Mega-Tech Services, LLC

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

Revision 1

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Exelon Generation Company, LLC
Oyster Creek Nuclear Generating Station
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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 requirements memorandum (SRM) for SECY-11-0093, the NRC staff reviewed the NTTF recommendations within the context of the NRC's existing regulatory framework and considered the various regulatory vehicles available to the NRC to implement the recommendations. SECY-11-0124 and SECY-11-0137 established the staff's prioritization of the recommendations.

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

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

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

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

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

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

2.0 EVALUATION PROCESS

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

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

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

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

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

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

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

3.0 TECHNICAL EVALUATION

By letter dated February 28, 2013, (ADAMS Accession No. ML13060A126), and as supplemented by the first six-month status report in a letter dated August 28, 2013 (ADAMS Accession No. ML13240A263) Exelon Generation Company, LLC (the licensee or Exelon) provided the Oyster Creek Nuclear Generating Station (OCNGS) Integrated Plan for compliance with Order EA-12-049**.** The Integrated Plan describes the guidance and strategies under development for implementation by Exelon for the maintenance or restoration of core cooling, containment, and SFP cooling capabilities following a BDBEE, including modifications necessary to support this implementation, pursuant to Order EA-12-049. By letter dated August 28, 2013 (ADAMS Accession No. ML13234A503), the NRC notified all licensees and construction permit holders that the NRC staff is conducting audits of their responses to Order EA-12-049. That letter described the process used by the staff in its review, leading to the issuance of an interim staff evaluation and audit report. The purpose of the staff's audit is to determine the extent to which the licensees are proceeding on a path towards successful implementation of the actions needed to achieve full compliance with the Order.

3.1 EVALUATION OF EXTERNAL HAZARDS

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

3.1.1 Seismic Events

NEI 12-06, Section 5.2 states:

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

On page 1 of the Integrated Plan, the licensee states that seismic events are applicable to OCNGS. On page 3 of the Integrated Plan, the licensee identifies the Safe Shutdown Earthquake (SSE) as having peak ground accelerations of 0.184g horizontal and 0.0952g vertical. The licensee further identified the reference containing the SSE Site Specific Response Spectra, which were approved by the NRC in March, 1992.

On page 5 of the Integrated Plan, the licensee stated, that the Oyster Creek site screens in for an assessment for seismic hazard.

On page 8 of the Integrated Plan, the licensee stated that flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012, are not completed and therefore not assumed in the Integrated Plan. The licensee stated that as the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.

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

3.1.1.1 Protection of FLEX Equipment – Seismic Hazard

NEI 12-06, Section 5.3.1 states:

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

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

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

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

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

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

On pages 21, 30, 39, and 47 of the Integrated Plan, the licensee stated that structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06, Section 11. The licensee stated that procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to Oyster Creek. However, in the August 2013 six-month status update the licensee stated that that equipment will be stored outdoors.

During the audit, the licensee stated that the FLEX equipment will be stored on Seismic Category 1 concrete pads and will be evaluated for potential seismic interactions in accordance with NEI 12-06, Rev. 0, Section 5.3.1.1.c for outdoor storage locations. The licensee stated that the concrete pads will have appropriate anchors to secure the equipment to the pads in accordance with procedures that will be written to address securing equipment and its movement.

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 FLEX equipment protection considering the 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.

During the audit, the licensee was requested to discuss deployment routes for FLEX equipment. The licensee responded that the planned deployment path for Oyster Creek is circular in nature. Access to the FLEX water supply and the area of deployment can be reached by driving clockwise or counterclockwise. The locations for the outdoor storage pads for the FLEX equipment are approximately 180 degrees and are at least 1200 feet apart north to south. The licensee stated that this strategy would always allow for the FLEX equipment to be deployed over two paths (clockwise or counterclockwise). In conclusion, the licensee stated the travel path is not subject to seismic liquefaction per site studies.

The Integrated Plan conforms to NEI 12-06, Section 5.3.2 consideration 1 because site studies determined the travel paths are not subject to seismic liquefaction.

