licensee stated:

> LSCS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER).
>
> The industry will establish two (2) Regional Response Centers (RRC) to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. 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 the affected nuclear site 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 within 24 hours from the initial request.

The licensee has not yet identified the local staging area(s) for the RRC FLEX equipment and has not yet described the methods to be used to deliver the equipment to the site in the Integrated Plan. The confirmatory item tracking this issue has been combined with previously identified 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 using offsite resources during a snow, ice and extreme cold hazard, if these requirements are implemented as described.

3.1.5 High Temperatures

NEI 12-06, Section 9.2 states:

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

On page 3 of the Integrated Plan, in the section regarding the determination of applicable extreme external hazards, the licensee stated NEI 12-06 states that all sites must consider high temperatures.

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

3.1.5.1 Protection of FLEX Equipment - High Temperature Hazard

NEI 12-06, Section 9.3.1, states:

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

In various sections of the Integrated Plan, the licensee stated that protection of associated portable equipment from the high temperature hazard would be provided as follows:

> Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LaSalle.

During the audit, the licensee stated that storage for the equipment will conform to NEI 12-06, Section 9.3.1 for high temperatures.

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

3.1.5.2 Deployment of FLEX Equipment - High Temperature Hazard

NEI 12-06, Section 9.3.2 states:

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

On page 12 of the Integrated Plan, in the section regarding programmatic controls, the licensee stated that equipment associated with these strategies will be procured as commercial equipment with design as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.

On page 11 of the Integrated Plan, in the section regarding how strategies will be deployed in all modes, the licensee stated that an administrative program will be developed that will ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes. The licensee stated the administrative program is an open item and its closure will be documented in a future six-month update.

Page 56 of the Integrated Plan identifies a Ford-F-750 truck for use as a towing vehicle. During the audit, the licensee identified that the truck will be stored with the other portable equipment.

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

3.1.5.3 Procedural Interfaces – High Temperature Hazard

NEI 12-06, Section 9.3.3 states:

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

On page 11 of the Integrated Plan, in the section regarding how strategies will be deployed in all modes, the licensee stated that an administrative program will be developed that will ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes. The licensee stated the administrative program is an open item and its closure will be documented in a future six-month update.

On page 12 of the Integrated Plan, in the section regarding programmatic controls, the licensee stated that equipment associated with these strategies will be procured as commercial equipment with design as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.

On page 18 of the Integrated Plan regarding procedures, strategies and guidelines during Phase 1, the licensee stated:

> LaSalle will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

During the audit, the licensee stated the location for operating the diesel driven pumps and generators is outdoors. The reviewer notes that such a location would not suffer the high temperatures that could arise if the equipment was located in an enclosed space.

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 from a high temperature hazard, if these requirements are implemented as described.

3.2 PHASED APPROACH

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

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

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

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

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

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

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

3.2.1.1 Computer Code Used for the ELAP Analysis.

NEI 12-06, Section 1.3 states:

> To the extent practical, generic thermal hydraulic analyses will be developed to support plant- specific decision-making. Justification for the duration of each phase will address the on-site availability of equipment, the resources necessary

to deploy the equipment consistent with the required timeline, anticipated site conditions following the beyond-design-basis external event, and the ability of the local infrastructure to enable delivery of equipment and resources from off-site.

On pages 9 and 10 of the Integrated Plan regarding the sequence of events (SOE) timeline, the licensee stated that the timeline is based on analysis using the Modular Accident Analysis Program (MAAP). Review of the MAAP analysis in the licensee's ePortal identified version MAAP 4.0.5 was used.

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

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

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

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

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

    a. Nodalization
    b. General two-phase flow modeling
    c. Modeling of heat transfer and losses
    d. Choked flow
    e. Vent line pressure losses

f. Decay heat (fission products / actinides / etc.)

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

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

The concern regarding the MAAP limitations was addressed during the audit process. The licensee stated that LSCS will provide a letter to the NRC documenting compliance with the generic approach and addressing the 5 limitations for the use of MAAP.

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

3.2.1.2 Recirculation Pump Seal Leakage Models.

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

The Integrated Plan did not discuss reactor coolant inventory loss including normal system leakage and losses due to BWR recirculation pump seal leakage that is included in the ELAP analysis. There is no discussion of the details of seal leakage rates, the details of the seal qualification tests, the seal leakage rate models and supporting test data, leakage rate pressure-dependence, and any conservative margin are not described within the mitigation plan or supplied with it.

During the audit, the licensee posted the MAAP analysis on the ePortal. Review of the calculation identified that the seal leakage is specified as 18 gpm for each of the 2 recirculation pumps and unidentified system leakage is 25 gpm for a total of 61 gpm leakage. The analysis assumed 100 gpm for conservatism. The leak was modeled as a hole with a 100 gpm throughput at full system pressure. As the system pressure is reduced, the leak-off is reduced by the MAAP model.

Additional information is needed including the technical basis for the assumptions made regarding the leakage rate through the recirculation pump seals and also other sources. In addition, information is needed to identify whether the leakage was determined or assumed to be single-phase liquid, two-phase mixture, or steam at the donor cell, and how mixing the leakage flow with the drywell atmosphere is modeled. This has been identified as Confirmatory Item 3.2.1.2.A in Section 4.2.

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

3.2.1.3 Sequence of Events

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

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

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

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

The RCIC system is proposed as the initial means by which the licensee will remove decay heat during an ELAP event. The RCIC system consists of a steam-driven turbine pump unit and associated valves and piping capable of delivering makeup water to the reactor vessel. The steam supply to the turbine comes from the reactor vessel. The steam exhaust from the turbine dumps to the suppression pool. The pump can take suction from the demineralized water in the condensate storage tank (CST) or from the suppression pool. For the case of an ELAP at LSCS, the licensee states that the RCIC suction path will swap if the CST is not available. The RCIC system logic control power is supplied from Division 1 and Division 2 125 volts direct current (Vdc). The RCIC motor operated valves are powered from 250 Vdc, with the exception of three 480 Vac containment isolation valves discussed in the Integrated Plan. Following any reactor shutdown, steam generation continues due to heat produced by the radioactive decay of fission products. The steam normally flows to the main condenser through the turbine bypass valves or, if the condenser is isolated, through the RPV safety/relief valves (SRVs) to the suppression pool. The RCIC system turbine pump unit either starts automatically upon a receipt of a reactor vessel low-low water level signal or is started by the operator from the Control Room by remote manual controls. The RCIC system delivers its design flow within 30 seconds after actuation. To limit the amount of fluid leaving the reactor vessel, the reactor vessel low-low water level signal also actuates the closure of the main steam isolation valves.

During the audit, the licensee was requested to discuss the inboard and outboard isolation valves of RCIC that are powered by 480 Vac with regard to how loss of ac would affect mitigating strategies and any required actions. The licensee responded that during normal standby operation, the E51-F063 valve (inboard steam isolation valve) is normally open, the E51-F076 valve is normally closed (inboard steam isolation valve that is used for RCIC steam line warming - it provides a bypass path around the larger E51-F063 valve), and the E51-F008 valve (outboard steam isolation valve) is normally open. The normal standby positions of these valves supports normal RCIC operation and the loss of ac power during the ELAP does not affect the operation of RCIC to support the FLEX strategies since these valves are not required to change position from their normal standby position to support RCIC operation.

During the audit, the licensee was requested to provide a discussion that supports that the instrumentation to switch RCIC suction from the CST to the suppression pool will remain operational, the switchover function will be accomplished in a timely manner, and that RCIC injection to the RPV will remain uninterrupted. The licensee was also requested to discuss whether switchover function during ELAP will be carried out manually or automatically; and if manually, then whether it is carried out from the main control room (MCR), or from the remote control panel, or from any other secured and accessible location.

The licensee responded by stating:

> The normal system line-up is to the Condensate Storage tank (CST) through the 1(2)E51-F010 suction valve to the RCIC pump. On a CST low level of approximately 3' 1" the suction is transferred to the suppression pool. The suppression pool suction valve 1(2)E51-F031 opens on a low level signal from either 1(2)E51-N035A/E. The 1(2)E51-F010 CST suction valve is logic tied to close when the 1(2)E51-F031 suppression pool suction valve opens. These as well as any other RCIC valve required to change position to support a RCIC start/run are 250VDC. Both suction valves and associated piping are safety related and seismic category 1. The CST level instrumentation is located in the Turbine building on the 710' elevation. The level instrumentation reads from a stand pipe (1(2)CY11A-8') which is not safety related or seismic. The level instrumentation 1(2)E51-N035A/E are of Augmented Quality and seismic category 1. The level instrumentation electrical feed is from 125VDC. The switch over from CST to Suppression Pool suction is an automatic function. For the ELAP event in which the CST is not available, the suction swap from the CST to the suppression pool can be accomplished by opening the suppression pool suction valve and then closing the CST suction valve from control switches located in the main control room.

Justification is required that taking readings from a standpipe which is not safety related or seismic does not make the CST level instrumentation inadequate for the automatic swap or informing the operators of CST loss so that they may respond with manual action using the control switches located in the MCR. This has been identified as Confirmatory Item 3.2.1.3.A in Section 4.2.

