MEGA-TECH SERVICES LLC

# 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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Constellation Energy Nuclear Group, LLC
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## 1.0 BACKGROUND

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

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

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

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

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

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

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

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

## 2.0 EVALUATION PROCESS

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

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

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

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

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

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

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

## 3.0 TECHNICAL EVALUATION

By letters dated February 28, 2013 and March 8, 2013, (ADAMS Accession Nos. ML13066A171 and ML13074A056), and as supplemented by the first six-month status report in letter dated August 27, 2013 (ADAMS Accession No. ML13254A278), Constellation Energy Nuclear Group, LLC (the licensee or CENG) provided Nine Mile Point, Unit 2 (NMP2) Integrated Plan for Compliance with Order EA-12-049. The Integrated Plan describes the strategies and guidance under development for implementation by the licensee for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the NRC staff in its review, leading to the issuance of an interim staff evaluation and audit report. The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the Order.

## 3.1 EVALUATION OF EXTERNAL HAZARDS

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

### 3.1.1 Seismic Events.

NEI 12-06, Section 5.2 states:

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

A review was made of the licensee's screening process for the seismic hazard. The licensee confirmed on page 5 of the Integrated Plan that seismic hazards are applicable to NMP2 and that the seismic design criteria for NMP2 is the Safe Shutdown Earthquake which is 0.15g. The licensee stated on page 7 of the Integrated Plan that the seismic re-evaluation was not completed pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 and therefore was not assumed in their Integrated Plan.

The licensee's screening for seismic hazards as presented in their Integrated Plan has appropriately screened in the seismic hazard and identified the hazard levels for reasonable protection of the 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 screening for seismic hazards if these requirements are implemented as described.

#### 3.1.1.1 Protection of FLEX Equipment – Seismic Hazard

NEI 12-06, Section 5.3.1 states:

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

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

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

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

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

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

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the seismic hazard. On page 26 in the section of the Integrated Plan discussing maintaining core cooling during the transition phase (Phase 2), the licensee stated that protection of associated portable equipment from seismic hazards would be provided by constructing structures that meet the specifications of NEI 12-06 Section 11. Section 11 provides general storage design guidance, but does not provide the details for protection during a seismic hazard as delineated in NEI 12-06, Section 5.3.1 above.

However, in their discussion of protection of FLEX equipment during the audit process the licensee stated that they intended meet the guidance specified in NEI 12-06 sections 5.3.1.2 and 5.3.1.3 as well as Sections 2.3 and 11.3. The licensee also stated on pages 8 and 16 of the Integrated Plan that FLEX equipment would be protected against screened-in hazards.

The licensee provided additional information as part of the audit process stating that although the storage facility design is not complete, large portable FLEX equipment will be protected as specified by NEI 12-06, Section 5.3.1, considerations 2 and 3.

Although the licensee has indicated NMP2 procedures and programs are being developed to address storage structure requirements, the licensee has not identified the configuration selected for the protection of portable/FLEX equipment during a seismic hazard as specified in NEI 12-06, Section 5.3.1 consideration 1. The licensee stated that the design of the storage facility was under development.

Therefore, the information available, at this time, is not sufficient to conclude that these procedures and programs will provide for securing large portable equipment to protect them during a seismic event or to ensure unsecured and/or non-seismic components do not damage the equipment as is specified in NEI 12-06 Section 5.3.1, considerations 1, 2 and 3. This has been identified as Confirmatory Item 3.1.1.1.A. in Section 4.2, below.

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

3.1.1.2 Deployment of FLEX Equipment - Seismic Hazard

NEI 12-06, Section 5.3.2 states:

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable/FLEX equipment during a seismic hazard, protection of connection points, water sources and the means and power requirements to deploy portable/FLEX equipment. On page 8 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that portable/FLEX equipment will be procured commercially. The licensee discussed deployment of portable/FLEX equipment on pages 8, 13, 16 and 55 of the Integrated Plan. The licensee has stated that deployment routes will be identified once storage locations for FLEX equipment have been established and that procedures to keep pathways clear will be developed. The licensee has identified internal commitment tracking for these issues. On page 5, the licensee stated that an evaluation would be made for the potential of soil liquefaction at the storage locations and deployment routes. The licensee has identified the need to provide additional information regarding storage and deployment routes.

The licensee specified that programs and procedures, including administrative controls, will be employed to ensure that deployment of the portable/FLEX equipment remains possible in all modes but are still under development. Storage buildings have not yet been designed, so the need for power to open doors cannot be evaluated.

Therefore, the information available, at this time, is not sufficient to conclude that the deployment considerations 1 and 4 of NEI 12-06, Section 5.3.2 will be met. This has been identified as Confirmatory Item 3.1.1.2.A. in Section 4.2, below.

On page 27, in the section of the Integrated Plan discussing connection points used with coping strategies for maintaining core cooling during the transition phase, the licensee stated that connections will be located in a structure protected against flooding, tornado missiles and seismic events. Similar statements were made on pages 31, 40, 42, 49, 51 59 and 62 in sections of the integrated Plan that discussed connection points used with coping strategies for maintaining core, containment and SFP cooling and safety functions support during the transition and final phases. The licensee supplemented the information in the Integrated Plan during the audit process addressing the connection points individually.

The licensee provided additional information concerning access to connection points as part of the audit process to supplement the Integrated Plan. The connection points used to support coping strategies to maintain core, containment and SFP cooling will either be accessible from outside structures or the access path will be through seismically robust structures.

On page 59 the licensee identified trucks for transport of portable equipment and fuel but omitted discussion of the protection to be afforded these vehicles from seismic hazards. The licensee provided additional information as part of the audit process stating that the storage facility design is not complete, but FLEX support equipment will be protected as specified in NEI 12-06, Sections 5.3.2, 6.2.3.2, 7.3.2, 2.3 and 11.3. This conforms to the specifications of NEI 12-06, Section 5.3.2 consideration 5, regarding the protection of transportation vehicles.

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

3.1.1.3 Procedural Interfaces – Seismic Hazard

NEI 12-06, Section 5.3.3 states:

> There are four procedural interface considerations that should be addressed.
>
> 1. Seismic studies have shown that even seismically qualified electrical equipment can be affected by BDB seismic events. In order to address these considerations, each plant should compile a reference source for the plant operators that provides approaches to obtaining necessary instrument readings to support the implementation of the coping strategy (see Section 3.2.1.10). This reference source should include control room and non-control room readouts and should also provide guidance on how

and where to measure key instrument readings at containment penetrations, where applicable, using a portable instrument (e.g., a Fluke meter). Such a resource could be provided as an attachment to the plant procedures/guidance. Guidance should include critical actions to perform until alternate indications can be connected and on how to control critical equipment without associated control power.

2. Consideration should be given to the impacts from large internal flooding sources that are not seismically robust and do not require ac power (e.g., gravity drainage from lake or cooling basins for non-safety-related cooling water systems).

3. For sites that use ac power to mitigate ground water in critical locations, a strategy to remove this water will be required.

4. Additional guidance may be required to address the deployment of FLEX for those plants that could be impacted by failure of a not seismically robust downstream dam.

A review was made of the licensee's plans for the development of the mitigating strategies. The licensee has described the framework for their administrative program for FLEX on pages 7 through 9 of the Integrated Plan.

The licensee has also identified instrumentation necessary to support implementation of coping strategies for core, containment and SFP cooling during all phases on pages 22, 23, 35, 36, 38, 39, 45, 47 and 51 of the integrated plan. The instrumentation identified in the Integrated Plan conforms to the list of parameters specified in NEI 12-06, Section 3.2.1.10. However, there is no discussion in the Integrated Plan to support the implementation of the mitigating strategies in the event that seismically qualified electrical equipment is affected by beyond-design-basis seismic events. Since seismically qualified instrumentation may fail during a BDB seismic event, NEI 12-06 consideration 1, recommends developing a reference source that provides guidance on obtaining key parameter values through measurements taken using a portable instrument. Consideration 1 further specifies that guidance should include critical actions to perform until alternate indications can be connected and on how to control critical equipment without associated control power.

The licensee provided additional information as part of the audit process stating that the NMP2 instruments are located in the main control room (MCR) and are Regulatory Guide 1.97 and are Category 1 safety related. The instruments are powered from Class 1E dc through an inverter and will remain available throughout the BDBEE. The licensee references NEI 12-06, Section 3.2.1.3 initial condition (6) that states that permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, high winds and associated missiles, are available.

The alternate approach discussed by the licensee does not meet the intent of NEI 12-06, Section 5.3.3 consideration 1, because the NMP2 instrumentation system, as described by the licensee, is of a common design configuration for BWRs that may be susceptible to the failure mechanism discussed in NEI 12-06. That is, a BDB seismic event may result in a failure of seismically qualified power supply, dc-ac inverter or a failure of the instrument channel itself. Therefore, the information available, at this time, is not sufficient to conclude that the recommendations of NEI 12-06 Section 5.3.3 consideration 1, concerning the failure of seismically qualified electrical equipment by BDB seismic events will be included in the NMP2 mitigating strategies. This has been identified as Open Item 3.1.1.3.A. in Section 4.1, below.