In the licensee's August 2013 six-month status update, the licensee identified an alternate path for deploying hoses and cables following a seismic event than described in the Integrated Plan. During the audit, the licensee was requested to describe how the alternate paths meet NEI 12-06, Section 5.3.2, consideration 2. The licensee responded that OCNGS performed walkdowns and developed a primary path that will only use seismically robust buildings and pathways. The licensee stated all installed equipment used for FLEX strategy is safety-related except for certain existing connections. In addition, the licensee stated that that all connections are located in the reactor building which is a Seismic Class 1 structure which will enhance the survivability of the connections and that all permanent piping/connections will be installed in accordance with the system classification and, at a minimum, will be seismically robust.

Consideration 3 is not applicable to OCNGS. The UHS is Barnegat Bay (Atlantic Ocean). There are no downstream dams whose failure would have a perceptible effect on how water is accessed.

In the Integrated Plan, the licensee did not state whether power is required to move or deploy the FLEX equipment. The licensee identified in the six-month status update and audit that the equipment will be stored outdoors and therefore, power is not required to open the door from a storage location.

On page 53 of the Integrated Plan, in the listing of BWR portable Equipment Phase 2, the licensee identified one Ford F-750 flat-bed truck with debris plow to be used as a tow vehicle, portable equipment refueling vehicle, and debris removal vehicle. During the audit, the licensee identified that FLEX equipment will be stored on Seismic Category 1 concrete pads and will be anchored as appropriate.

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

3.1.1.3 Procedural Interfaces – Seismic Hazard

NEI 12-06, Section 5.3.3 states:

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

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

In the Integrated Plan, the licensee identifies the instruments required for the key reactor and containment parameters. The location of the instrumentation is identified including where isolation condenser (IC) level can be read locally

In the Integrated Plan, the licensee does not state whether a reference source describing what actions should be taken if instruments were lost due to a seismic event is or will be available. This has been identified as Confirmatory Item 3.1.1.3.A in Section 4.2.

During the audit, the licensee was requested to provide details on their plans to address seismic hazards associated with large internal flooding sources that are not seismically robust and do not require ac power (if any); or whether the use of ac power to mitigate ground water in critical locations would be required. In response, the licensee stated that the reactor building has no large tanks or any other internal source of water that would cause flooding. The licensee stated that the turbine building external source of flooding resulting from a seismic event is the circulating water pumps discharge piping and/or condenser overboard piping. If no ac power is available to operate the condenser isolation valves and a storm is predicted that would reach the Probable Maximum Hurricane Level, the licensee has procedures in place that will direct the operators to manually close the isolation valves. In addition, the licensee stated that to ensure dewatering capability OCNGS, as part of its FLEX has purchased 3 diesel-driven dewatering pumps for removing any water from areas of concern. The dewatering pumps and power supply generators for each will be stored on the FLEX truck for deployment.

Consideration 4 is not applicable. As discussed in Section 3.1.1.2 above the UHS is Barnegat Bay (Atlantic Ocean) and it is not susceptible to dam failures.

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 after a seismic event, if these requirements are implemented as described.

3.1.1.4 Considerations in Using Offsite Resources – Seismic Hazard

NEI 12-06, Section 5.3.4 states:

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

On pages 14 and 15 of the Integrated Plan, in the section regarding the Regional Response Center (RRC) Plan, the licensee stated:

> Oyster Creek has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER).
>
> The industry will establish two (2) Regional Response Centers (RRC) to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Equipment will be moved from an RRC to a local Assembly Area, established by the SAFER team and the utility. Communications will be established between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's playbook, will be delivered to the site within 24 hours from the initial request.

The licensee's plans for the use of offsite resources provided insufficient information regarding the identification of the local arrival staging area and a description of the methods to be used to deliver the equipment to the site. The licensee addressed these concerns during the audit by stating that the licensee is actively involved in industry initiatives to establish RRCs to meet the guidelines of NEI 12-06 to provide Phase 3 equipment to the site. This includes the SAFER plan that will contain implementation details for generic and specific equipment obtained from the RRC. This plan will also contain the logistics for equipment transportation, area set up, and other needs for ensuring the equipment and commodities to sustain the site's coping strategies. The final development of these plans has been identified as Confirmatory Item 3.1.1.4.A in Section 4.2.