On pages 42 and 43 of the Integrated Plan, the licensee discussed load shedding. The licensee has determined that dc load reductions must be completed within specific times following an

ELAP. Completion of these operator actions results in a battery coping time or lifetime of eight hours. The licensee has stated that load reductions for the two 125 volt batteries and one 250 volt battery at each unit should be complete, using existing SBO procedures, within 30 minutes elapsed time following the start of the ELAP event. The load shed is initiated at 5 minutes elapsed time and completed at 30 minutes elapsed time. A second 'extended' dc load shed is started at approximately 180 minutes elapsed time on both Unit 1 safety division dc busses and one Unit 2 safety division. The licensee stated that the 'extended' load reductions for the two Unit 1 125 volt station batteries should be completed prior to 4.5 hours elapsed time for Division 1 battery 1DC07E and prior to 5.5 hours for the Division 2 battery 1DC14E. Load shedding should be completed prior to 5.5 hours for the Unit 2 Division 1 battery 2DC07E. No additional or 'extended' load shedding is required for the Unit 2 Division 2 battery 2DC14E or the Unit 1 and Unit 2 250 volt batteries, 1DC01E and 2DCO1E, respectively. The licensee has stated that completion of the initial dc bus load shedding and the additional 'extended' load shedding on three dc busses will result in a battery coping time of at least eight hours. The SOE timeline identifies action 21 at elapsed time 6 hours to have the FLEX 480 Vac generators connected to the battery chargers.

In addition to dc electrical power, the automatic depressurization system (ADS) SRVs also require a source of pressurized nitrogen that acts as an operating gas. Each SRV has a compressed gas accumulator that acts as a reservoir that is normally kept pressurized by a non-safety related drywell compressed gas system. Because the drywell pneumatic system is not available during an ELAP, a backup nitrogen system is installed at LSCS that consists of a bank of high pressure compressed nitrogen cylinders.

On page 8 of the Integrated Plan, in the section regarding time constraints identified in the SOE timeline, the licensee stated in part:

> Action Item #19:
> Manual control of the ADS SRVs requires adequate nitrogen supply to the ADS accumulators. Existing SBO nitrogen supply calculation L-03263, Rev. 2, "Volume Requirements for ADS Back-up Compressed Gas System (Bottle Banks), states that the 20 degree/hr cooldown rate would require 28 ADS SRV actuations in a four (4) hour period. It also calculates that both ADS nitrogen bottle banks can support 38 actuations. At a rate of ~7 actuations per hour, additional nitrogen supply will be required at ~5 hours.

A reactor cooldown and depressurization is started within 20 minutes post event time at 20°F per hour by cycling open the ADS SRVs. Anticipatory containment venting is initiated at 12 pounds per square inch gauge (psig) containment wetwell pressure, this will occur at approximately 5.4 hours event time based on the MAAP analysis. Portable/FLEX pumps are connected and aligned to pump water from the UHS into the suppression pool or directly into the RPV and start injecting at 6 hours event time. At 6.7 hours event time when the Heat Capacity Temperature Limit (HCTL) of the suppression pool is expected to be reached, the RPV is depressurized to 200 psig, and held between 150 to 250 psig to support RCIC turbine operation. SFP makeup is started at 12 hours event time using portable/FLEX pumps pumping from the UHS using CSCS piping. The timeline is based on the results of the MAAP analysis case 3e that was made available on the licensee's ePortal during the audit.

During the audit, the licensee clarified that LSCS did not use the NEDC-33771P, "GEH Evaluation of FLEX Implementation Guidelines," Revision 0, results to support the event timeline.

On page 25 of the Integrated Plan, in the section regarding coping strategies for Phase 3, the licensee stated:

> Phases 1 and 2 strategy will provide sufficient capability such that no additional Phase 3 strategies are required.
>
> Phase 3 equipment for LaSalle includes backup portable pumps and generators. The portable pumps will be capable of providing the necessary flow and pressure as outlined in Phase 2 response for Core Cooling, Containment Cooling and Spent Fuel Pool Cooling. The portable generators will be capable of providing the necessary 480 volt power requirements as outlined in Phase 2 response for Safety Functions Support.

On page 5 of the Integrated Plan, the licensee stated:

> The times to complete actions in the Events Timeline are based on operating judgment, conceptual designs, and current supporting analyses. The final timeline will be time validated once detailed designs are completed and procedures are developed. The results will be provided in a future six-month update.

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

3.2.1.4 Systems and Components for Consequence Mitigation

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

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

And,

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

NEI 12-06, Section 3.2.1.12 states:

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

On page 14 of the Integrated Plan, the licensee stated that equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in JLD-ISG-2012-01, Section 6, and NEI 12-06, Section 11. Installed structures, systems and components pursuant to 10 CFR 50.63(a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout.

On pages 55 through 58 of the Integrated Plan, in the section listing portable/FLEX equipment intended to be used during Phase 2, the licensee included the following equipment:

Three (3) large self-prime pumps (Support Alternate Strategy).
Performance Criteria: To be determined as part of detailed design process.

Three (3) 480 VAC Generators (Support Primary Strategy).
Performance Criteria: To be determined as part of detailed design process.

Two (2) 480 VAC Pumps (Support Primary Strategy).
Performance Criteria: To be determined as part of detailed design process.

Three (3) Submersible Hydraulic Pumps (Support Alternate Strategy).
Performance Criteria: To provide suction to portable large self-prime pumps from UHS. Actual number and size of submersible hydraulic pumps to be determined as part of detailed design process. [These are low pressure high volume pumps.]

Ford F-750 Truck w/snow plow and diesel fuel tanks.
Performance Criteria: Tow vehicle, portable equipment refueling vehicle, and debris removal vehicle

Three (3) Tandem Axle Hose Trailers (Support Alternate Strategy).
Performance Criteria: Capable of hauling hoses, fittings, tools and spray monitors

Six (6) 5.5 kW portable diesel generators (Support powering fans for RCIC room cooling).
Performance Criteria: Diesel, 5.5 kW.

Ten (10) portable fans with ducting (Support RCIC room cooling).
Performance Criteria: 115 VAC, 5,000 SCFM.

Two (2) Oscillating Spray Fire Monitors (Support SFP Spray).
Performance Criteria: 250 gpm.

Miscellaneous fire hose and fittings (Support Alternate Strategy and SFP Spray).
Performance Criteria: Various.

The coping strategies for maintaining core, containment and SFP cooling discuss using portable/FLEX pumps for makeup to the suppression pool and for direct RPV injection and also use of portable/FLEX electrical generators for powering 480 Vac busses and dc busses through station battery chargers. However, the Integrated Plan does not state details necessary to validate these strategies.

There was insufficient information presented to confirm the ability of the portable/FLEX pumps to deliver the required flow and of the portable/FLEX electrical generators to supply critical electrical loads. The Integrated Plan did not contain supporting information concerning the required water flow rates, the portable/FLEX pump complete head/flow characteristics, suction and discharge losses, system backpressure, elevation differences and piping losses to allow verification that this will be a successful strategy. Likewise, there was insufficient data on electrical loads and of the capacity of portable/FLEX electrical generators planned for use during the transition and final phases. This has been identified as Confirmatory Items 3.2.1.4.A and 3.2.1.4.B in Section 4.2.

On pages 59 and 60 of the Integrated Plan, in the section regarding portable/FLEX equipment to be delivered from the RRC, the licensee stated in part:

> Medium Voltage Diesel Generator
> Performance Criteria: 2 MW [megawatt] output at 4160 Vac, three phase
>
> Air Compressor
> 120 psi minimum pressure, 2000 scfm [standard cubic feet per minute]

Although the licensee has identified this equipment to be delivered from the RRC, the Integrated Plan has not identified a coping strategy application for this equipment. During the audit, the licensee stated that these items were identified for potential long term recovery and were not specifically for a FLEX strategy. The licensee stated that they will continue to evaluate the equipment listing as the final design evolves and identify any changes in a future six-month report.

During the audit, the licensee was requested to provide a summary of non-safety-related installed equipment that is used in the mitigation strategies, including a discussion of the equipment's reliability and qualification to survive all ELAP external events. The licensee responded by stating LaSalle County Station is not relying on any non-safety related installed systems or equipment for ELAP mitigation strategies currently used. Credit is taken for structures as follows:

> With regards to the flood control condenser pit walls, and more specifically their capacity to withstand a seismic event, both the LaSalle UFSAR and Design Structure Criteria indicate that their design is seismic. The shear walls for the Reactor Building, Auxiliary Building, Turbine Building, Radwaste Building, Diesel Generator Buildings, and Off-gas Filter Building are all interconnected. All of these shear walls have been considered to act together to resist lateral loads applied to these buildings.

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

3.2.1.5 Monitoring Instrumentation and Controls

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

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

On pages 18, 21, and 22 of the Integrated Plan, in the section regarding instrumentation credited for supporting the coping strategy to maintain core cooling during Phase 1 and Phase 2, the licensee listed instrument channels:

1(2) C34-N004B, RPV Level (Control Room indicator is 1(2) C34-R606B), Narrow Range, 0-60 inches
1(2) C34-N004C, RPV Level (Control Room indicator is 1(2) C34- R606C), Narrow Range, 0-60 inches
1(2) E51-R602, RCIC Turbine Steam Inlet Pressure (Control Room), 0-1500 psig
1(2) C61-R011, RPV Pressure (Remote Shutdown Panel), 0-1500 psig
1(2) C61-R010, RPV Level (Remote Shutdown Panel,) Wide Range, -150 to +60 inches

On pages 28, 30, and 31 of the Integrated Plan, in the section regarding instrumentation credited for supporting the coping strategy to maintain containment during Phase 1 and Phase 2, the licensee listed instrument channels:

Drywell temperature, 1(2) TI-CM045 (Remote Shutdown Panel), 0-600 Deg F
Drywell pressure -1(2)C71-N004 (Local Rx Bldg 761 Elev.), Narrow range, -20 to +60 inches water o Equates to ---0.75 to +2.25 psig
Suppression Pool water temperature - 1(2) TI-CM037 (Remote Shutdown Panel), 0-225 Deg F
Suppression Pool level - 1(2) CM02M (Local Rx Bldg 694 Elev), Narrow range, approximately +/-1 ft of 699'11"
Suppression Pool air temperature - 1(2) TI-CM040 (Remote Shutdown Panel), 0-275 Deg F

During the audit, the licensee stated that the listed instrumentation is dc powered with the exception of drywell pressure (mechanical pressure gauge) and suppression pool level (sight glass).