The licensee supplemented the information in the Integrated Plan during the audit process and stated that there were no large internal flooding sources and that mitigation of ground water was not required. Also, because of the facility location, consideration 4, concerning downstream dams was not applicable.

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

3.1.1.4 Considerations in Using Offsite Resources – Seismic Hazard

NEI 12-06, Section 5.3.4 states:

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

A review was made of the licensee's plans for the use of offsite resources. The licensee stated that NMP2 has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER) on page 15 of the Integrated Plan. However, the licensee has not discussed the local staging area and the method to be used to deliver the FLEX equipment to the site. Therefore, the information available, at this time, is not sufficient to conclude that there is reasonable assurance that the use of offsite resources will conform to the specifications of NEI 12-06 Section 5.3.4. This has been identified as Confirmatory Item 3.1.1.4.A. in Section 4.2, below.

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

3.1.2 Flooding

NEI 12-06, Section 6.2 states:

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

part is the application of the flooding characterization to the protection and deployment of FLEX strategies.

NEI 12-06, Section 6.2.1 states in part:

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

A review was made of the licensee’s screening process for the flood hazard. The licensee has identified that NMP2 is constructed below the design basis flood level Probable Maximum Precipitation (PMP) on page 5 of the Integrated Plan. The source of the event that leads to the design basis flood level of elevation 262.5 feet is a local Probable Maximum Precipitation (PMP) event in combination with historical maximum lake level. Per Table 6-1 of NEI 12-06, the warning time would be days and the persistence of the event would be many hours to months. The licensee also stated on page 7 that the flooding re-evaluation pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 had not been completed and therefore was not assumed in their Integrated Plan.

The licensee’s screening for external flooding hazards as presented in their Integrated Plan has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the 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 evaluation of the flooding hazard if these requirements are implemented as described.

3.1.2.1 Protection of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.1 states:

> These considerations apply to the protection of FLEX equipment from external flood hazards:
>
> 1. The equipment should be stored in one or more of the following configurations:
>
>    a. Stored above the flood elevation from the most recent site flood analysis. The evaluation to determine the elevation for storage should be informed by flood analysis applicable to the site from early site permits, combined license applications, and/or contiguous licensed sites.
>
>    b. Stored in a structure designed to protect the equipment from the flood.
>
>    c. FLEX equipment can be stored below flood level if time is available and plant procedures/guidance address the needed actions to relocate the

equipment. Based on the timing of the limiting flood scenario(s), the FLEX equipment can be relocated [footnote 2 omitted] to a position that is protected from the flood, either by barriers or by elevation, prior to the arrival of the potentially damaging flood levels. This should also consider the conditions on-site during the increasing flood levels and whether movement of the FLEX equipment will be possible before potential inundation occurs, not just the ultimate flood height.

> 2. Storage areas that are potentially impacted by a rapid rise of water should be avoided.

A review was made of the licensee's plans for protecting portable/FLEX equipment during the flooding hazard. The licensee has not yet discussed their plans for protection and storage of portable/FLEX equipment from external hazards including the flooding hazard. There is no discussion of the location and elevation of the primary and alternate storage locations relative to flood levels. As discussed in Section 3.1.1.1, above, statements on page 26 of the Integrated Plan indicated that the licensee plans on storing portable/FLEX equipment in a structure constructed to the criteria of NEI 12-06, Section 11. The licensee also stated on pages 8 and 16 of the Integrated Plan that FLEX equipment would be protected against screened-in hazards. The licensee has not discussed protection of portable/FLEX equipment as specified by NEI 12-06, Section 6.2.3.1. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the flooding hazard as is specified in NEI 12-06, Section 6.2.3.1. The item tracking this issue has been combined with Confirmatory Item 3.1.1.1.A in Section 4.2, below.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2013-01, 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 storage and protection of portable equipment during a flooding hazard if these requirements are implemented as described.

3.1.2.2 Deployment of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.2 states:

> There are a number of considerations which apply to the deployment of FLEX equipment for external flood hazards:
>
> 1. For external floods with warning time, the plant may not be at power. In fact, the plant may have been shut down for a considerable time and the plant configuration could be established to optimize FLEX deployment. For example, the portable pump could be connected, tested, and readied for use prior to the arrival of the critical flood level. Further, protective actions can be taken to reduce the potential for flooding impacts, including cooldown, borating the RCS, isolating accumulators, isolating RCP seal leak off, obtaining dewatering pumps, creating temporary flood barriers, etc. These factors can be credited in considering how the baseline capability is deployed.
>
> 2. The ability to move equipment and restock supplies may be hampered during a flood, especially a flood with long persistence. Accommodations along

these lines may be necessary to support successful long-term FLEX deployment.

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

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

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

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

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

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

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable/FLEX equipment during the flood hazard. On page 8 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that portable/FLEX equipment will be procured commercially. The licensee discussed deployment of portable/FLEX equipment on pages 8, 13, 16 and 55 of the Integrated Plan. The licensee provided additional details on the protection of FLEX transportation equipment during the audit process. The licensee has stated that deployment routes will be identified once storage locations for FLEX equipment have been established and that procedures to keep pathways clear will be developed. The licensee has identified the need to provide additional information regarding storage and deployment routes. The licensee has identified internal commitment tracking for these issues. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 6.2.3.2 will be met concerning the deployment of portable/FLEX equipment during the flooding hazard. The item tracking this issue has been combined with Confirmatory Item 3.1.1.2.A. in Section 4.2, below.

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

3.1.2.3 Procedural Interfaces – Flooding Hazard

NEI 12-06, Section 6.2.3.3 states:

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

A review was made of the licensee's plans for the development of the mitigating strategies. The licensee has described the framework for their administrative program for FLEX on pages 7 through 9 of the Integrated Plan. However, there was no discussion of the deployment of portable/FLEX equipment during the flood hazard and no discussion of the need for and deployment of temporary flood barriers. Therefore, the information available, at this time, is not sufficient to conclude that procedural interfaces for the flood hazard will conform to the specifications of NEI 12-06, Section 6.2.3.3. This issue has been combined with Confirmatory Item 3.1.1.2.A regarding characterization of the flooding hazard with respect to persistence.

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

3.1.2.4 Considerations in Using Offsite Resources – Flooding Hazard

NEI 12-06, Section 6.2.3.4 states:

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

A review was made of the licensee's plans for use of offsite resources from the Regional Response Center (RRC) during the flood hazard. The licensee stated that NMP2 has contractual agreements in place with the SAFER on page 15 of the Integrated Plan. However, the licensee has not discussed the local staging area and the method to be used to deliver the FLEX equipment to the site. There is no discussion of access routes and staging areas. There is no discussion of the impact of persistent floods on the routes and staging areas. Therefore, the information available, at this time, is not sufficient to conclude that there is reasonable assurance that the use of offsite resources will conform to the specifications of NEI 12-06 Section 6.2.3.4. The item tracking this issue has been combined with Confirmatory Item 3.1.1.4.A. in Section 4.2, below.

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

3.1.3 High Winds

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

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

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

The licensee discussed their screening for the high wind hazard on page 6 on the Integrated Plan. The licensee stated that there is a one in one million chance per year for hurricane induced peak-gust wind speed of greater than 120 miles per hour. The licensee also stated that there is a one in one million chance of tornado wind speeds of 169 miles per hour. This is greater than the threshold of 130 miles per hour. The plant screens in for tornado wind hazards, including, tornado missiles, impacting FLEX deployment, but, does not screen in for hurricane straight wind hazard.

A review was made of the licensee's screening process for the severe storm with high wind hazard and it was determined that the licensee has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the portable equipment for high winds from tornadoes.

The licensee's screening for severe storms with high winds hazard as presented in their Integrated Plan has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the 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 screening for the severe storms with high winds hazard if these requirements are implemented as described.

3.1.3.1 Protection of FLEX Equipment - High Winds Hazard

NEI 12-06, Section 7.3.1 states:

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

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

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

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

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

A review was made of the licensee's plans for protection and storage of portable/FLEX equipment during the severe storm with high winds hazard. As discussed in Section 3.1.1.1, above, statements on page 26 of the Integrated Plan indicated that the licensee plans on storing portable/FLEX equipment in a structure constructed to the criteria of NEI 12-06, Section 11. The licensee also stated on pages 8 and 16 of the Integrated Plan that FLEX equipment would be protected against screened-in hazards. However, the licensee did not discuss the protection criteria stated in NEI 12-06, Section 7.3.1 that addresses protection of portable/FLEX equipment during storms with high winds hazard. There was no discussion of the design criteria selected for the storage facility, the design specifications of the structure or the number of sets of equipment. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the severe storm with high winds hazard will meet the specifications of NEI 12-06, Section 7.3.1. The item tracking this issue has been combined with Confirmatory Item 3.1.1.1.A. in Section 4.2, below.