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

3.1.2 Flooding

NEI 12-06, Section 6.2 states:

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

NEI 12-06, Section 6.2.1 states in part:

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

> and those that install temporary barriers or rely on watertight doors to keep the design basis flood from impacting safe shutdown equipment.

On pages 5 and 6 of the Integrated Plan, the licensee stated that the current licensing basis CLB) includes two bounding floods: the Probable Maximum Hurricane (PMH) and the Probable Maximum Precipitation (PMP) event. The licensee stated that tsunami events are not typical of the eastern coast of the United States and are not addressed in the CLB. In addition, the licensee stated that dam failure was evaluated and no flooding which would affect safety related structures was postulated for the site as stated in the UFSAR, Section 204.

The licensee stated that the PMH postulated for OCNGS is evaluated in UFSAR section 204, Appendix A and that the PMH results in a storm surge still water level of 22' MSL, with waves at plant site of up to 1' high. The main plant grade is at 23' MSL.

The licensee stated that the PMP event postulated for OCNGS was evaluated most recently in the site Individual Plant Examination of External Events (IPEEE) Request for Additional Information (RAI) response, reported by letter dated August 17, 2000, ADAMS Accession No. ML003743533. Onsite water levels were calculated to be 23.6' immediately adjacent to the Reactor Building and 23.5' over the remainder of the site. The PMP is not assumed to occur coincidental with the PMH.

The two bounding flooding event for OCNGS result in water levels higher than the main plant grade. As a result, OCNGS is characterized as a wet site.

On page 8 of the Integrated Plan, the licensee stated that flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012, are not completed and therefore not assumed in the Integrated Plan. The licensee stated that as the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.

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

3.1.2.1 Protection of FLEX Equipment – Flooding Hazard

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.

In the August 2013 six-month status update the licensee revised the approach for storage of the equipment to be in outdoor locations on concrete pads. During the audit, the licensee stated that the proposed storage location will not be susceptible to a rapid rise of water. However, the licensee stated that OCNGS flood procedures will be revised to require relocation of the FLEX portable equipment to flood protected locations in the event of a potential site flood event in conformance with NEI 12-06, Section 6.2.3.1, configuration 1.c.

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

3.1.2.2 Deployment of FLEX Equipment – Flooding Hazard

NEI 12-06, Section 6.2.3.2 states:

> There are a number of considerations which apply to the deployment of FLEX equipment for external flood hazards:
>
> 1. For external floods with warning time, the plant may not be at power. In fact, the plant may have been shut down for a considerable time and the plant configuration could be established to optimize 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 [reactor cooling system] RCS, isolating accumulators, isolating [reactor cooling pump] 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 [loss of ultimate heat sink] LUHS, as well as ELAP.

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

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

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

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

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

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

On page 13 of the Integrated Plan, in the section regarding how strategies will be deployed in all modes, the licensee stated:

> Deployment of FLEX is expected for all modes of operation. Transportation routes will be developed from the equipment storage area to the FLEX staging areas. An administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation. This administrative program will also ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes.
>
> Identification of storage and creation of the administrative program are open items. Closure of these items will be documented in a 6-month update.

The OCNGS UFSAR states that the diesel fuel oil tanks are in the EDG buildings and that the tanks are surrounded by a wall that has an elevation of 25 feet 6 inches MSL. The maximum flood level at the DG building is 23.6 feet MSL as identified on page 6 of the Integrated Plan. Fuel oil storage tanks are protected well above the maximum flood level and therefore conform to NEI 12-06, Section 6.2.3.2 consideration 4 since they will not be inundated by the flood.

The Integrated Plan does identify if temporary flood barriers are used and if they are, is the storage such that they can be easily deployed. This has been identified as Confirmatory Item 3.1.2.2.A in Section 4.2.