On page 28 of the Integrated Plan, in the section regarding modifications required for maintaining containment, the licensee stated that modifications are needed to:

1. Have suitable instrument(s) for Drywell Pressure and/or Suppression Chamber (Pool) Pressure indication.

2. Have suitable instrument for Suppression Pool level indication.

3. Expand the range for Suppression Pool water temperature.

On page 38 of the Integrated Plan, in the section regarding key parameters for maintaining SFP cooling, the licensee stated that SFP level is in accordance with Order EA 12-051.

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

3.2.1.6 Motive Power, Valve Controls and Motive Air System

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

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

And,

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

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

On pages 15 and 16 of the Integrated Plan, the licensee describes that the RPV cooldown is managed by manually opening the ADS SRVs along with the operation of the turbine driven RCIC pump. The SRVs require dc electrical control power, pressurized air or nitrogen and system pressure to operate the main valve within the SRV in the relief mode. Each of the seven ADS SRVs has an associated accumulator that is charged by the Drywell Pneumatic System. Although it is the normal supply to the SRV accumulators, the Drywell Pneumatic System is not safety-related and will not operate during an ELAP. An ADS accumulator backup compressed gas system is provided in addition to the Drywell Pneumatic System. The backup compressed gas system consists of banks of high pressure nitrogen cylinders. In addition, there is an emergency pressurization station in an accessible area of the auxiliary building at which each

ADS gas line can be recharged indefinitely via nitrogen bottles brought to that point, in the event the reactor building becomes inaccessible.

On page 8 of the Integrated Plan, in the section regarding time constraints identified in the SOE timeline, the licensee stated in part:

> Action Item #19:
> Manual control of the ADS SRVs requires adequate nitrogen supply to the ADS accumulators. Existing SBO nitrogen supply calculation L-03263, Rev. 2, "Volume Requirements for ADS Back-up Compressed Gas System (Bottle Banks) [LaSalle Calculation L-003263, Rev. 02, "Volume Requirements for ADS Back-up Compressed Gas System (Bottle Banks)"], states that the 20 degree/hr cooldown rate would require 28 ADS SRV actuations in a four (4) hour period. It also calculates that both ADS nitrogen bottle banks can support 38 actuations. At a rate of ~7 actuations per hour, additional nitrogen supply will be required at ~5 hours.

The licensee has identified the need to replace the SRV backup nitrogen supply high pressure cylinders during an ELAP to maintain the operability of the SRVs for coping strategies for core and containment cooling. However, the Integrated Plan does not include a discussion of the quantity of high pressure nitrogen cylinders to be stored on-site. Although the Integrated Plan mentions that the connection point is in the Auxiliary Building, there is no discussion of the access pathways and the seismic robustness of structures that need to be accessed.

During the audit, the licensee stated:

> A detailed evaluation of the nitrogen supply necessary to sustain SRV operation during the ELAP event has not yet been performed. Current strategy is to maintain spare nitrogen bottles in protected storage (either in the new FLEX building or in existing protected structures) and/or have compressed air capability to maintain SRV operation. The additional bottles or compressed air supply will be connected at the Emergency Pressurization Station on the 731 elevation of the protected Aux Building. Details of this plan, when finalized, will be communicated in a future six-month update.

During the audit, the licensee identified the Emergency Pressurization Station is a Seismic Category 1 system and access is available through a seismically robust path.

DC electrical power is also needed to operate the SRVs. Although the licensee has not specifically discussed dc power requirements for SRV operation, the licensee has discussed coping strategies to deploy a portable/FLEX electrical generator to power a station battery charger and charge station batteries prior to battery depletion.

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

3.2.1.7 Cold Shutdown and Refueling

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

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

The NRC staff reviewed the licensee's Integrated Plan and determined that the Generic Concern related to shutdown and refueling guidelines 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.

The licensee discussed this issue during the audit process. The licensee stated that LSCS plans to abide by the generic resolution. Furthermore, the licensee stated that a review is in progress to develop a plan to address potential plant-specific issues associated with implementing the generic approach and the results and conclusions of this review will be provided in a future 6-month update

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

3.2.1.8 Use of Portable Pumps

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

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

NEI 12-06 Section 11.2 states in part:

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

On page 20 of the Integrated Plan, in the section regarding coping strategies to maintain core cooling during Phase 2, the licensee identified that they will permanently stage a portable/FLEX pump in the CSCS pump rooms at each unit for either direct RPV injection or injection into the suppression pool.

> In the strategy described below, the FLEX pump is pre-staged to essentially jumper around this 'B' [fuel pool cooling] FC [emergency makeup] EMU pump to use the safety-related water source available in the CSCS pump room (UHS water from Lake Screen House/Lake) and discharge to the path described in item #3 above (RPV and containment).
>
> The primary strategy for providing RPV injection via FLEX equipment (should RCIC become unavailable) will be via 480 VAC pumps installed in a Unit 1 and Unit 2 CSCS pump room (conceptual design is using installation in the Div. 2 CSCS pump room). These pre-staged FLEX pumps will be connected to an UHS water source available in the CSCS pump rooms and the discharge will be connected to the discharge of the existing 'B' FC EMU pump.

On page 23 of the Integrated Plan, the licensee stated that for the primary strategy (for RPV injection if RCIC becomes unavailable), FLEX pumps will be pre-staged on each unit in one of the CSCS pump rooms.

During the audit, the licensee was requested to describe how permanent staging of portable/FLEX pumps and the distribution panel meets the specifications for a phased approach discussed in NEI 12-06 and JLD-ISG-2012-01 where coping strategies use portable/FLEX equipment that had been protected from all external hazards.

The licensee responded that the pre-staged FLEX pumps will be located in the Division 2 CSCS pump rooms on each unit which are safety related, seismic, protected structures that will be protected from all beyond design basis external events.

On pages 20 and 21 of the Integrated Plan, the licensee stated

> The alternate strategy for providing RPV injection via FLEX equipment is to pump water from the UHS (lake location) using a high volume, low pressure pumping system that conceptually consists of a hydraulic submersible pump to be placed in the UHS water source that provides adequate flow/[net positive suction head] NPSH to a portable diesel driven pump (PDDP). The PDDP provides water to each reactor building where it is attached to a new water piping system that is included in the hardened containment vent chase that goes up the outside wall on the east side of each reactor building. This new water piping system will have penetrations into the reactor buildings at the 761 ft elevation for connection to the

existing B.5.b RHR connections that provide a path for RPV injection. This RHR connection can also provide makeup to the suppression pool to help maintain RCIC suction.

On pages 55 and 56 of the Integrated Plan, the licensee stated that the performance criteria for the pumps will be determined during detailed design. This has been combined with previously identified Confirmatory Item 3.2.1.4.A, in Section 4.2.

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

3.2.2 Spent Fuel Pool Cooling Strategies

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

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

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

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

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

2. Although sloshing may occur during a seismic event, the initial loss of SFP inventory does not preclude access to the refueling deck around the pool.

3. SFP cooling system is intact, including attached piping.

4. SFP heat load assumes the maximum design basis heat load for the site.

On page 35 of the Integrated Plan, in the section regarding maintaining SFP cooling during the initial phase, the licensee stated:

> There are no Phase 1 actions required at this time that need to be addressed.
>
> An evaluation of Spent Fuel Pool scenarios was performed and documented in LaSalle EC 392196 [LaSalle Engineering Evaluation EC 392196, Rev. 0, "Spent Fuel Pool Uncovery Time for Outage and Online Scenarios]. Spent Fuel Pool (SFP) makeup is not a time constraint with the initial condition of Mode 1 at 100% power, since the worst case fuel pool heat load conditions only exist during a refueling outage. Under non-outage conditions, the maximum SFP heat load is 27.38 MBtu/hr. Loss of SFP cooling with this heat load and an initial SFP temperature of 140 degrees F results in a time to boil of 12.1 hours, and 123 hours to the top of active fuel. Therefore, completing the equipment line-up for initiating SFP makeup at 12 hours into the event ensures adequate cooling of the spent fuel is maintained.
>
> The worst case SFP heat load during an outage is 56.03 MBtu/hr. Loss of SFP cooling with this heat load and an initial SFP temperature of 140 degrees F results in a time to boil of 5.86 hours, and 60.1 hours to the top of active fuel. With the entire core being located in the SFP, manpower resources normally allocated to aligning core cooling along with the Operations outage shift manpower can be allocated to aligning SFP makeup which ensures the system alignment can be established within eight (8) hours. Initiation at eight (8) hours into the event ensures adequate cooling of the spent fuel is maintained.
>
> Analysis will be performed during development of the detailed design to validate the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. The results of this analysis will be provided during a scheduled six-month update. This update will include any changes to the initial designs and/or strategies as submitted in the February 28, 2013 Integrated Plan.