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

3.1.3.2 Deployment of FLEX Equipment – High Wind Hazard

NEI 12-06, Section 7.3.2 states:

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

taken to reduce the potential for wind impacts. These factors can be credited in considering how the baseline capability is deployed.

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

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

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

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during a severe storm with high wind hazard. On page 8 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that portable/FLEX equipment will be procured commercially. The licensee discussed deployment of portable/FLEX equipment on pages 8, 13, 16 and 55 of the Integrated Plan. The licensee had identified several internal commitment items concerning debris clearing and the equipment to be available during the transition and final phases for debris clearing in the Integrated Plan. This information was supplemented in the six-month update dated August 27, 2013 and during the audit process.

On pages 24 and 25 of the Integrated Plan the licensee describes coping strategies to energize a 600 Vac power distribution board using a portable/FLEX generator that will supply electrical power to reenergize a battery charger and support long term operation of Reactor Core Isolation Cooling (RCIC) and the Automatic Depressurization System (ADS) Safety Relief Valves (SRV). Additional strategies include using a portable/FLEX pump to fill the suppression chamber or to pump into the Reactor Pressure Vessel (RPV) through the Residual Heat Removal System (RHR), and refilling storage tanks to support SRV operation.

In the sequence events timeline on page 70 of the Integrated Plan, the licensee identified the station battery coping time as 6.9 hours. The licensee included a statement that additional analysis was in progress to demonstrate that the station batteries were capable of greater than an eight (8) hour coping time. The portable/FLEX electrical generator was to be deployed and operating supplying power to a portion of the electrical distribution system at or before approximately eight (8) hours event time. Deployment of portable/FLEX equipment within this time frame appears to be a reasonable assumption in the context of storm debris removal.

The licensee has stated that deployment routes will be identified once storage locations for FLEX equipment have been established and that procedures to keep pathways clear will be developed. The licensee has identified the need to provide additional information regarding storage and deployment routes. The licensee has identified internal commitment tracking for these issues. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 7.3.2 the deployment of portable/FLEX equipment during the high winds hazard will be met. The item tracking this issue has been combined with Confirmatory Item 3.1.1.2.A. in Section 4.2, below.

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

3.1.3.3 Procedural Interfaces – High Wind Hazard

NEI 12-06, Section 7.3.3, states:

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

A review was made of the licensee's plans for the development of procedures and programs regarding the deployment of portable equipment during severe storms with high wind hazard. The licensee discussed deployment considerations on pages 8, 13, 16 and 55 of the Integrated Plan. There was no specific discussion of procedural interfaces for portable/FLEX equipment deployment and tornado and severe weather procedures. The licensee's plan to incorporate deployment considerations into procedures was also reviewed in Section 3.1.3.2, above. The item tracking the findings is Confirmatory Item 3.1.1.2.A, in Section 4.2, below.

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

3.1.3.4 Considerations in Using Offsite Resources – High Wind Hazard

NEI 12-06, Section 7.3.4 states:

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

A review was made of the licensee's plans for the use of offsite resources during the severe storm with high wind hazard. The licensee stated that NMP2 has contractual agreements in place with SAFER on page 15 of the Integrated Plan. However, there is no discussion of routes to be used for delivery of RRC FLEX equipment and of local staging areas. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 7.3.4 concerning considerations in using off-site resources during high wind hazard will be met. The item tracking this issue has been combined with Confirmatory Item 3.1.1.4.A. in Section 4.2, below.

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

3.1.4 Snow, Ice and Extreme Cold

As discussed in NEI 12-06, Section 8.2.1:

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

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

The licensee discussed their screening of the hazard on page 6 of the Integrated Plan. The licensee stated that the plant screens in for an assessment of snow, ice and extreme cold. The site is located above the 35$^{th}$ parallel; thus, the capability to address hindrances caused by extreme snowfall with snow removal equipment will be provided. The lowest recorded temperature at or near the site was -26 degrees Fahrenheit in 1979. The site is located within the region characterized by the Electric Power Research Institute (EPRI) as ice severity level 5.

A review was made of the licensee's screening process for the snow, ice, and extreme cold hazard and it was determined that the licensee has appropriately screened in this external hazard and identified the hazard levels for reasonable protection of the 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 screening the snow, ice and extreme cold hazard if these requirements are implemented as described.

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

NEI 12-06, Section 8.3.1 states:

> These considerations apply to the protection of FLEX equipment from snow, ice, and extreme cold hazards:
>
> 1. For sites subject to significant snowfall and ice storms, portable FLEX equipment should be stored in one of the two configurations.

a. In a structure that meets the plant's design basis for the snow, ice and cold conditions (e.g., existing safety-related structure).

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

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

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

A review was made of the licensee's plans for the storage and protection of portable equipment from snow, ice, and extreme cold. As discussed in Section 3.1.1.1, above, statements on page 27 of the Integrated Plan indicated that the licensee plans on storing portable/FLEX equipment in a structure constructed to the criteria of NEI 12-06, Section 11. The licensee also stated on pages 8 and 16 of the Integrated Plan that FLEX equipment would be protected against screened-in hazards. However, the licensee did not discuss the protection criteria stated in NEI 12-06, Section 8.3.1 that addresses protection of portable/FLEX equipment during snow, ice and extreme cold hazard. There was no discussion of the design criteria selected for the storage facility, the design specifications of the structure or the number of sets of equipment. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the high wind hazard will meet the specifications of NEI 12-06, Section 8.3.1. The item tracking this issue has been combined with Confirmatory Item 3.1.1.1.A. in Section 4.2, below.

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

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

NEI 12-06, Section 8.3.2 states:

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

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

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

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during a snow, ice, and extreme cold hazard. On page 8 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that portable/FLEX equipment will be procured commercially. The licensee discussed deployment of portable/FLEX equipment on pages 8, 13, 16 and 55 of the Integrated Plan. The licensee had identified several internal commitment items concerning debris clearing and the equipment to be available during the transition and final phases for debris clearing in the Integrated Plan. This information was supplemented in the six-month update dated August 27, 2013 and during the audit process. The licensee's reference to debris clearing procedures and equipment is assumed to include snow and ice removal.

Additionally, regarding consideration 3, there was no discussion in the Integrated Plan regarding potential of surface icing existing on sources of makeup water on which FLEX pumps will take suction including frazil ice. The licensee stated during the audit process that heat tracing was not required.

The licensee has stated that deployment routes will be identified once storage locations for FLEX equipment have been established and that procedures to keep pathways clear will be developed. The licensee has identified the need to provide additional information regarding storage and deployment routes. The licensee has identified internal commitment tracking for these issues. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 8.3.2 concerning equipment deployment and the administrative program elements to ensure the pathways are clear will include snow or ice removal are sufficient. The item tracking this issue has been combined with Confirmatory Item 3.1.1.2.A. in Section 4.2, below.

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

3.1.4.3 Procedural Interfaces – Snow, Ice and Extreme Cold Hazard

NEI 12-06, Section 8.3.3, states:

> The only procedural enhancements that would be expected to apply involve addressing the effects of snow and ice on transport the FLEX equipment. This

> includes both access to the transport path, e.g., snow removal, and appropriately equipped vehicles for moving the equipment.

A review was made of the licensee's plans for procedural enhancements that address the effects of snow and ice on transportation equipment. As discussed in Section 3.1.4.2, the licensee has discussed debris clearing equipment in the Integrated Plan and during the audit process.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 8.3.3 regarding procedural interfaces for the snow, ice and extreme cold hazard during an ELAP.

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

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

NEI 12-06, Section 8.3.4, states:

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

A review was made of the licensee's plans for the use of offsite resources during the snow, ice and extreme cold hazard. The licensee stated that NMP2 has contractual agreements in place with the SAFER on page 15 of the Integrated Plan. However, there is no discussion of routes to be used for delivery of RRC FLEX equipment and of local staging areas. Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 8.3.4 concerning considerations in using off-site resources during high wind hazard will be met. The item tracking this issue has been combined with Confirmatory Item 3.1.1.4.A. in Section 4.2, below.

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

3.1.5 High Temperatures

NEI 12-06, Section 9 states:

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

A review was made of the licensee's screening process for the high temperature hazard that was discussed on page 6 of the Integrated Plan. The licensee stated that the maximum temperature observed at the site was 98 degrees Fahrenheit in 1953, and that extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

The licensee has appropriately screened in for the high temperature hazard and has identified the hazard levels for reasonable protection of the 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 screening for the high temperature hazard if these requirements are implemented as described.