On page 53 of the Integrated Plan, in the listing of BWR portable equipment for Phase 2, the licensee identified one Ford F-750 flatbed truck with a debris plow to be used as a tow vehicle, portable equipment refueling vehicle, and debris removal vehicle. During the audit, as described in Section 3.1.2.1 above, OCNGS flood procedures will be revised to require relocation of the FLEX portable equipment to flood protected locations in the event of a potential site flood event in accordance with the guidance of NEI 12-06, Section 6.2.3.1, configuration 1.c. The licensee stated the proposed storage location will not be susceptible to a rapid rise of water.

During the audit, the licensee was requested to identify if connection points remain viable for a flooded connection. The licensee responded that all connections are located at 23.6 feet or higher and that the location of suction connections for the FLEX pump depends on the level of flooding. In addition, the licensee stated that although the normal suction will be approximately at the 13 foot elevation, as the flood level changes the pump will be moved to maintain the pump above the water level maintaining suction. The Integrated Plan is in conformance with NEI 12-06, considerations 3 and 6.

During the audit, the licensee identified a strategy to ensure dewatering capability. Oyster Creek as part of its FLEX strategy has purchased 3 diesel driven dewatering pumps for removing any water areas of concern. The dewatering pumps and power supply generators for each will be stored on the Flex truck for deployment. The Integrated Plan is in conformance with the guidance on NEI 12-06, consideration 7.

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

During the audit, the licensee was requested to identify if there are external flooding procedures that address NEI 12-06, Section 6.2.3.3, consideration 1.

The licensee responded that:

> FLEX procedures/ Strategies for deployment of planned equipment will be developed and incorporated into pre- planned guidance. This guidance will provide flexible and diverse direction for the acquisition, deployment, connection, and operation of the equipment. Procedures that apply are OP-AA-108-111-1001 (severe weather and natural disaster guidelines) ABN-31 (high winds) and ABN 32 (abnormal intake level).

During the audit, the licensee stated that connection points are the same for flooded and non-flooded conditions.

The severe weather procedures address deployment of sand bags for flooding conditions. During the audit, the licensee identified that there are de-watering pumps on the FLEX truck that can be deployed.

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

3.1.2.4 Considerations in Using Offsite Resources – Flooding Hazard

NEI 12-06, Section 6.2.3.4 states:

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

On pages 14 of the Integrated Plan, the licensee stated that OCNGS has contractual agreements in place with SAFER. As part of the agreement, equipment will be moved from the RRC location to the site. However, the subject of flooding hazards with regard to transporting offsite equipment to the site and where equipment would be staged is not specifically addressed.

During the audit, the licensee addressed these concerns by stating that the licensee is actively involved in industry initiatives to establish RRCs to meet the guidelines of NEI 12-06 to provide Phase 3 equipment to the site. This includes the SAFER plan that will contain implementation details for generic and specific equipment obtained from the RRC. This plan will also contain the logistics for equipment transportation, area set up, and other needs for ensuring the equipment and commodities to sustain the site's coping strategies. The final development of these plans has been combined with Confirmatory Item 3.1.1.4.A in Section 4.2.

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

3.1.3 High Winds

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

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

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

On page 7 of the Integrated Plan, the licensee stated that per NEI 12-06 Figures 7-1 and 7-2, OCNGS is subject to hurricanes and tornado hazards.

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

3.1.3.1 Protection of FLEX Equipment - High 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.

On pages 21, 31, 39, and 47 of the Integrated Plan, the licensee stated that Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. However, in the August 2013 six-month status update revised the storage to outdoors on a concrete pad. During the audit, the licensee stated that for high winds, two redundant storage pad locations for the FLEX portable equipment will be separated by sufficient distance to minimize the probability that a single event would damage all FLEX portable equipment in both storage locations in accordance with NEI 12-06, Rev. 0, Section 7.3.1.1.c. This is identified as Confirmatory Item 3.1.3.1.A in Section 4.2 below.

The licensee stated that procedure OP-OC-108-109-1001, “Severe Weather Preparation TRM for Oyster Creek,” will be revised to relocate FLEX equipment to one of three protected locations in the event of severe weather conditions heavy snow / icing / hurricane. The protected storage locations are still under evaluation and will be added to the revision of OP-OC-108-109-1001 when completed.