On page 37 of the Integrated Plan, in the section regarding maintaining SFP cooling during Phase 2, the licensee stated:

> The primary and alternate strategies for connection of the FLEX pumps for Core Cooling and Containment Cooling also provide connection to a dedicated hose station on the refuel floor that can be used for SFP filling and spray. The primary and alternate strategy connections also provide a path through 'B' RHR for SFP water addition without accessing the refuel floor. An additional spool piece will require installation to provide SFP fill via the RHR line.

On pages 35 and 37 of the Integrated Plan, the licensee stated:

> Evaluation of the spent fuel pool area for steam and condensation has not yet been performed. The results of this evaluation and the vent path strategy, if needed, will be provided in a future six-month update.

Evaluation of vent path strategy has been identified as Confirmatory Item 3.2.2.A, in Section 4.2.

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

3.2.3 Containment Function Strategies

NEI 12-06, Table 3-1 and Appendix C provide a description of the safety functions and performance attributes for BWR containments which are to be maintained during an ELAP as defined by Order EA-12-049. The safety function applicable to LaSalle, a BWR with a Mark II containment, listed in Table 3-1 is "Containment Pressure Control/Heat Removal", and the method cited for accomplishing this safety function is "Containment Venting or Alternative Containment Heat Removal." Furthermore, the performance attributes listed in Table C-2 denote the containment's function is to provide a "reliable means to assure containment heat removal". JLD-ISG-2012-01, Section 5.1 is aligned with this position stating, in part, that the goal of this strategy is to relieve pressure from the containment.

The licensee's strategy, as indicated in their Integrated Plan and further discussed during the audit process, is to utilize the guidance of Revision 3 of the Boiling Water Reactor Owners' Group (BWROG) Emergency Procedures Guidelines (EPG) Severe Accident Guidelines (SAG) to open the Hardened Containment Vent System (HCVS) and remove decay heat from the primary containment following an ELAP event.

On page 27 of the Integrated Plan, in the section regarding maintaining containment integrity during the Phase 1, the licensee stated:

> During Phase 1, containment integrity is maintained by the normal design features of the containment. In accordance with NEI 12-06, the containment is assumed to be isolated following the event. As the suppression pool heats up and the water begins to boil, the containment will begin to heat up and pressurize. In order to protect the containment for this scenario, an early containment venting strategy is implemented. In this case, the Hardened Containment Vent System (HCVS) is used as implemented per EA-12-050, Reliable Hardened Containment Vents [NRC Order EA-12-050, "Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents," March 12, 2012,] with control from the main control room (MCR) or remote operating station. Commencing early containment venting (at a conceptual trigger of 12 psig wetwell pressure) will serve to limit the Containment pressure rise and Suppression Pool temperature rise, which will allow for long term operation of the RCIC System for core cooling.
>
> The suppression pool temperature is a limiting factor for implementation of the ELAP strategy. RCIC suction temperature will be allowed to go as high as ~230°F. By opening the HCVS at approximately the 5.4 hour point (corresponding to the conceptual trigger of 12 psig wetwell pressure), and maintaining the suppression pool airspace pressure at ~8 psig, the suppression pool temperature

peaks at ~234°F [LS-MISC-017, Rev. 1, "MAAP Analysis to Support Initial FLEX Strategy," LaSalle Units 1 and 2].

The containment design pressure is 45 psig (UFSAR Table 6.2-1). Containment pressure limits are not expected to be reached during the event as indicated by MAAP analysis [LS-MISC-017], because the HCVS is opened prior to exceeding any containment pressure limits.

On page 30 of the Integrated Plan, in the section regarding maintaining containment integrity during the Phase 2, the licensee stated:

Containment venting via the use of the installed HCVS will continue in Phase 2.

Inventory will be made up to the Suppression Pool with the FLEX Pump via the RHR System, which will maintain Suppression Pool level and also provide some cooling of the Suppression Pool.

On page 9 of Integrated Plan, in the section regarding time constraints identified in the SOE timeline, the licensee stated in part:

The basic coping strategy being pursued at LaSalle is a cooldown of less than or equal to 20°F/hr coupled with an early containment venting strategy and makeup to the suppression pool via an external source such that RCIC is maintained available for RPV level control. The following timeline events are based on the MAAP analysis [LS-MISC-017, Case 3.e]:

- The conceptual early containment venting trigger of 12 psig wetwell pressure is reached at ~5.4 hours. A wetwell pressure of ~8 psig is then regulated via the Hardened Containment Vent System (HCVS) to maintain the suppression pool temperature at ~234°F for long term RCIC operation.
- Suppression pool makeup via the external source (FLEX pump with UHS suction source) is initiated at ~6 hours based on suppression pool level decreasing as a result of the containment venting.
- The HCTL curve is exceeded at ~6.7 hours.
- The Pressure Suppression Pressure Limit/Curve is NOT exceeded under this strategy.
- Drywell airspace temperature does NOT exceed the EOP limit of 340°F (peaks at 261°F under this strategy).

On pages 64 and 65 of the Integrated Plan, in the section regarding discussing the SOE timeline, the licensee stated in part:

Action Item: 20, Event Time: ~5.4 hours
Action: Initiate early containment venting strategy at a wetwell pressure of ~12 psig. Open hardened containment vent with path from the wetwell.
Remarks: MAAP analysis [LS-MISC-017] indicates that the conceptual early containment venting strategy trigger of 12 psig in the wetwell will occur at ~5.4 hrs with this strategy.

Action Item: 22, Event Time: 6 hours

Action: FLEX pumps connected (electrical and water suction/discharge path) and alignment for suppression pool makeup established. Suppression pool makeup begins.
Remarks: MAAP analysis [LS-MISC-017] is showing suppression pool makeup at 6.2 hrs based on the suppression pool level reduction from implementation of the early containment venting strategy at ~5.4 hrs. This MAAP analysis also shows a required makeup flowrate of ~95 gpm for the first 4 hrs after the vent is opened.

Action Item: 23, Event Time: ~6.7 hours
Action: Heat Capacity Temperature Limit (HCTL) curve exceeded, RPV depressurization to ~200 psig required. RPV pressure now maintained 150-250 psig range to support RCIC operation.
Remarks: MAAP analysis [LS-MISC-017] indicates that the HCTL curve will be exceeded at ~6.7 hrs based on this strategy. RPV depressurization stops at ~200 psig (pressure band of 150-250 psig used) in RPV to preserve RCIC operation. Modified depressurization approach supported by BWROG changes to EPGs.

On page 3 of the Integrated Plan, in the section regarding key assumptions associated with the implementation of FLEX strategies, the licensee stated in part:

> BWROG EOP Revision EPG/SAG Rev.3, containing items such as guidance to allow early venting and to maintain steam driven injection equipment available during emergency depressurization, is approved and implemented in time to support the compliance date.

During the audit, the licensee was requested to provide a detailed description of how the required NPSH for the RCIC pump is ensured during an ELAP. In the description, the licensee was requested to include discussion of (1) how Figure 4-1, "The EOP RCIC NPSH Limit Curve," is applied, and (2) technical and procedural details about the vent cycling which will be performed by the operators consistent with the MAAP run, Case 3.e.

The licensee responded by stating:

> The LaSalle EOP RCIC NPSH Limit curve (Figure 4-1) identifies the limiting suppression chamber pressure and suppression pool temperature for various suppression pool levels. These curves were developed in accordance with the EOP guidelines by taking credit for containment pressure in a beyond design basis scenario. To maintain sufficient NPSH available to the RCIC pump, the following conditions listed below must be met based on using venting strategies to maintain suppression pool temperatures at approximately 230 °F.
>
> 1. Maintain suppression chamber pressure below 10 psig
> 2. Maintain greater than 25.2 feet of water in the suppression pool
> 3. Maintain suppression pool water temperature less than 237 °F
>
> For case 3e of the MAAP analysis, the following can be seen:
> 1. Suppression chamber is vented using HCVS to maintain suppression chamber pressure around 8 psig
> 2. Minimum suppression pool level is 26.2 feet

> 3. Suppression pool does not exceed 234 °F.
>
> Based on the above, the requirements for RCIC NPSH are met. To ensure this, operators will monitor the critical parameters (suppression pool level, suppression chamber pressure, and suppression pool temperature). These parameters can be plotted on Figure 4-1 to determine if there is adequate NPSH available to the RCIC pump.
>
> To ensure that the suppression chamber pressure remains below 10 psig, the conceptual design of the HCVS is to provide a pressure control (throttling) valve that can be set to maintain a constant chamber pressure. In this case, the operators would set the controlled pressure to be approximately 8 psig. The system would then automatically control as necessary and maintain this pressure. Limited operator action would be necessary consistent with the requirements of EA-13-109 [Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions].

The licensee's six-month update stated that EA-13-109 has superseded EA-12-050 and as a result, the licensee will submit a request for relief/relaxation for the EA-12-049 schedule of implementation.