3.1.5.1 Protection of FLEX Equipment – High Temperature Hazard

NEI 12-06, Section 9.3.1, states:

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

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

As discussed in Section 3.1.1.1, above, statements on page 27 of the Integrated Plan indicated that the licensee plans on storing portable/FLEX equipment in a structure constructed to the criteria of NEI 12-06, Section 11. The licensee also stated on pages 8 and 16 of the Integrated Plan that FLEX equipment would be protected against screened-in hazards. However, the licensee did not discuss the protection criteria stated in NEI 12-06, Section 9.3.1 that addresses protection of portable/FLEX equipment during the high temperature hazard. There was no discussion of the design criteria selected for the storage facility that will maintain the portable/FLEX equipment at a temperature within a range to ensure its likely function when called upon. Therefore, the information available, at this time, is not sufficient to conclude that the protection of portable/FLEX equipment during the high temperature hazard will meet the specifications of NEI 12-06, Section 9.3.1. The item tracking this issue has been combined with Confirmatory Item 3.1.1.1.A. in Section 4.2, below.

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

3.1.5.2 Deployment of FLEX Equipment – High Temperature Hazard

NEI 12-06, Section 9.3.2 states:

> The FLEX equipment should be procured to function, including the need to move the equipment, in the extreme conditions applicable to the site. The potential

impact of high temperatures on the storage of equipment should also be considered, e.g., expansion of sheet metal, swollen door seals, etc. Normal safety-related design limits for outside conditions may be used, but consideration should also be made for any manual operations required by plant personnel in such conditions.

A review was made of the licensee's plans for implementation of the strategies to deploy portable equipment during a high temperature hazard. On page 8 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that portable/FLEX equipment will be procured commercially. The licensee discussed deployment of portable/FLEX equipment on pages 8, 13, 16 and 55 of the Integrated Plan. Also, during the audit process, the licensee the locations for deployed portable/FLEX pumps and electrical generators. All are to be deployed and operated outside of plant buildings and structures and therefore are not operated in a high temperature environment.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 9.3.2 regarding deployment of equipment during a high temperature hazard during an ELAP.

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

3.1.5.3 Procedural Interfaces – High Temperature Hazard

NEI 12-06, Section 9.3.3 states:

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

A review was made of the licensee's plans for procedural enhancements that address the effects of a high temperature hazard on portable/FLEX equipment. The effect of high temperature on the protection and storage of the equipment was been addressed in Section 3.1.5.1 above. The licensee provided additional information during the audit process. Portable/FLEX equipment will be deployed and operated to locations outside of plant structures and buildings.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 9.3.3 regarding procedural interfaces that address the effects of high temperature on portable/FLEX equipment during an ELAP.

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

## 3.2 PHASED APPROACH

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

To meet these EA-12-049 requirements, Licensees will establish a baseline coping capability to prevent fuel damage in the reactor core or SFP and to maintain containment capabilities in the context of a BDBEE that results in the loss of all ac power, with the exception of buses supplied by safety-related batteries through inverters, and loss of normal access to the UHS. As described in NEI 12-06, Section 1.3, "[p]lant-specific analyses will determine the duration of each phase." This baseline coping capability is supplemented by the ability to use portable pumps to provide reactor pressure vessel (RPV)/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, or the high pressure coolant injection (HPCI) system to provide core cooling with installed equipment for the initial phase. This approach relies on depressurization of the RPV for injection with a portable injection source with diverse injection points established to inject through separate divisions/trains for the transition and final phases. This approach also provides for manual initiation of RCIC/HPCI/IC as a contingency for further degradation of installed SSCs as a result of the beyond-design-basis initiating event.

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

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

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

3.2.1.1. Computer Code Used for ELAP Analysis.

NEI 12-06, Section 1.3 states:

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

The licensee provided a Sequence of Events (SOE) Timeline on pages 69 through 71 of their Integrated Plan, which included the time constraints and the technical basis for the site. The time constraints, which were identified in the SOE Timeline, were discussed on pages 9 through 13 of the Integrated Plan. The licensee cited GE-Hitachi (GEH) NEDC-33771P, Revision 1 as contributing to the technical basis for the time constraints. The licensee referenced their Modular Accident Analysis Program (MAAP) analysis in their discussion of the time constraints identified in the sequence of events timeline on pages 11 and 12 of the Integrated Plan. The licensee also discussed the results of their preliminary MAAP analysis when discussing the coping strategies for maintaining core cooling during the initial and transition phases on pages 17 through 24 of the Integrated Plan and when discussing the coping strategies for maintaining containment during the initial and transition phases on pages 34 through 37. The licensee stated an internal commitment to complete the evaluation of containment response during all phases of the ELAP on page 16 of the Integrated Plan.

The licensee provided additional information during the audit process stating that they had used MAAP to benchmark mitigating strategies but that MAAP was not their primary evaluation tool. The licensee stated that mitigating strategies are based on preliminary MAAP sensitivities,, station blackout (SBO) analysis, preliminary manual calculations and industry benchmarking from NEDC-33771P, Revision 1 and ongoing analysis. The licensee also stated that they intend to meet the guidance of the NEI whitepaper concerning MAAP and plan on using MAAP to verify their coping strategies.

The licensee provided a discussion of the ELAP analysis process during the audit process and referenced that its basis, in part, is the previously completed SBO analysis. However, the licensee has not discussed the details of that analysis in the context of the ELAP with LUHS that is, qualifying the framework of the previous analysis, initial conditions, event progression and other relevant factors to the framework of the ELAP. It is not clear if the licensee intends to evaluate coping strategies to maintain core cooling and evaluate time constraints with a plant-specific analysis as discussed in NEI 12-06, Section 1.3. Although not specifically stated, the licensee implied that the review of the SOE would use the industry-developed Modular Accident Analysis Program (MAAP) Version 4 computer code during the verification of their coping strategies.

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

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

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

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

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

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

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

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

(5) The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan must be identified and should be available on the ePortal for NRC staff to view. Alternately, a comparable level of information may be included in the supplemental response. In either case, the analysis should include a plot of the collapsed vessel level to confirm that TAF is not reached (the elevation of the TAF

should be provided) and a plot of the temperature cool down to confirm that the cool down is within tech spec limits. This has been identified as Confirmatory Item 3.2.1.1.E in Section 4.2, below.

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

3.2.1.2 Recirculation Pump Seal Leakage Models

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

A review was made of the NMP2 Integrated Plan to verify that the recirculation pump seal leakage models specified by NEI 12-06, Sections 3.2.1.5 had been adopted by the licensee in their analysis. On pages 10 and 17 of the integrated Plan, the licensee discussed their coping strategy of reducing RPV pressure to within a band of 200 to 400 psig in order to reduce pressure dependent leakage. On page 21 the licensee stated that the current SBO analysis and the preliminary MAAP analysis assumed a total of 61 gpm reactor recirculation system leakage. This was derived by assuming that the recirculation pump seal leakage was 18 gpm per pump and also that the unidentified leakage was at the Operating License Technical Specifications maximum of 25 gpm. The licensee noted that the RCIC pump capacity of 600 gpm was well within compensating for this assumed leak rate. The licensee clarified their assumption for this leak rate during the audit process as the licensing basis for SBO and was not derived from seal qualification testing and that the evaluation models the leakage as recirculation system small break area sized to result in 61 gpm at rated pressure conditions. Two phase critical flow correlation in the MAAP analysis uses Henry-Fauske two phase flow modeled as a vessel lower elevation liquid small break assuming critical flow through a fixed orifice directly to the drywell containment volume.

However, the licensee did not Identify or provide justification for the assumptions made regarding system leakage from the recirculation pump seals and other sources, that addresses the following items:

1. The assumed leakage rate and its predicted pressure dependence relative to test data.
2. Clarification of whether the leakage was determined or assumed to be single-phase liquid, two-phase mixture, or steam at the donor cell.
3. Comparison of design-specific seal leakage testing conditions to code-predicted thermal hydraulic conditions (temperature, void fraction) during an ELAP and justification if predicted conditions are not bounded by testing.
4. Discussion of how mixing of the leakage flow with the drywell atmosphere is modeled.

Therefore, the information available, at this time, is not sufficient to conclude that the specifications of NEI 12-06, Section 3.2.1.5 concerning recirculation pump seal leakage models and reactor coolant inventory loss in the ELAP analysis will be met. This has been identified as Confirmatory Item 3.2.1.2.A in Section 4.2, below.

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

3.2.1.3 Sequence of Events

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

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

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

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

A review was made of the sequence of events and the discussion of time constraints identified in the sequence of events. The sequence of events, Attachment 1A, Sequence of Events Timeline, was included on pages 69 through 71 by the licensee in the Integrated Plan. Additionally the time constraints identified in the sequence of events timeline are discussed on pages 9 through 13 and the coping strategies for maintaining core cooling during the initial, transition and final phases are discussed on pages 17 through 22, 24, 25, 29 and 30 of the Integrated Plan. The licensee included NEDC-33771P, Revision 1, "GEH Evaluation of FLEX Implementation Guidelines" as technical basis supporting information and provided the reconciliation between their analysis and the NEDC-33771P, Revision 1 analysis in Attachment 3 to the six-month update dated August 27, 2013.