The identification of qualified protected storage locations requires further development by the licensee to meet the plant’s design basis for the hurricane conditions. This has been identified as Confirmatory Item 3.1.3.1.B in Section 4.2.

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

3.1.3.2 Deployment of FLEX Equipment - High Winds Hazard

NEI 12-06, Section 7.3.2 states:

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

During the Audit, the licensee provided abnormal operating procedure ABN-31, "High Winds," for review. Table ABN-31-1 directs that when forecasted wind speeds are greater than 85 mph and as directed by the Director, Operations, plant shutdown is to be initiated.

The Integrated Plan identifies the intake or discharge canal as the water source for strategies for maintaining adequate core cooling, reactor makeup and SFP cooling. During the audit, the licensee was requested to discuss the quality of this water (e.g., suspended solids) and provide justification that its use will not result in blockage to an extent that would inhibit adequate flow to the core, or block cooling water to the SFP.

The licensee responded that the Intake suction hose for the portable FLEX pumps has a coarse suction strainer. In addition, the licensee stated that the procedures governing use of the portable FLEX pumps during a BDBEE have not been developed. Furthermore, as the procedural guidance for use of the portable FLEX pumps is developed, concerns such as priority of water source and actions to be taken to ensure coolant flow across fuel assemblies will be addressed. Exelon identified this as an action that required further analysis. This is identified as Confirmatory Item 3.1.3.2.A in Section 4.2.

On page 53 of the Integrated Plan, in the listing of BWR portable equipment for Phase 2, the licensee identified one Ford F-750 flat-bed truck with debris plow to be used as a tow vehicle, portable equipment refueling vehicle, and debris removal vehicle. During the audit, the licensee stated, in part, that for high winds, Procedure OP-OC-108-109-1001 will be revised to relocate FLEX equipment to one of three protected locations in the event of severe weather conditions including hurricanes. FLEX procedures will be written with FLEX Equipment deployment paths. The FLEX equipment will remain inside the site protected area and have two deployment paths. The storage locations being evaluated for protection of the FLEX equipment from severe weather /hurricane conditions are located along the deployment paths.

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 deployment of FLEX equipment for the high wind event, if these requirements are implemented as described.

3.1.3.3 Procedural Interfaces - High Winds Hazard

NEI 12-06, Section 7.3.3, states:

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

On page 13 of the Integrated Plan, the licensee stated that an administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation. This administrative program will also ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes. The licensee stated that identification of storage and creation of the administrative program are open items and that closure of these items will be documented in a 6-month update.

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

3.1.3.4 Considerations in Using Offsite Resources – High Winds Hazard

NEI 12-06, Section 7.3.4 states:

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

On pages 14 of the Integrated Plan, the licensee stated that OCNGS has contractual agreements in place with SAFER. As part of the agreement, equipment will be moved from the RRC location to the site. However, the subject of high wind hazards with regard to transporting offsite equipment to the site and where equipment would be staged is not specifically addressed.

During the audit, the licensee addressed these concerns by stating that the licensee is actively involved in industry initiatives to establish RRCs to meet the guidelines of NEI 12-06 to provide Phase 3 equipment to the site. This includes the SAFER plan that will contain implementation details for generic and specific equipment obtained from the RRC. This plan will also contain the logistics for equipment transportation, area set up, and other needs for ensuring the equipment and commodities to sustain the site's coping strategies. The final development of these plans has been combined with Confirmatory Item 3.1.1.4.A in Section 4.2.

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

3.1.4 Snow, Ice and Extreme Cold

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

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

On pages 6 and 7 of the Integrated Plan, the licensee stated that OCNGS is located above the 35th parallel at 39° 49' N, 074° 12'W, and thus the capability to address impedances caused by extreme snowfall with snow removal equipment needs to be provided. The licensee stated that during normal plant operation, icing has been limited to the canal area outside of the steel trash grates. The area in close proximity to the intake, where the suction of the pumps is taken, is kept from freezing by the thermal dilution gates, which recirculate discharge water through the intake bay, and by the turbulence induced by the circulating water pumps. Discharge canal remains free of ice during normal operation due to the plant-heated effluent. In addition, the licensee stated that, according to UFSAR Section 2.4.7, is unlikely that ice blockage would cause problems to any safety related systems as the emergency service water flow utilizes approximately only 3 percent of the design capacity of the 6 screens on the intake structure.