In an endorsement letter dated January 9, 2014 (ADAMS Accession No. ML13358A206), the NRC staff concluded that the changes to the BWR venting strategy, as described in the November 21, 2013, position paper submitted by NEI on behalf of the Boiling Water Reactor Owners Group (BWROG) (ADAMS Accession No. ML13352A057), are acceptable, subject to each licensee addressing the plant-specific implementation of the guidance. The letter stated,

> The NRC staff agrees that the changes to the containment venting strategies as described in the BWROG information report are acceptable for use as part of strategies proposed in response to Order EA-12-049, provided that licensee implementation is in compliance with normal change processes for plant emergency procedures and provided that plant-specific evaluations support the use of the revised strategies. The BWROG paper addresses the venting strategy on a generic basis, but plant-specific implementation relies on such items as the capabilities of the installed vent path, net positive suction head for the reactor coolant system injection pumps, and guidance to prevent negative pressure in containment. The NRC staff will evaluate a licensee's application of containment venting strategies in its development of the final Safety Evaluation documenting compliance with NRC Order EA-12-049.

As discussed above, the licensee has indicated that a relief/relaxation request will be submitted for the LaSalle plant which will allow full EA-12-049 compliance to be delayed until modifications can be completed consistent with the technical and schedule requirements of Phase 1 of NRC Order EA-13-109. Compliance with Phase 1 of Order EA-13-109 will ensure the capability of the installed vent path to perform the strategies described in response to Order EA-12-049. The completion of the modifications associated with Order EA 13-109, the verification of the analysis which models the final, installed configuration of the 13-109-compliant HCVS, and the review of the procedures which govern its use are combined and listed as Open Item 3.2.3.A in Section 4.1, below.

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

3.2.4 Support Functions

3.2.4.1 Equipment Cooling - Cooling Water

NEI 12-06, Section 3.2.2, Guideline (3) states:

> *Plant procedures/guidance should specify actions necessary to assure that equipment functionality can be maintained (including support systems or alternate method) in an ELAP/LUHS or can perform without ac power or normal access to the UHS.*
>
> Cooling functions provided by such systems as auxiliary building cooling water, service water, or component cooling water may normally be used in order for equipment to perform their function. It may be necessary to provide an alternate means for support systems that require ac power or normal access to the UHS, or provide a technical justification for continued functionality without the support system.

On pages 16 and 17 of the Integrated Plan, in the section regarding coping strategies to maintain core cooling during Phase 1, the licensee stated in part:

> The RCIC System will maintain RPV water inventory using the suppression pool as a suction source, while the ADS SRVs will be used for RPV pressure control.
>
> Venting of the containment will be initiated such that peak Suppression Pool temperature remains below the maximum allowed for RCIC operation. BWROG RCIC System Operation in Prolonged Station Blackout - Feasibility Study [GEH/BWROG Project Task Report, "RCIC System Operation in Prolonged Station Blackout - Feasibility Study," 0000-0143-0382-R 1, March 2012] indicates that RCIC will remain functional as long as Suppression Pool temperature can be maintained less than approximately 230°F. Operation of RCIC above 230°F is currently being evaluated by General Electric and the BWROG. [BWROG RCIC Pump and Turbine Durability Evaluation - Pinch Point Study, 0000-0155-1545-XX - currently in approval process]. The preliminary MAAP analysis [LS-MISC-017, Case 3.e] performed for strategy development indicated a maximum Suppression Pool temperature of 234°F. Additional work will be performed during detailed design development to ensure Suppression Pool temperature will support RCIC operation, in accordance with approved BWROG analysis, throughout the event.
>
> The operators will commence a DC load shed to preserve DC power. Subsequently, the operators will reduce RPV pressure to 150-250 psig in order to maintain functionality of RCIC.

During the audit, the licensee was requested to provide additional information to justify that RCIC will continue to operate with a suppression pool suction temperature above 200°F. The licensee responded that an evaluation of RCIC is being performed and the results and conclusion will be provided in a future six-month update. Confirmation that the RCIC durability study and results provided for review are adequate has been identified as Confirmatory Item 3.2.4.1.A in Section 4.2.

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

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

3.2.4.2 Ventilation – Equipment Cooling

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

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

> For the limited cooling requirements of a cabinet containing power supplies for instrumentation, simply opening the back doors is effective. For larger cooling loads, such as HPCI, RCIC, and AFW pump rooms, portable engine-driven blowers may be considered during the transient to augment the natural circulation provided by opening doors. The necessary rate of air supply to these rooms may be estimated on the basis of rapidly turning over the room's air volume.
>
> Temperatures in the HPCI pump room and/or steam tunnel for a BWR may reach levels which isolate HPCI or RCIC steam lines. Supplemental air flow or the capability to override the isolation feature may be necessary at some plants. The procedures/guidance should identify the corrective action required, if necessary.
>
> Actuation setpoints for fire protection systems are typically at 165-180°F. It is expected that temperature rises due to loss of ventilation/cooling during an ELAP/LUHS will not be sufficiently high to initiate actuation of fire protection systems. If lower fire protection system setpoints are used or temperatures are expected to exceed these temperatures during an ELAP/LUHS, procedures/guidance should identify actions to avoid such inadvertent actuations or the plant should ensure that actuation does not impact long term operation of the equipment.

On pages 4 and 5 of the Integrated Plan, in the section regarding key assumptions associated with implementation of FLEX strategies, the licensee stated in part:

> Maximum environmental room temperatures for habitability or equipment availability is based on NUMARC 87-00 ["Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," Revision 1] guidance if other design basis information or industry guidance is not available.

On pages 44, and 48 of the Integrated Plan, the licensee stated habitability conditions will be evaluated and a strategy will be developed. The strategy and associated support analyses will be submitted in a future six-month update.

On page 8 of the Integrated Plan, in the section regarding time constraints identified in the SOE timeline, the licensee stated in part:

> Action Items #12 & #13:
> Opening all panel doors in the Main Control Room and AEER within 30 minutes is time sensitive because it supports the temperature transient calculations that were performed for SBO conditions and the application of NUMARC 87-00, Rev. 1 requirements.

During the audit, the licensee was requested to provide a detailed discussion of the technical basis and the resulting plan to ensure that the equipment qualification of the MCR will be maintained in all phases of an ELAP.

The licensee responded by stating that LaSalle plans to perform further evaluation and will provide the results in a future six-month update.

In various sections of the Integrated Plan, the licensee stated in part:

> Per GOTHIC Analysis [Sargent & Lundy Calculation 2012-11819, Rev. 0, "Transient Analysis of RCIC Pump Room for Extended Loss of A-C Power,"], RCIC Room temperature reaches 169°F (equipment acceptance limit per [LaSalle Calculation ATD-0351, "RCIC Pump Room Temperature Transient Following Station Blackout with Gland Seal Leakage," Rev. 3]) at 13 hours. This drives the action to provide external air flow to the RCIC room. The time of 11 hours to initiate external air flow to the RCIC room is established to provide margin to the calculated value.

During the audit, the licensee was requested to provide a detailed discussion of the technical basis and the resulting plan to ensure that the equipment qualification limits within the RCIC Room will be maintained in all phases of an ELAP.

The licensee responded by stating:

> LaSalle has documented the evaluation of the RCIC room heatup in EC 392331 ["RCIC Room Heatup for Extended Loss of AC Power (ELAP) in Support of FLEX," Rev. 0]. This EC has been placed on the ePortal. To protect RCIC equipment, external air flow [5000 cubic feet per minute at 100°F] is planned to be provided by 11 hours as described in the Original Integrated Plan Sequence of Events Timeline. It is expected that RCIC will operate without the need for operator access to the room with the exception of placing the fan/ductwork for room cooling. From a starting RCIC room ambient temperature of 100 deg. F, and with a suppression pool water temperature of 230 deg. F, the peak RCIC room temperature prior to placing a fan/ductwork in place does not exceed the current design basis limits so there is no impact on EQ limits. Appropriate personal protective equipment will be provided to the personnel needing to access the room. The room heatup evaluation shows that the room temperature remains around 132 deg. F following placement of the fan/ductwork.

On page 43 of the Integrated Plan, the licensee stated:

> It is expected that the rise in temperature in the Safety Related Battery Rooms due to the loss of ventilation will not adversely affect the functionality of the batteries. To address hydrogen generation upon re-energizing the battery chargers, the battery room doors will be propped open to prevent a buildup of hydrogen in the battery rooms.

During the audit, the licensee was requested to provide analysis of the need for hydrogen gas ventilation, and to provide a discussion on the hydrogen gas exhaust path for ventilation of hydrogen gas, if ventilation is needed. The licensee responded that battery room conditions will be evaluated and a strategy will be developed to maintain acceptable conditions. The strategy and associated support analyses will be submitted in a future six-month update. Confirmation that the strategy and support analysis for hydrogen gas ventilation is adequate has been identified as Confirmatory Item 3.2.4.2.A in Section 4.2.

On pages 43 and 47 and of the Integrated Plan, in the section regarding Auxiliary Electric Equipment Room (AEER) habitability during Phase 1 and Phase 2, the licensee stated:

> Exelon Generation Company, LLC (the licensee) intends on maintaining the functions/actions that occur in the AEER for the SBO/ELAP scenario. Habitability conditions will be evaluated and a strategy will be developed to maintain AEER habitability. The strategy and associated support analyses will be submitted in a future six-month update.