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

Steam will be drawn off through the SRVs, which discharge into the suppression pool. The SRVs will be manually controlled from the main control room (MCR). The steam turbine driven RCIC pump also exhausts into the suppression pool. In addition to the turbine steam supply, RCIC operation is dependent on direct current (dc) power for control, instrument and motor operated valve power. The licensee clarified the plant design during the Mitigation Plan Audit explaining that the switchover of the RCIC pump suction from the CST to the suppression pool is dependent on dc power only and that the components are located within seismically qualified structures. This includes the instrumentation, logic and motor operated valves. Reactor pressure control is accomplished by operating the main steam SRVs. In addition to main steam pressure, the SRVs require dc power and a pneumatic supply to operate.

The licensee plans to deploy a portable/FLEX electrical generator that will supply power to charge the station batteries and maintain the RCIC control power. The licensee also plans to deploy a portable/FLEX pump that will be used to supply water to the suppression chamber or for direct injection into the RPV through the residual heat removal (RHR) system. Water supplied to the RHR system can be directed either to the RPV or to the containment through valve operation. The pump is planned to take suction on Lake Ontario through a new dry hydrant that is piped to the screen well of the intake structure. The pump is planned to connect to the RHR system through new connection points located outside of the Reactor Building.

Action Item 8 of Attachment 1A states that at or before 8 hours event time, a portion of the 600 volt electrical buss will be energized using a portable/FLEX 600 Vac DG to supply power to the safety related battery chargers. The discussion of time constraints identified in the sequence of events timeline on page 11 of the Integrated Plan states that restoration of the dc bus battery chargers is necessary before battery voltage decreases below 105 Vdc because of dependencies by instrumentation and also SRV control power. The licensee noted that the current battery coping time was calculated to be 6.9 hours and that further calculations and load shedding strategies were being developed to extend the station battery coping time to eight (8) hours.

The load shedding that supports the increase in station battery coping time is expected to be completed at approximately two (2) hours event time. The estimates for the completion of load shedding and for installation of the portable/FLEX electrical generator were derived during operations department table top discussions.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 regarding the sequence of events timeline for coping strategies during an ELAP and the time constraints identified in the timeline.

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

3.2.1.4 Systems and Components for Consequence Mitigation

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

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

And,

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

NEI 12-06, Section 3.2.1.12 states:

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

A review was made of the mitigation strategies discussed in the Integrated Plan. The RCIC pump provides water for core cooling during the initial phase of the ELAP. The RCIC pump can take suction from either the CST or from the suppression pool. If the CST is unavailable due to low water level or because of tank failure, suction will be transferred to the suppression pool. In responding to a Mitigation Strategies Audit question, the licensee provided additional information explaining that the CST to suppression pool switchover logic, instrumentation and motor operated valves are dc powered and are located in seismically robust structures and are not sensitive to an ELAP. Also, because the valves are dc powered, operators can perform a manual transfer from the control room if required.

The transition phase coping strategies include using onsite portable/FLEX equipment to maintain core cooling by reenergizing a portion of the dc distribution system. The licensee provided an overview of the hydraulic calculations that support the coping strategy during the audit process. The licensee also provided a discussion of the dc bus loads and portable/FLEX electrical generator size calculations.

The Integrated Plan identifies Lake Ontario as the water source for strategies for maintaining core and SFP cooling. The licensee discussed the water quality from this source during the audit process stating that the water from Lake Ontario is classified as drinking water quality and that the Emergency Operating Procedures (EOPs) provide guidance to the operators on selection of a water source if demineralized water was not available.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.1.12 and Section 11 regarding systems and components for consequence mitigation during an ELAP.

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

3.2.1.5 Monitoring Instrumentation and Controls

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

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

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

A review was made of the identified instrumentation necessary for successful completion of mitigation strategies. The licensee listed the installed instrumentation credited for the coping evaluation for maintaining core cooling and containment during ELAP on pages 22, 23, 35, 36 and 47 of the Integrated Plan. The following instrumentation was included: RPV water level and pressure, drywell pressure and temperature, suppression chamber pressure, water level and temperature, and RCIC flow.

The reactor and containment parameters discussed in the Integrated Plan appear to provide adequate instrumentation to implement the coping strategies for maintaining core and containment cooling. There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.1.10 regarding monitoring instruments and controls during an ELAP.

On page 35 of Integrated Plan, the licensee stated that a design change would install a HCVS in accordance with NRC Order EA-12-050 [now superseded by EA-13-109], issuance of Order to Modify Licenses with regard to Reliable Hardened Containment Vents, which will include necessary instrumentation for HCVS 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 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:

> 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.
>
> 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.

NEI 12-06, Table 12-1 includes "Portable air compressor or nitrogen bottles & regulators (if required by plant strategy)

A review was made of pneumatic systems associated with the mitigation strategies identified by the licensee in the Integrated Plan. Seven (7) safety relief valves (SRVs) are used for the automatic depressurization (ADS) function at NMP2. As discussed by the licensee on page 20 of the Integrated Plan, each valve is provided with safety related accumulator that will provide enough pneumatic volume at sufficient pressure to cycle open each valve five (5) times, which is sufficient for the initial phase of an ELAP. The licensee discussed their coping strategy for the replenishment of the nitrogen supply for the SRVs during the transition phase on page 24 of the Integrated Plan.

The licensee has identified the need for compressed nitrogen to operate valves within the hardened containment vent system (HCVS) on pages 36 and 39 of the Integrated Plan. The licensee has included a portable air compressor within their list of FLEX equipment for use during the transition phase on page 65 of the Integrated Plan.

The licensee discussed the needs of the future hardened containment vent system during the audit process and stated that replenishment high pressure nitrogen cylinders may be required. The licensee intends to include margin into the system design, which will include the ability to deploy and replenish consumables. The staff finds that there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 12.1 regarding motive power, valve controls and motive air systems during an ELAP.

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

3.2.1.7 Cold Shutdown and Refueling

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

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

A review was made of the coping strategies discussed by the licensee on pages 21 and 22 of the Integrated Plan to maintain core cooling during an ELAP with LUHS that occurs when the reactor is in Cold Shutdown or Refueling.

A review of the Integrated Plan for NMP2 revealed that the Generic Concern related to shutdown and refueling requirements is applicable to the plant. This Generic Concern has been resolved generically through the NRC endorsement of NEI position paper entitled "Shutdown/Refueling Modes" (ADAMS Accession No. ML13273A514); and has been endorsed by the NRC in a letter dated September 30, 2013 (ADAMS Accession No. ML13267A382).

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

The licensee informed the NRC of their plan to abide by this generic resolution.

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

3.2.1.8 Use of Portable Pumps

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

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

NEI 12-06 Section 11.2 states in part:

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

A review was made of the use of portable pumps for FLEX mitigation strategies. The licensee discussed using one portable/FLEX pump to pressurize either division of the RHR system during the transition phase on pages 24 and 25 of the Integrated Plan. Water can be supplied either to replenish the suppression pool or to inject directly into the RPV. The licensee also discussed these strategies during the audit process. The licensee intends to use a second pump to supply water to fill the SFP. The suction source for both pumps is Lake Ontario through a new dry hydrant that is piped to the screen well of intake structure. The licensee has provided an overview of the hydraulic calculations for RPV injection and SFP fill during the audit process. The protection of FLEX equipment was discussed in Section 3.1, above.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 11.2 regarding the use of portable pumps during an ELAP.

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

### 3.2.2 Spent Fuel Pool Cooling Strategies

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

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

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

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

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

A review was made of the discussions in the licensee's Integrated Plan for maintaining SFP cooling during an ELAP. The licensee discussed SFP cooling on pages 43, 44, 46 and 47 of the Integrated Plan. The licensee also discussed a revision to their SFP cooling strategy in their six-month update dated August 27, 2013.

The licensee stated that in the worst case, the SFP will heat up from 140 degrees Fahrenheit and will reach 212 degrees Fahrenheit in approximately 5.4 hours. The licensee further stated that approximately 73 gpm will be required to maintain level at that time. Without makeup water it would take approximately 32 hours event time for the water level to reach a level of 10 feet above the spent fuel from the normal level of 23 feet above the top of the spent fuel. A water level below 10 feet above the spent fuel is assumed prohibit access to the refueling floor level from the radiological perspective. Based on this, the licensee assumes that the transition from the initial to the transition phase of the ELAP will occur at 24 hours event time. Additional information provided during the audit process clarified the licensee's intentions in that one of the deployed portable/FLEX pumps would be used for supplying water to the SFP. 73 gpm would be required if water was supplied directly though connections in the SFP piping or 250 gpm through flexible hose deployed to the refueling floor if spray was used. The licensee also discussed their preliminary calculations for this coping strategy including system back pressure, line and system head loss and elevation change. The portable/FLEX pump suction source would be from the intake structure through a new dry hydrant.