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

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

NEI 12-06, Section 8.3.1 states:

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

On pages 22, 31, 39, and 47 of the Integrated Plan, the licensee stated that structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. However in the August 2013 six-month status update the licensee revised the storage location to outdoors on a concrete pad with block heaters installed on equipment. The licensee stated that to compensate for the change in storage originally identified in the Integrated Plan, the OCNGS severe weather procedure will be revised to require moving the FLEX portable equipment from the outside storage location to the inside truck bays during periods of predicted snow fall, ice, or extreme cold to protect the equipment from these hazards.

During the audit, the licensee revised the use of the truck bays as storage area locations for the severe weather conditions of heavy snow / icing / hurricane. The licensee stated that Procedure OP-OC-108-109-1001 will be revised to relocate FLEX equipment to one of three protected locations in the event of severe weather conditions that include heavy snow / Icing / hurricane. The protected storage locations are still under evaluation and will be added to the revision of OP-OC-108-109-1001 when completed.

The identification of qualified protected storage locations requires further development by the licensee the plant's design basis for the extreme snow and icing conditions. This has been combined with previously identified Confirmatory Item 3.1.3.1.A in Section 4.2.

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

During the audit, the licensee stated FLEX procedures will be written with FLEX Equipment deployment paths. The FLEX equipment will remain inside the site protected area and have two deployment paths. In addition, the storage locations being evaluated for protection of the FLEX equipment from severe weather conditions are located along the deployment paths.

On page 13 of the Integrated Plan, the licensee stated that an administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation.

On page 7 of the Integrated Plan, the licensee identified a FLEX truck (Ford F-750) equipped with a plow for debris and snow removal.

As discussed in Section 3.1.4 of this evaluation, water at the suction of the pumps is kept from freezing by the thermal dilution gates, which recirculate discharge water through the intake bay, and by the turbulence induced by the circulating water pumps and that the discharge canal remains free of ice during normal operation due to the plant-heated effluent. However, the licensee does not address how the access to the UHS will be assured during extreme cold temperatures with an ELAP.

During the audit, the licensee was requested to address the availability of a water source during plant shutdown when there is significant surface icing existing on sources of makeup water on which FLEX pumps will take suction. The licensee responded that the external connection used for FLEX is via suction hose and discharge hose that will be deployed at the time of the event. The suction point is a protected section of the discharge tunnel and is not subject to ambient freezing.

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

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

NEI 12-06, Section 8.3.3, states:

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

As discussed above in Section 3.1.4.2 above, the licensee has committed to develop an administrative program to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation.

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

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

NEI 12-06, Section 8.3.4, states:

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

On pages 14 of the Integrated Plan, the licensee stated that OCNGS has contractual agreements in place with SAFER. As part of the agreement, equipment will be moved from the RRC location to the site. However, the subject of snow, ice and extreme cold hazards with regard to transporting offsite equipment to the site and where equipment would be staged is not specifically addressed.

During the audit, the licensee addressed these concerns by stating that the licensee is actively involved in industry initiatives to establish RRCs to meet the guidelines of NEI 12-06 to provide Phase 3 equipment to the site. This includes the SAFER plan that will contain implementation details for generic and specific equipment obtained from the RRC. This plan will also contain the logistics for equipment transportation, area set up, and other needs for ensuring the equipment and commodities to sustain the site's coping strategies. The final development of these plans has been combined with Confirmatory Item 3.1.1.4.A in Section 4.2.