On pages 63 and 65 of the Integrated Plan, in the section regarding the SOE timeline, the licensee stated in part:

> Action Item: #13, Elapsed Time: 30 minutes, Time Constraint: Yes
> Action: All panel doors in AEER opened
> Remarks: Time sensitive for AEER temperature evaluation.
>
> Action Item: #14, Elapsed Time: 30 minutes, Time Constraint: Yes
> Action: All panel doors in Main Control Room opened
> Remarks: LOA-AP-101, Att. K, Step 11 Time sensitive for Control Room temperature evaluation.
>
> Action Item: #24, Elapsed Time: ~11 hours, Time Constraint: Yes
> Action: Provide external air flow to RCIC room
> Remarks: GOTHIC analysis [Sargent & Lundy Calculation 2012-11819, Rev. 0, "Transient Analysis of RCIC Pump Room for Extended Loss of A-C Power,"] shows that external air flow needs to be provided within 13 hrs to prevent room temps from exceeding 169 deg F which is the maximum allowable value from the current SBO analysis [LaSalle Calculation ATD-0351, "RCIC Pump Room Temperature Transient Following Station Blackout with Gland Seal Leakage," Rev. 3].

The Integrated Plan does not discuss engineered safety features that may actuate due to high area temperature caused by loss of ventilation. For example, high temperature in the area of the RCIC steam line that result in steam supply line isolation. The licensee has identified the need to defeat the RCIC low steam line pressure isolation in both the MCR and the AEER but the Integrated Plan does not discuss the effect of high area temperature on the continued operability of the RCIC system.

During the audit, the licensee was requested to provide additional information concerning the effect of high area temperatures resulting from the loss of ventilation systems during an ELAP on Engineered Safety Features (ESF) and other interlocks and automatic actuations and isolations.

The licensee responded by stating:

> LaSalle has not identified any impacts from high area temperature isolations, actuations or interlocks that would impact the implementation of the FLEX strategies. The RCIC-related temperature isolations (steam tunnel and area temps/delta temps) would cause closure of the RCIC steam isolation valves. However, these valves are AC powered, therefore, they will not have motive power to close on the isolation signal. Further, the emergency RCIC operation procedures (LGA-RI-101(201)) contains steps to bypass these temperature isolations and contains a CAUTION that states "RCIC bypass keys should be taken to test before AC Power restored to prevent isolations on high

temperatures when AC power is restored to the logic - room temperatures with VR off may exceed the isolation setpoints." VR is the reactor building ventilation system. The bypass keys are located in the main control room.

The licensee identified a range of portable/FLEX pumps and electrical generators to be used to support coping strategies in the event of an ELAP. From the information provided in the Integrated Plan, it cannot be determined that all of the engine powered portable/FLEX equipment is intended to be located outside of facility buildings. During the audit, the licensee addressed this concern by stating LaSalle Station is not planning to use gasoline or diesel-powered equipment within enclosed structures.

On pages 35 and 37 of the Integrated Plan, the licensee stated:

> Evaluation of the spent fuel pool area for steam and condensation has not yet been performed. The results of this evaluation and the vent path strategy, if needed, will be provided in a future six-month update.

Evaluation of vent path strategy has been combined with previously identified Confirmatory Item 3.2.2.A, in Section 4.2.

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

3.2.4.3 Heat Tracing

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

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

The Integrated Plan does not address heat tracing for freeze protection of piping, instrument lines and equipment. The need for heat tracing and freeze protection during an ELAP may include permanent plant equipment and also portable/FLEX equipment that is deployed outdoors during periods of cold weather. During the audit, the licensee was requested to discuss freeze protection of unheated piping, instrument lines and portable/FLEX equipment to provide reasonable assurance that the plan will conform to NEI 12-06, Section 3.2.2, Guideline (12). The licensee responded that LSCS has identified no potential for freezing of piping or instrument lines (currently installed) required for the FLEX strategies at this time. The primary water supply strategy does not have any external connections. The external connection piping used for the alternate water supply strategy is normally dry until it's used for FLEX. Any modifications performed for FLEX will ensure freezing is not a concern.

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

3.2.4.4 Accessibility - Lighting and Communication

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.

The Integrated Plan does not discuss portable, emergency and hand held lighting available to operators for implementing other coping strategies. There is no discussion of MCR lighting or lighting in plant locations where portable/FLEX equipment will be deployed. The table on pages 55 through 58 of the Integrated Plan, in the section listing portable/FLEX equipment designated for the transition phase does not address portable, emergency or hand held lighting. Although some plant lighting may be repowered during an ELAP by portable/FLEX electrical generators, there is no discussion of the availability of lighting in the Integrated Plan.

During the audit, the licensee addressed this concern by stating:

> The current EOP and Safe Shutdown field actions include provisions for temporary lighting (including staged flashlights) and periodic checks are performed on EOP and Safe Shutdown equipment lockers that verify lighting equipment functionality and battery replacement. Plant procedures will be developed to provide guidance for personnel to have all necessary equipment for performance of FLEX activities.
>
> LaSalle is planning to procure external lighting to be used at the external FLEX deployment locations. These will likely be a combination of external light assemblies that can be powered from the FLEX generators and external lighting mounted on the generator skids themselves.

The licensee also stated that the lighting equipment will be stored in the protected FLEX building, or other protected storage.

The NRC staff has reviewed the licensee communications assessment (ADAMS Accession Nos. ML12306A199 and ML13056A135) in response to the March 12, 2012 50.54(f) request for information letter for LSCS and, as documented in the staff analysis (ADAMS Accession No. ML13114A067) has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. Therefore, there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.2, Guideline (8) regarding communications capabilities during an ELAP. Verification of required upgrades has been identified as Confirmatory Item 3.2.4.4.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 lighting and communications support for accessibility for operator actions, if these requirements are implemented as described.

3.2.4.5 Protected and Internal Locked Area Access

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

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

There is no discussion in the Integrated Plan of the guidance and strategies with regard to the effects of ac power loss on area access. During the audit, the licensee addressed this concern by identifying that keys are maintained under the control of the Operations Shift Manager that can be utilized during the ELAP event to ensure that operators can access the areas required to implement the FLEX strategies. Site access would be controlled by security through gates that can be manually opened.

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

3.2.4.6 Personnel Habitability - Elevated Temperature

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

> *Plant procedures/guidance should consider accessibility guidelines 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.

On pages 4 and 5 of the Integrated Plan, in the section regarding key assumptions associated with implementation of FLEX strategies, the licensee stated in part:

Maximum environmental room temperatures for habitability or equipment availability is based on NUMARC 87-00 [NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, Revision 1] guidance if other design basis information or industry guidance is not available.

On pages 44, and 48 of the Integrated Plan, the licensee stated habitability conditions will be evaluated and a strategy will be developed. The strategy and associated support analyses will be submitted in a future six-month update.

On page 8 of the Integrated Plan, in the section regarding time constraints identified in the SOE timeline, the licensee stated in part:

Action Items #12 & #13:
Opening all panel doors in the Main Control Room and AEER within 30 minutes is time sensitive because it supports the temperature transient calculations that were performed for SBO conditions and the application of NUMARC 87-00, Rev. 1 requirements.

The August 28, 2013 status update identified evaluation of the habitability conditions for the MCR and development of a strategy to maintain habitability as an open item.

During the audit, the licensee was requested to provide a detailed discussion of the technical basis and the resulting plan to ensure that the habitability limits of the MCR (consistent with the assumptions of the habitability standard) will be maintained in all phases of an ELAP.

The licensee responded by stating:

With respect to habitability, LaSalle will apply the "toolbox" approach. That is, procedures will be developed to address long term habitability via monitoring control room conditions, applying heat stress countermeasures, rotation of personnel to the extent feasible, opening of control room doors, and availability of portable fans. Exelon is evaluating the use of personal cooling equipment. An update on the approach to control room habitability will be provided in a future six-month update.

The completion of analyses or evaluations necessary to support the proceduralized “toolbox” approach to ensure vital area habitability and the proper staging and protection of any equipment to implement this approach is listed as Confirmatory Item 3.2.4.6.A in Section 4.2.

On page 37 of the Integrated Plan, in the section regarding maintaining SFP cooling during Phase 2, the licensee stated:

> The primary and alternate strategy connections also provide a path through 'B' RHR for SFP water addition without accessing the refuel floor. An additional spool piece will require installation to provide SFP fill via the RHR line.

Since SFP makeup can be established without entering the SFP area, habitability of the refueling floor is not an issue.

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 personnel habitability, if these requirements are implemented as described.

3.2.4.7 Water Sources

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

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

The LSCS primary coping strategy to prevent core damage during an ELAP is through the use of the RCIC pump. The CST is the normal pump suction supply to RCIC. The suction supply for the RCIC pump will automatically transfer from the CST to the suppression pool on low CST level through the use of safety class instrumentation and dc motor operated valves. The Integrated Plan identifies that water will be injected into the suppression pool from the UHS using CSCS piping and portable/FLEX equipment at six-hour event time. Likewise, water will be injected into the SFP at twelve (12) hours.

On page 19 of the Integrated Plan, the licensee stated:

> The CSCS-ECW [Equipment Cooling Water] subsystems take suction from the service water tunnel located in the basement of the Lake Screen House. The service water tunnel is kept full by six-inlet lines which connect to the Circulating Water pump forebays. Prior to entering the service water tunnel inlet pipes, the water is strained by the Lake Screen House travelling screens to prevent large pieces of debris from entering the system and blocking flow or damaging equipment. The travelling screens are not seismically designed nor are they supplied with electrical power from the plant essential power buses. A 54-inch normally closed bypass line is installed to assure access to a continuous supply of CSCS water to the system in the unlikely event that all the travelling screens become blocked.