The licensee also revised their coping strategy for maintaining SFP cooling during the final phase in their six month update dated August 27, 2013 and during the audit process. The revised strategy will use the same strategy used during the transition phase in the final phase.

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

On page 55 of the Integrated Plan the licensee discussed, but has not completed their evaluation and possible coping strategies for a SFP area steam and vent path. Therefore, the information available, at this time, is not sufficient to conclude that the Integrated Plan will conform to the specifications of NEI 12-06, Table C-3 regarding a vent pathway for SFP steam and condensation. This is identified Confirmatory Item 3.2.2.A, in Section 4.2, below.

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

### 3.2.3 Containment Functions Strategies

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

To remove heat from the containment, the licensee plans to employ the guidance of the Boiling Water Reactor Owner's Group (BWROG) Emergency Procedures Guidelines/Severe Accident Guidelines (EPG/SAG) document, Revision 3, in conjunction with a Hardened Containment Vent System (HCVS). A review was made of the licensee's plans for maintaining containment during an ELAP. In the initial phase, the suppression pool begins to heat up and pressurize the containment; however, the containment design pressure is 45 psig, and, containment integrity is not challenged early in the ELAP event. The licensee discussed the coping strategies for maintaining the containment functions during the transition phase on page 37 of the Integrated Plan. The licensee also discussed the coping strategy for maintaining the containment during the transition phase in the six-month update and during the audit process. Preliminary analysis indicates that it will take approximately 8 hours event time for the suppression pool to reach 230 degrees Fahrenheit. At this time the HCVS valves will be opened to remove heat and mass from the suppression pool. The licensee's suppression pool has a design temperature of 212°F. Consequently, there is a licensee identified action item in the six-month update to perform an evaluation of containment structures to identify necessary actions to enable implementation of the strategy with running RCIC with elevated temperatures. This is identified as Confirmatory Item 3.2.3.A in Section 4.2.

Preliminary calculations demonstrating the cooling water flow rate delivered through the RHR system were also discussed during the audit process. The same portable/FLEX pump that is used for RPV injection will be used to fill the suppression pool, although not concurrently. The flow path for both is through the RHR system and the suction source is Lake Ontario through a new dry hydrant that is piped to the screen well in the intake structure.

The licensee has not performed finalized calculations to demonstrate that the above timeline is appropriate and that containment functions will be restored and maintained following an ELAP event in accordance with Order EA-12-049. The need for a finalized calculation commensurate with the level of detail which is contained in NEDC-33771P, "GEH Evaluation of FLEX Guidelines", was communicated to the licensee during the audit process, and there is a licensee identified action item in their six-month update tracking the completion of this action. This is identified as Open Item 3.2.3.B in Section 4.1.

The NRC staff also considers the adoption of Revision 3 to the BWROG EPG/SAG by licensees to be a Generic Concern (and thus an Open Item) because the BWROG has not addressed the potential for the revised venting strategy to increase (relative to currently accepted venting strategies) the likelihood of detrimental effects on containment response for events in which the venting strategy is invoked. In particular it has not been shown that the potential for negative pressure transients, hydrogen combustion, or loss of containment overpressure (as needed for pump NPSH) is not significantly different when implementing Revision 3 of the EPG/SAG vs. Revision 2 of the EPG/SAG. Revision 3 provides for earlier venting than previous revisions. The BWR procedures are structured such that the new venting strategy is not limited to use during the BDBEEs that are the subject of EA-12-049, but could also be implemented during a broad range of events. Acceptance of EPG/SAG Revision 3, including any associated plant-specific evaluations, is identified as Open Item 3.2.3.C. in Section 4.1, below.

The licensee's approach described above, as currently understood, has raised concerns which must be addressed before confirmation can be provided that the approach is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, will be met with respect to venting containment only when no other means of core cooing are available. These questions are identified as Open Items in Section 4.1 and a Confirmatory Item in Section 4.2, below.

### 3.2.4 Support Functions

#### 3.2.4.1 Equipment Cooling – Cooling Water

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

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

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

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 (3) regarding equipment cooling during an ELAP.

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

NEI 12-06, Section 3.2.1.8 states that:

> The effects of loss of HVAC in an extended loss of ac power event can be addressed consistent with NUMARC 87-00 or by plant-specific thermal hydraulic calculations, e.g., GOTHIC calculations.

A review was made of the NMP2 integrated Plan for discussions of coping strategies addressing the impact on critical equipment and components caused by the loss of ventilation and cooling during an ELAP. The licensee has discussed their pending review of steam and condensate from the SFP area that is also on the refueling floor level of the Reactor Building.

The licensee discussed the RCIC room habitability on page 53 of the Integrated Plan. The RCIC room temperature calculation that had been completed for the SBO identifies that the RCIC room temperature stabilizes at 146 degrees Fahrenheit if RCIC room doors are opened early in the event. The sequence of events time line on pages 69 and 70 of the integrated Plan states that the RCIC room high temperature isolations are to be bypassed within 15 minutes event time and that the doors to the RCIC room are opened within two (2) hours event time. The licensee discussed the status of their analysis of high sustained temperature on the equipment located within the RCIC room in the six-month update dated August 27, 2013. However, that analysis has not yet been completed.

The licensee discussed the effect of the loss of ventilation on the station batteries on page 55 of the Integrated Plan. The licensee stated that hydrogen production will begin when the battery charger is restored. During an ELAP, hydrogen gas will migrate out of the battery room through the exhaust ductwork in the Control Building. NMP2 will need to perform an evaluation for mitigation strategy of hydrogen hazard from charging the batteries without ventilation. During the audit process, the licensee stated that normal battery room HVAC exhaust configuration is expected to remain unchanged for the ELAP condition. NMP2 plans to re-power the existing installed battery room ventilation fans, since these fans are normally energized from the emergency busses and the FLEX strategy is to repower a 600 Vac emergency bus by a FLEX diesel generator.

During the audit process, the licensee also stated that at NMP2, the battery rooms are not susceptible to significant heatup or cooldown following an ELAP. The battery rooms are located within the Control Building at ground Elevation 261 and the battery room walls are not exposed to the outside weather conditions.

The completion and determination of acceptable results for all of the aforementioned calculations associated with the proposed strategies for ventilation – equipment cooling are identified as Confirmatory Item 3.2.4.2.A in Section 4.2.

Pending successful completion of the Confirmatory Item listed above, there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 3.2.1.8 and Section 3.2.2 Guideline (10) regarding plant environmental conditions to maintain FLEX equipment operability during an ELAP.

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

3.2.4.3 Heat Tracing.

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

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

A review was made of the NMP2 Integrated Plan for coping strategies discussing freeze protection. The Integrated Plan does not address heat tracing for freeze protection of piping, instrument lines and equipment in the Integrated Plan. However, the licensee provided a discussion of the need for heat tracing during the audit process. The licensee stated that none was necessary to successfully complete FLEX strategies during an ELAP.

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 (12) regarding freeze protection to maintain plant and FLEX equipment operability during an ELAP.

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

3.2.4.4 Accessibility – Lighting and Communications.

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

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

A review was made of the Integrated Plan for coping strategies discussing plant lighting and communications systems during an ELAP that support personnel access for coping strategies that maintaining core, containment and SFP cooling. On page 57 of the Integrated Plan, the licensee stated that the emergency lighting system provides adequate illumination in areas required for operating safety-related equipment during emergency conditions. The emergency lighting system normally receives power from Division I, II, and III 600 Vac emergency buses. A supply of flashlights, headlights, batteries and other lighting tools are routinely used by the operators and additional supplies will be provided in strategic storage locations throughout the site, including protected storage locations.

During the audit process, the licensee stated that during an ELAP, for Phase 1, use of installed battery-pack lighting and flashlights will be necessary. In Phase 2, portions of Emergency Lighting may be restored upon re-powering the safety-related 600 Vac emergency switchgear. For phase 3, NMP2 lighting plans include six (6) portable exterior lighting fixtures with 30 foot extendable masts that are self-powered by diesel engines. The potential restoration of a portion of the Emergency Lighting System when Division I 600 Vac Unit Substation 2EJS*US1 (or alternatively Division II 2EJS*US3) is repowered is currently under evaluation. NMP2 will provide a summary of the restoration of Emergency Lighting expected to be restored in a future update. This is identified as Confirmatory Item 3.2.4.4.A in Section 4.2 below.

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 lighting capabilities during an ELAP.