Page 20 of the Integrated Plan identifies the UHS (Lake Screen House/Lake) as the primary water source for strategies for maintaining spent fuel pool cooling. The licensee has not discussed water quality of the UHS. During the audit, the licensee was requested to provide justification that its use will not result in blockage at the fuel assembly inlets to an extent that would inhibit adequate flow to the fuel assemblies when used for spent fuel pool cooling. The licensee was also requested to address potential blockage of the RCIC suction strainer in the suppression pool when UHS water was being injected to the suppression pool. Include a discussion of any other makeup water sources that support coping strategies for maintaining core and containment cooling including suppression pool cooling.

During the audit, the licensee identified there are no strainers on the FLEX pumps, and did not provide adequate justification for use of the Lake Screen House/Lake with regard to water quality. This has been identified as Confirmatory Item 3.2.4.7.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 water sources, if these requirements are implemented as described.

3.2.4.8 Electrical Power Sources/Isolations and Interactions

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

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

On pages 8 and 9 of the Integrated Plan, in the section regarding time constraints identified in the SOE time line, the licensee stated in part:

> Action Item #21:
> Connection of the FLEX 480 VAC generator to supply power to the 125 VDC and 250 VDC battery chargers within six-hours supports the DC coping analysis (with margin).

On page 64 of the Integrated Plan, in the section regarding the SOE timeline, the licensee stated in part:

> Action Item: 21, Event Time: 6 hours
> Action: 480VAC generators connected to supply battery chargers for 125VDC (Div. 1 and 2) and 250VDC buses
> Remarks: Restore AC power to battery chargers prior to loss of each battery at the analyzed value of ~8 hrs

In the Integrated Plan, the licensee did not provide information on the methods to be used to protect the station emergency diesel generators, station electrical switchgear and electrical components from damage caused by being energized by a portable/FLEX electrical generator as specified by NEI 12-06, Section 3.2.2, Guideline (13). During the audit, the licensee addressed this concern by stating:

> Power leads from the FLEX generator will not be connected to the Class I electrical equipment during normal operation. When the FLEX generator is connected to the FLEX distribution panels during an ELAP, the main supply breakers will be opened per the associated FSG [FLEX Support Guideline]. This will prevent unintentionally powering the bus from multiple sources.

On page 51 of the Integrated Plan, the licensee stated a mobile distribution panel is pre-staged in a protected structure (EDG Building or Auxiliary Building).

During the audit, the licensee was requested to provide additional information to describe how the permanently staged electrical distribution panel will be protected from all BDBEEs. The licensee responded that the pre-staged electrical distribution panels will be located in safety related, seismic, protected structures and will be protected from all applicable BDBEEs. The licensee also stated the pre-staged electrical distribution panels will be located in the EDG Building hallway on the 710 foot elevation.

There is insufficient data on electrical loads and the capacity of portable/FLEX electrical generators planned for use during Phase 2 and Phase 3. This has been combined with previously identified Confirmatory Item 3.2.1.4.B, in Section 4.2.

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

3.2.4.9 Portable Equipment Fuel

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

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

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

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

On pages 56 of the Integrated Plan, in the section listing portable/FLEX equipment intended to be available to support coping strategies during the transition phase, the licensee included one Ford F-750 truck with diesel fuel tanks.

During the audit, the licensee was requested to describe plans for supplying fuel oil to FLEX equipment (i.e., fuel oil storage tank volume, transfer method, supply pathway, etc.). Also, the licensee was requested to explain how fuel quality will be assured if stored for extended period of time.

In response, the licensee stated:

> The station EDG fuel oil day tanks and storage tanks are installed in the seismic category 1 Diesel Generator buildings and are protected from all external hazards. The technical specification minimum available fuel oil supply for the division 1 and 2 day tanks (3 tanks) is 250 gals. The technical specification minimum available fuel oil for the division 3 day tanks (2 tanks) is 550 gals. This is in addition to the 5 main underground storage tanks. The division 1 and 2 storage tanks (3 tanks) have a tech spec minimum capacity of 32,200 gals. The division 3 tanks (2 tanks) have a tech spec minimum of 30,000 gals. Fuel consumption rates of the FLEX generators and pumps are not yet determined. The strategy to access the fuel in the fuel oil storage day tank consists of attaching a portable 120 VAC transfer pump to the Day Tank drain and transferring fuel to the FLEX truck transfer tank or directly to the FLEX generators via hose. The FLEX generators will be deployed adjacent to the Diesel Generator building and the EDG day tanks are located in the seismic EDG building. The FLEX truck will be stored in a protected building to ensure the BDBEE does not damage the truck.
>
> The Day Tank is maintained full by the installed Fuel Oil Transfer Pump. This pump is fed from the [motor control center] MCC energized from the FLEX generator and could be used to fill the day tank if required (Divisions 1 and 2 ONLY, Division 3 is not powered via the FLEX strategies). The FLEX pump located at the Spray pond (Alternate water supply strategy) will have a procedure developed to transport the fuel from the source as described above to the FLEX equipment location.
>
> The fuel in these tanks is maintained fresh by the routine use and replenishment of the main EDGs. Fuel in equipment tanks will be periodically replaced as part of the equipment PM program.

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

3.2.4.10 Load Reduction to Conserve DC Power

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

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

On pages 42 and 43 of the Integrated Plan, the licensee discussed load shedding. The licensee has determined that dc load reductions must be completed within specific times following an ELAP. Completion of these operator actions results in a battery coping time or lifetime of eight (8) hours. The licensee stated that load reductions for the two 125 volt batteries and one 250 volt battery at each unit should be complete, using existing SBO procedures, within 30 minutes elapsed time following the start of the ELAP event. The load shed is initiated at 5 minutes elapsed time and completed at 30 minutes elapsed time. A second 'extended' dc load shed is started at approximately 180 minutes elapsed time on both Unit 1 safety division dc busses and one Unit 2 safety division. The licensee stated that the extended' load reductions for the two Unit 1 125 volt station batteries should be completed prior to 4.5 hours elapsed time for Division 1 battery 1DC07E and prior to 5.5 hours for the Division 2 battery 1DC14E. Load shedding should be completed prior to 5.5 hours for the Unit 2 Division 1 battery 2DC07E. No additional or 'extended' load shedding is required for the Unit 2 Division 2 battery 2DC14E or the Unit 1 and Unit 2 250 volt batteries, 1DC01E and 2DCO1E, respectively. The licensee stated that completion of the initial dc bus load shedding and the additional 'extended' load shedding on three dc busses will result in a battery coping time of at least eight hours. The SOE timeline identifies action 21 at elapsed time 6 hours to have the 480 Vac generators connected to the battery chargers.

During the audit, the licensee was requested to provide the following:

(a) The dc load profile with the required loads for mitigating strategies to maintain core cooling, containment, and the spent fuel pool cooling.

(b) Minimum dc bus voltage and the basis for the minimum dc bus voltage required to ensure proper operation of all required electrical equipment,

(c) Discussion on the loads that will be shed from the dc bus, the equipment location (or location where the required action needs to be taken), and the required operation actions needed to be performed and the time to complete each action.

(d) Discussion of components changing state when loads are shed and actions needed to mitigate resultant hazards (for example, allowing hydrogen release from the main generator, disabling credited equipment via interlocks, etc.).

The licensee responded that for item a), battery sizing/capacity calculations will be updated as part of the detailed design work and will be provided in a future six-month update. For item b), the minimum dc bus voltage and the basis for the minimum dc bus voltage and other inputs/initial conditions required will be available after formal battery calculations are performed. For items c) and d), LSCS abnormal operating procedures LOA-AP-101(201) contain the listing of DC loads to be shed, and the locations, for both the initial load shed and the "deep" load shed. This abnormal operating procedure also identifies the effect of turning off each load and includes action to be taken to vent the generator hydrogen prior to removing the seal oil pump load.

During the audit, the licensee stated that both the Division 1 and Division 2 125VDC as well as the 250VDC systems will remain energized and available to support RCIC operation since RCIC loads are not shed as part of either the initial or deep load shed evolutions.

The reviewer noted that that EC 391795, Rev. 0, “Battery Coping Times during ELAP with Extended Load Shedding” was added to the ePortal and provides detailed calculations to support the minimum dc bus voltage and the basis for the minimum dc bus voltage.

During the audit, the licensee was requested to address the effect of high/low temperatures on battery sizing calculations. The licensee responded by stating that LSCS will perform detailed high/low temperature analysis (i.e., temperatures above /below those currently assumed in the sizing calculations) to determine the effects on expected battery life. The licensee also stated the results will be provided in a future six-month update. This has been identified as Confirmatory Item 3.2.4.10.A, in Section 4.2.

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

3.3 PROGRAMMATIC CONTROLS

3.3.1 Equipment Maintenance and Testing

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

In order to assure reliability and availability of the FLEX equipment required to meet these capabilities, the site should have sufficient equipment to address all functions at all units on-site, plus one additional spare, i.e., an N+1 capability, where "N" is the number of units on-site. Thus, a two-unit site would nominally have at least three portable pumps, three sets of portable ac/dc power supplies, three sets of hoses & cables, etc. It is also acceptable to have a single resource that is sized to support the required functions for multiple units at a site (e.g., a single pump capable of all water supply functions for a dual unit site). In this case, the N+1 could simply involve a second pump of equivalent capability. In addition, it is also acceptable to have multiple strategies to accomplish a function (e.g., two separate means to repower instrumentation). In this case the equipment associated with each strategy does not require N+1. The existing 50.54(hh)(2) pump and supplies can be counted toward the N+1, provided it meets the functional and storage requirements outlined in this guide. The N+1 capability applies to the portable FLEX equipment described in Tables 3-1 and 3-2 (i.e., that equipment that directly supports maintenance of the key safety functions). Other FLEX support equipment only requires an N capability.

NEI 12-06, Section 11.5 states:

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

2. Portable equipment that directly performs a FLEX mitigation strategy for the core, containment, or SFP should be subject to maintenance and testing[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 [Electric Power Research Institute]) 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.

[1] Testing includes surveillances, inspections, etc.

a. The unavailability of installed plant equipment is controlled by existing plant processes such as the Technical Specifications. When installed plant equipment which supports FLEX strategies becomes unavailable, then the FLEX strategy affected by this unavailability does not need to be maintained during the unavailability.

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

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

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

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

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

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

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

During the audit, the licensee informed the NRC of their plans to abide by this generic resolution.

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

3.3.2 Configuration Control

NEI 12-06, Section 11.8 provides that:

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

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

3. Changes to FLEX strategies may be made without prior NRC approval provided:

    a. The revised FLEX strategy meets the requirements of this guideline.

    b. An engineering basis is documented that ensures that the change in FLEX strategy continues to ensure the key safety functions (core and SFP cooling, containment integrity) are met.

On page 12 of the Integrated Plan, in the section regarding programmatic controls, the licensee stated, in part:

> LaSalle will implement an administrative program for FLEX to establish responsibilities, and testing & maintenance requirements. A plant system designation will be assigned to FLEX equipment which requires configuration controls associated with systems. Unique identification numbers will be assigned to all components added to the FLEX plant system.

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

3.3.3 Training

NEI 12-06, Section 11.6 provides that:

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

[2] The Systematic Approach to Training (SAT) is recommended.

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 12 of the Integrated Plan, the licensee stated:

> Training materials for FLEX will be developed for all station staff involved in implementing FLEX strategies. For accredited training programs, the Systematic Approach to Training, SAT, will be used to determine training needs. For other station staff, a training overview will be developed per change management plan.

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

[3] Emergency response leaders are those utility emergency roles, as defined by the Emergency Plan, for managing emergency response to design basis and beyond-design-basis plant emergencies.

random inspections by the Nuclear Regulatory Commission.

4) Provisions to ensure that no single external event will preclude the capability to supply the needed resources to the plant site.
5) Provisions to ensure that the off-site capability can be maintained for the life of the plant.
6) Provisions to revise the required supplied equipment due to changes in the FLEX strategies or plant equipment or equipment obsolescence.
7) The appropriate standard mechanical and electrical connections need to be specified.
8) Provisions to ensure that the periodic maintenance, periodic maintenance schedule, testing, and calibration of off-site equipment are comparable/consistent with that of similar on-site FLEX equipment.
9) Provisions to ensure that equipment determined to be unavailable/non-operational during maintenance or testing is either restored to operational status or replaced with appropriate alternative equipment within 90 days.
10) Provision to ensure that reasonable supplies of spare parts for the off-site equipment are readily available if needed. The intent of this provision is to reduce the likelihood of extended equipment maintenance (requiring in excess of 90 days for returning the equipment to operational status).

On pages 12 and 13 of the Integrated Plan, in the section regarding the RRC, the licensee stated:

> LSCS has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER).
>
> The industry will establish two (2) Regional Response Centers (RRC) to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. 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 the affected nuclear site 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 within 24 hours from the initial request.

On page 66 of the Integrated Plan, in the section regarding the SOE timeline, the licensee stated in part:

> Action Item: #26, Elapsed Time: 24 – 72 hours, Time Constraint: No
>
> Action: Continue to maintain critical functions of core cooling (via RCIC), containment (via hardened vent opening and FLEX pump injection to suppression pool) and SFP cooling (FLEX pump injection to SFP). Utilize initial RRC equipment in spare capacity.
>
> Remarks: Not time critical/sensitive since Phase 2 actions result in indefinite coping times for all safety functions.

The licensee's plans, as discussed above, for the use of off-site resources conform to the minimum capabilities specified in NEI 12-06 Section 12.2, with regard to the capability to obtain equipment and commodities to sustain and backup the site's coping strategies (item 1 above). Insufficient information has been provided to conclude there is reasonable assurance that the licensee's development and implementation of guidance and strategies will conform to the remaining considerations (2 through 10 above) of NEI 12-06, Section 12.2 and will comply with the requirements of Order EA-12-049. During the audit the licensee stated strategies for deployment of planned Phase-3 equipment will be developed and incorporated into pre-planned guidance that will provide flexible and diverse direction for the acquisition, deployment, connection, and operation of the equipment. This has been identified as Confirmatory Item 3.4.A. in Section 4.2 regarding considerations 2 through 10 of NEI 12-06, Section 12.2.

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

4.0 OPEN ITEMS AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

Item Number	Description	Notes
3.2.3.A	Verify the completion of the modifications associated with Order EA 13-109 on a Hardened Containment Vent System (HCVS) and the analysis which models the final, installed configuration of the 13-109-compliant HCVS, and the review of the procedures which govern its use.	

4.2 CONFIRMATORY ITEMS

Item Number	Description	Notes
3.1.1.2.A	Confirm that the licensee performs an evaluation for potential soil liquefaction of transportation paths and the results of the evaluation are acceptable.	
3.1.1.2.B	Confirm that the licensee identifies an egress path for personnel to reach the FLEX storage building that is seismically robust, or provides additional justification on the proposed alternate approach that relies on availability of multiple egress paths that are not seismically robust.	
3.1.1.4.A	Confirm that the licensee addresses the logistics for equipment transportation, area set up, and other needs for ensuring the equipment and commodities to sustain the site's coping strategies are available from offsite resources.	
3.1.3.1.A	If the licensee credits separation of storage sites to address tornado threats, confirm that the axis of separation and distance between storage locations will provide assurance that a single tornado would not impact all locations if the licensee relies on NEI 12-06, Section 7.3.1, configurations 1.b. or 1.c for	

	protection of the portable equipment from the high winds hazard.	
3.2.1.1.A	Confirm that benchmarks are identified and discussed that demonstrate that MAAP is an appropriate code for the simulation of an ELAP event at LSCS.	
3.2.1.1.B	Confirm that the collapsed level remains above Top of Active Fuel (TAF) and the cool down rate remains within technical specifications limits for MAAP analyses.	
3.2.1.1.C	Confirm that MAAP is used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper (ADAMS Accession No. ML13190A201).	
3.2.1.1.D	Confirm that the licensee identifies and justifies the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP Application Guidance, Desktop Reference for Using MAAP Software, Revision 2" (Electric Power Research Institute Report 1020236). This should include response at a plant-specific level regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included. a. Nodalization b. General two-phase flow modeling c. Modeling of heat transfer and losses d. Choked flow e. Vent line pressure losses f. Decay heat (fission products / actinides / etc.)	
3.2.1.1.E	Confirm that the specific MAAP analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan is identified. Alternately, a comparable level of information may be included in the supplemental response.	
3.2.1.2.A	Confirm adequacy of the technical basis for the assumptions made regarding the leakage rate through the recirculation pump seals and other sources. The analysis should include the assumed pressure-dependence of the leakage rate, and whether the leakage was determined or assumed to be single-phase liquid, two-phase mixture, or steam at the donor cell, and how mixing the leakage flow with the drywell atmosphere is modeled.	
3.2.1.3.A	Confirm adequate justification is provided that taking readings from a standpipe which is not safety related or seismic does not make the CST level instrumentation inadequate for the automatic swap or informing the operators of CST loss so that they may respond with manual action using the control switches located in the MCR.	
3.2.1.4.A	Confirm the pump sizing results include required water flow rates, the portable/FLEX pump complete head/flow characteristics, suction and discharge losses, system	

	backpressure, elevation differences and piping losses to allow verification that this will be a successful strategy.	
3.2.1.4.B	Confirm the generator sizing results include appropriate electrical loads and adequate capacity of portable/FLEX electrical generators planned for use during Phase 2 and Phase 3.	
3.2.2.A	Confirm completion of the evaluation of the spent fuel pool area for steam and condensation and implementation of a vent path strategy, if needed.	
3.2.4.1.A	Confirm adequate justification is provided in a future six-month update for operation of RCIC with suction temperatures above 200 F.	
3.2.4.2.A	Confirm that the licensee provides an acceptable strategy and support analyses for hydrogen gas ventilation to prevent unacceptable hydrogen accumulation.	
3.2.4.4.A	Confirm that the upgrades to the plant communication systems discussed in the licensee communications assessment (ADAMS Accession Nos. ML12306A199 and ML13056A135) in response to the March 12, 2012 50.54(f) request for information letter for Limerick and, as documented in the staff analysis (ADAMS Accession No. ML13114A067) have been completed.	
3.2.4.6.A	Confirm the completion of analyses or evaluations necessary to support the proceduralized "toolbox" approach to ensure vital area habitability and the proper staging and protection of any equipment to implement this approach.	
3.2.4.7.A	Confirm the licensee provides justification that that the design of the FLEX pump suctions will prevent introducing excessive amounts of entrained debris as a result of extreme external hazards (e.g., suspended solids especially from high wind debris) in the cooling water from the Lake Screen House/Lake.	
3.2.4.10.A	Confirm the licensee performs detailed high/low temperature analysis (i.e., temperatures above /below those currently assumed in the sizing calculations) to determine the effects on expected battery life and the results are satisfactory.	
3.4.A	Confirm that the licensee will conform to considerations 2 through 10 of NEI 12-06, Section 12.2 and will comply with the requirements of Order EA-12-049 for the use of offsite resources.	