The licensee provided its communications assessment in letters dated October 26, 2012, and February 22, 2013 (ADAMS Number ML12311A300 and ML13066A710) in response to the NRC March 12, 2012, 50.54(f) request for information letter for NMP2. As documented in the staff analysis provided in letter dated April 24, 2013 (ML13100A236), the NRC staff has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. The NRC staff will follow up to confirm that the regulatory commitments regarding the site's communications systems have been completed. This has been identified as Confirmatory Item 3.2.4.4.B. in Section 4.2 below.

The licensee's approach described above, as currently understood, 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 lighting and communications support for accessibility for operator actions if these requirements are implemented as described.

3.2.4.5 Protected and Internal Locked Area Access

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

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

to obtain access.

A review was made of the Integrated Plan for coping strategies discussing personnel access to plant protected and locked areas during an ELAP to support strategies for maintaining core, containment and SFP cooling. The licensee provided a discussion of area access in the audit process that sufficiently addressed access to plant perimeter and interior areas during an ELAP. The discussion included the administrative authority and methods for gaining plant access.

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 (9) regarding entry to protected and interior plant areas during an ELAP.

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

3.2.4.6 Personnel Habitability – Elevated Temperature

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

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

Section 9.2 of NEI 12-06 states,

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

A review was made of the Integrated Plan for coping strategies discussing habitability of plant locations during an ELAP to allow personnel access to support strategies for maintaining core, containment and SFP cooling. The licensee discussed their coping strategies for Main Control Room (MCR) habitability on page 52 of the Integrated Plan. The licensee stated that their current analysis projects the control room temperature will stabilize at less than 100 degrees Fahrenheit and that they were continuing to evaluate control room habitability. The licensee stated in the six-month update dated August 27, 2013 that the control room temperature was expected to remain below limits for habitability. Because this evaluation has not been provided for verification of the licensee's conclusions, it is identified as Confirmatory Item 3.2.4.6.A.

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

The licensee discussed the SFP area habitability on page 55 of the Integrated Plan and stated that they had not yet evaluated the SFP area for steam and condensation during an ELAP. The results of this evaluation and the vent path strategy, if needed, will be provided in a future six-month update. This has been previously identified as part of Confirmatory Item 3.2.4.2.A above.

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

3.2.4.7 Water Sources.

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

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

A review was made of the Integrated Plan for discussion of water sources used for mitigating strategies for core, containment and SFP cooling. The licensee discussed coping strategies for maintaining core cooling on pages 17 through 22, 24, 25 29 and 30 of the Integrated Plan. The normal RCIC pump suction source is the CST. The suction path will automatically transfer to drawing from the suppression pool on low level in the CST. The licensee discussed the instrumentation, logic and power to motor operated valves that perform the automatic transfer during the audit process. The instrumentation, logic and motor operated valves are classified as safety related, seismically qualified and powered by the dc distribution system.

Makeup to the suppression pool or the RPV will be accomplished through the use of a portable/FLEX pump that will be installed at or before 16 hours event time. The pump will supply water to the RHR system. Flow paths from within the RHR system will allow pumping water into the RPV or into the suppression pool.

The licensee discussed the coping strategies for core, containment and SFP cooling during the audit process. The second portable/FLEX pump will supply the SFP. Makeup water to be pumped directly injected into the RPV, the suppression pool and supplied to the SFP will be drawn from the ultimate heat sink, Lake Ontario through a dry hydrant piped to the intake structure. The licensee discussed the preliminary calculations demonstrating the required flow rates considering system back pressure, pipe and flexible hose resistance and elevation changes. The licensee also provided additional information concerning the water quality of this source during the audit process.

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 (5) regarding the availability of water sources during an ELAP.

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

3.2.4.8 Electrical Power Sources/Isolations and Interactions

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

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

A review was made of the Integrated Plan for coping strategies and discussion of electrical isolations, interactions and protection of station electrical distribution equipment. The licensee discussed deployment of portable/FLEX electrical generators during Phase 2 on pages 24 and 25 of the Integrated Plan and discussed the use of portable/FLEX RRC generators during Phase 3 on page 29. The licensee also provided preliminary information detailing the portions on the electrical distribution system that would be reenergized using portable/FLEX electrical generators to be used during Phase 2 and Phase 3 of the ELAP. During the audit process, the licensee stated that the Phase 2 FLEX generator and the Phase 3 RRC generator protection scheme/configurations will be reviewed. The electrical protection setting and coordination calculations will be performed for the portable FLEX equipment and the installed equipment, during the design process to ensure adequate protection is provided.

The licensee also stated that multiple power sources would not be permitted to power the same switchgear unless specifically designed to be operated in parallel. The licensee stated that when the design review of the portable generator protection is completed, the specific details on the protection schemes to protect Class 1E equipment from faults from the portable FLEX equipment will be provided in a future update. This is identified as Confirmatory Item 3.2.4.8.A in Section 4.2 below.

During the audit process, the licensee also stated that the preliminary estimated size for the transition phase FLEX 600 Vac generator is 400 kW [typographic error corrected], 456 kVA. This FLEX generator is sized to provide ac power to one (1) 600 Vac emergency bus to repower (1) safety-related 600 Vac/125 Vdc, 400 Amp dc, 78.3 kVA static battery charger, which will supply 125 Vdc battery bus loads and re-charge the associated safety-related battery bank. The initial estimate for final phase RRC FLEX generator is to use three (3) 4160 Vac generators, 1 MW units, operating in parallel with a total output of approximately 3 MW. These generator units will be supplied by the RRC and will be used to repower one (1) 900 HP RHR pump, and if available, one (1) 600 HP service water pump. An updated summary of the sizing calculations for the FLEX generators will be provided in a future update. This is identified as Confirmatory Item 3.2.4.8.B in Section 4.2 below.

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

3.2.4.9 Portable Equipment Fuel.

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

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

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

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

A review was made of the Integrated Plan for the coping strategies addressing the fuel supply for portable/FLEX equipment. The licensee discussed the on-site fuel supply and fuel management and the process to replenish portable/FLEX equipment on pages 55 and 56 of the Integrated Plan. During the audit process, the licensee provided preliminary details regarding Fuel Consumption Rate and Run Time for FLEX diesel driven portable equipment, diesel fuel oil availability, refueling strategy, fuel oil quality, and fueling equipment availability. The licensee stated that a summary of the refueling strategies will be provided when finalized at a future date. This is identified as Confirmatory Item 3.2.4.9.A in Section 4.2 below.

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

3.2.4.10 Load Reduction to Conserve DC Power.

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

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

A review was made of the coping strategies to extend station battery lifetime or coping time by reducing dc bus electrical load. The licensee discussed station battery coping time and dc bus load shedding on pages 10, 11, 21, and 70 of the Integrated Plan. As discussed in the sequence of events timeline (page 70 of the Integrated Plan), the timeline load shedding is expected to be completed before two (2) hours event time. The licensee has identified the station battery coping time as 6.9 hours on page 11, 21 and 70 of the Integrated Plan. On page 21 of the Integrated Plan, the licensee stated that the current battery calculations and load shedding support 6.9 hour voltage profile. Further calculations are necessary to identify those actions necessary to achieve a coping time for individual battery coping time greater than eight (8) hours. At eight (8) hour elapsed time, a FLEX portable generator will start powering a 600 Vac bus and the battery charger. During the audit process, the licensee stated that, the battery coping time analysis is under review. Upon the completion of the battery coping time analysis, a detailed discussion on the loads that will be shed from the bus will be available. Current SBO Procedure N2-SOP-01 directs that before 2 hours have elapsed, dc loads be shed per SBO support Procedure N2 SOP-02, Attachment 3 – Load Stripping. This attachment contains the load shedding from both safety-related and non-safety-related batteries, and UPSs. All load shedding from the safety-related batteries is contained in Table 3 of Attachment 3 of the procedure N2-SOP-02. As a result of ongoing evaluations to extend battery life for the NMP2 ELAP scenario, additional load shedding may be identified. A finalized summary of battery coping time, dc load profile, discussion of loads shed, and minimum dc voltage will be provided in a future update. This is identified as Confirmatory Item 3.2.4.10.A in Section 4.2 below.

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

## 3.3 PROGRAMMATIC CONTROLS

### 3.3.1 Equipment Maintenance and Testing.

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

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

NEI 12-06, Section 11.5 states:

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

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

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

[1] Testing includes surveillances, inspections, etc.

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

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

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

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

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

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

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

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

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

A review was made of the licensee's plans for development and implementation of a program for equipment maintenance, testing and unavailability control. On page 14 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that NMP2 will implement an administrative program for portable/FLEX equipment to establish responsibilities, and testing & maintenance requirements. The licensee stated that they would establish a system designation for emergency portable equipment and will manage this system in a manner consistent with medium-risk plant systems per CNG-CM-4.01, Configuration Management. All elements of the program described in Section 11 of NEI 12-06, including recommended "should" items will be evaluated for inclusion in the station program. The equipment for FLEX will have unique identification numbers. Installed structures, systems and components pursuant to 10 CFR 50.63 (a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, SBO. Preventive Maintenance procedures will be established for all components and testing procedures will be developed with frequencies established based on type of equipment, original equipment manufacturer recommendations and considerations made within EPRI guidelines.

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.

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.

A review was made of the licensee's plans for development and implementation of a program for configuration control. On page 14 in the section of its Integrated Plan regarding programmatic controls, the licensee stated that NMP2 will implement an administrative program for FLEX to establish responsibilities. All elements of the program described in Section 11 of NEI 12-06, including recommended "should" items will be evaluated for inclusion in the station program. The equipment for FLEX will have unique identification numbers. Installed structures, systems and components pursuant to 10 CFR 50.63 (a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, SBO.

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

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 11.8 regarding configuration control of coping strategies and portable/FLEX equipment used for maintaining core, containment and SFP cooling during an ELAP.

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

3.3.3 Training.

NEI 12-06, Section 11.6 provides that:

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

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

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

4. "ANSI/ANS 3.5, Nuclear Power Plant Simulators for use in Operator Training" certification of simulator fidelity (if used) is considered to be sufficient for the initial stages of the beyond-design-basis external event scenario until the

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

current capability of the simulator model is exceeded. Full scope simulator models will not be upgraded to accommodate FLEX training or drills.

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

A review was made of the licensee's plans for development and implementation of a training program addressing FLEX. On page 14 in the section of its Integrated Plan regarding the training plan, the licensee stated that NMP2 will develop a new training of general station staff and Emergency Planning (EP) personnel will be performed no later than 2015, prior to NMP2 design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training.

There is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06, Section 11.6 regarding training programs for implementation of coping strategies and equipment operation to maintain core, containment and SFP cooling during an ELAP.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and 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 <u>OFF SITE RESOURCES</u>

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

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

status or replaced with appropriate alternative equipment within 90 days.

10) Provision to ensure that reasonable supplies of spare parts for the off-site equipment are readily available if needed. The intent of this provision is to reduce the likelihood of extended equipment maintenance (requiring in excess of 90 days for returning the equipment to operational status).

A review was made of the licensee's plans for interface with the RRC. On page 15 in the section of its Integrated Plan regarding the RRC, the licensee stated that NMP2 has contractual agreements in place with SAFER and described the current concept for those centers and for the transportation of RRC equipment. As stated on page 63 of the Integrated Plan, the licensee expects that RRC equipment will be in-service at the site within 72 hours event time. However, there is no discussion of the administrative procedure or control that would trigger the initial request for assistance with offsite resources. Therefore, the information available, at this time, is not sufficient to conclude that the administrative controls for the RRC FLEX equipment will conform to the specifications of NEI 12-06, Section 12.2. This has been identified as Confirmatory Item 3.4.A. in Section 4.2, below.

The licensee discussed the equipment to be provided by the RRC for coping strategies to maintain core and containment cooling during the final phase on pages 29, 30, 41, 50 and 61. The licensee listed this equipment and commodities on pages 67 and 68. The licensee also discussed the calculations used to size the FLEX RRC equipment during the audit phase. However, there is no discussion that assures the compatibility between station equipment configurations and connection points and the equipment that is provided by the RRC. Therefore, the information available, at this time, is not sufficient to conclude that the design and selection of RRC FLEX equipment will conform to the specifications of NEI 12-06, Section 12.2. This has been identified as Confirmatory Item 3.4.B. in Section 4.2, below.

The licensee stated that RRC FLEX equipment will be moved from an RRC to a local assembly area, established by the SAFER team and the utility, that communications will be established between the affected nuclear site and the SAFER team and that required equipment moved to the site as needed. However, there is no discussion of the logistics to accomplish this during a BDBEE. Therefore, the information available, at this time, is not sufficient to conclude that the administrative controls for the deployment of RRC FLEX equipment to the site will conform to the specifications of NEI 12-06, Section 12.2. This has been combined with Confirmatory Item 3.1.1.4.A. in Section 4.2, below.

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

## 4.0 OPEN AND CONFIRMATORY ITEMS

### 4.1 OPEN ITEMS

| Item Number | Description | Notes |
|---|---|---|
| 3.1.1.3.A | Seismic procedural interface consideration NEI 12-06, section 5.3.3, consideration 1, which considers the possible failure of | |

| | | |
|---|---|---|
| | seismically qualified electrical equipment by beyond-design-basis seismic events, was not discussed in the Integrated Plan or during the audit process. | |
| 3.2.3.B | The licensee has not performed finalized calculations to demonstrate that the assumed timeline is appropriate and that containment functions will be restored and maintained following an ELAP event. | |
| 3.2.3.C | Revision 3 to the BWROG EPG SAG is a Generic Concern because the BWROG has not addressed the potential for the revised venting strategy to increase the likelihood of detrimental effects on containment response for events in which the venting strategy is invoked. | Significant Concern |

## 4.2 CONFIRMATORY ITEMS

| Item Number | Description | Notes |
|---|---|---|
| 3.1.1.1.A | The design of the storage facility for FLEX equipment is under development. The method selected for protection of equipment during a BDBEE was not discussed in the Integrated Plan or during the audit process. Also, there was no discussion of securing large portable equipment for protection during a seismic hazard. | |
| 3.1.1.2.A | Deployment routes have not yet been finalized or reviewed for possible impacts due to debris and potential soil liquefaction. Movement of equipment and procedural interfaces during a BDBEE were not discussed in the Integrated Plan or during the audit process. Deployment of temporary flood barriers, restocking of supplies in the context of a flood with long persistence, and the potential impact of surface icing were also not addressed. | |
| 3.1.1.4.A | Concerning utilization of offsite resources during a BDBEE, the local staging area and access routes were not discussed in the Integrated Plan or during the audit process. | |
| 3.2.1.1.A | MAAP benchmarks must be identified and discussed which demonstrate that MAAP4 is an appropriate code for the simulation of an ELAP event. | |
| 3.2.1.1.B | MAAP Analysis - collapsed level must remain above Top of Active Fuel (TAF) and the cool down rate must be within technical specification limits. | |
| 3.2.1.1.C | MAAP4 must be used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper. | |
| 3.2.1.1.D | MAAP modeling parameters. | |
| 3.2.1.1.E | The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan must be identified and should be available for review. | |
| 3.2.1.2.A | There was no discussion of the applicability of the assumed recirculation system leakage rates and the recirculation pump seal leakage rates to the ELAP event; the pressure dependence | |

| | | |
|---|---|---|
| | of the leak rates; whether the leakage was determined to be single-phase, two-phase, or steam at the donor cell; and how mixing of the leakage flow with the drywell atmosphere was modeled. | |
| 3.2.2.A | Evaluation of the refueling floor SFP area for steam and condensation was not yet completed. Mitigating strategies were not discussed in the Integrated Plan or during the audit process. | |
| 3.2.3.A | Perform an evaluation of containment structures to identify necessary actions to enable implementation of the strategy with running RCIC with elevated temperatures. | |
| 3.2.4.2.A | The completion and determination of acceptable results for all of the calculations associated with the proposed strategies for ventilation and critical equipment cooling (e.g., RCIC and battery rooms) are required. | |
| 3.2.4.4.A | The potential restoration of a portion of the Emergency Lighting System when Division I 600 Vac Unit Substation 2EJS*US1 (or alternatively Division II 2EJS*US3) is repowered is currently under evaluation. NMP2 will provide a summary of the restoration of Emergency Lighting expected to be restored in a future update. | |
| 3.2.4.4.B | Follow-up of communication commitments as discussed in the staff analysis (ML13100A236) is required. | |
| 3.2.4.6.A | Licensee to provide calculation and basis for use of extrapolated SBO evaluation for Main Control Room habitability. | |
| 3.2.4.8.A | The licensee stated that when the design review of the portable generator protection is completed, the specific details on the protection schemes to protect Class 1E equipment from faults from the portable FLEX equipment will be provided in a future update. | |
| 3.2.4.8.B | The licensee will provide an updated summary of the sizing calculations for the FLEX generators at a future update. | |
| 3.2.4.9.A | The licensee stated that a summary of the refueling strategies for FLEX equipment will be provided when finalized at a future date. | |
| 3.2.4.10.A | The licensee stated that a finalized summary of battery coping time, dc load profile, discussion of loads shed, and minimum dc voltage will be provided in a future update. | |
| 3.4.A | The program or process to request RRC equipment was not discussed in the Integrated Plan or during the audit process. | |
| 3.4.B | Sizing calculations of RRC FLEX equipment and the compatibility of RRC equipment to plant connection points was not discussed in the Integrated Plan or during the audit process. | |