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

3.1.5 High Temperatures

NEI 12-06, Section 9.2 states:

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

On page 7 of the Integrated Plan, the licensee stated that the highest recorded temperature documented in the UFSAR for Southern New Jersey was listed as 106 °F. Per the NEI 12-06 guidance, extreme high temperature hazard should be considered by all sites. Therefore Oyster Creek screens in for an assessment for extreme high temperatures.

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

On pages 22, 31, 40, and 48 of the Integrated Plan, the licensee states that structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. However, in the August 2013 six-month status update the licensee stated that FLEX equipment will be stored outdoors on concrete pads.

On page 14 of the Integrated Plan, the licensee stated that Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in JLD-ISG-2012-01, Section 6 and NEI 12-06, Section 11. NEI 12-06, Section 11.2, Paragraph 1, provides that "[w]hen specifying portable equipment, the capacities should ensure that the strategy can be effective over a range of plant and environmental conditions." Paragraph 3 of that Section provides that functionality of the equipment may be outside the manufacturer's specifications if justified in a documented engineering evaluation. The reviewer noted that conformance with these portions of the guidance as planned by the licensee will result in acquisition of equipment that is functional in the high temperatures appropriate to the site.

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

3.1.5.2 Deployment of FLEX Equipment - High Temperature Hazard

NEI 12-06, Section 9.3.2 states:

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

The August 2013 six-month status update identified that FLEX will be stored outdoors on concrete pads, thus the potential impact of high temperatures on the storage of equipment, e.g., expansion of sheet metal, swollen door seals, etc., is not applicable.

On page 53 of the Integrated Plan, in the listing of BWR portable equipment for Phase 2, the licensee identified one Ford F-750 flatbed to be used as a tow vehicle.

On page 8 of the Integrated Plan, the licensee stated that "[m]aximum environmental room temperatures for habitability or equipment availability [are] based on (Nuclear Utility Management and Resources Council) NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," guidance if other design basis information or industry guidance is not available." NUMARC 87-00 states that for most mechanical and electrical equipment, temperatures up to 120°F would likely not adversely affect operability. Also, NUMARC 87-00 states that work in 110°F and relative humidities up to 50% would not be intolerable. These temperatures bound the temperature of 106°F identified on page 7 of the Integrated Plan, and therefore equipment and the use of personnel for moving equipment should not be affected by the high temperature event.

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

3.1.5.3 Procedural Interfaces – High Temperature Hazard

NEI 12-06, Section 9.3.3 states:

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

On pages 10 and 11 of the Integrated Plan, the licensee stated, in part, that:

> Existing plant maintenance programs and procedures will be used to identify and document maintenance and testing requirements. Preventative Maintenance work orders (PMs) will be established and testing procedures will be developed in accordance with the PM program. Testing and PM frequencies will be established based on type of equipment and considerations made within EPRI guidelines. The control and scheduling of the PMs will be administered under the existing site work control processes.

Because the licensee indicates on page 14 of the Integrated Plan that the equipment associated with the strategies identified in the Integrated Plan will be procured as commercial equipment with design as outlined in JLD-ISG-2012-01, Section 6 and NEI 12-06, Section 11, there is reasonable assurance that those requirements will conform to the guidance of NEI 12-06, Section 9.3.3.

The reviewer noted that NUMARC 87-00 states that for most mechanical and electrical equipment, temperatures up to 120°F would likely not adversely affect operability. This temperature bounds the temperature of 106°F identified on page 7 of the Integrated Plan.

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

3.2 <u>PHASED APPROACH</u>

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, described in NEI 12-06, Section 3, is endorsed 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 & heat removal, and inventory control strategies. This approach uses the installed (isolation condensers) ICs to provide core cooling and depressurization for the initial phase. Phase 2 relies on a FLEX pump to provide cooling water to the ICs to continue reactor cooling and depressurization which also limits system leakage, thus reducing containment heatup. When the RPV pressure is sufficiently reduced, the FLEX pump provides injection into the RPV for cooling, depressurization, and inventory control.

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

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

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

3.2.1.1 Computer Code Used for the ELAP Analysis

NEI 12-06, Section 1.3 states:

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

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

The August 2013 six-month status update identified the gaps between the input design values used in NEDC-33771P/NEDO-33771, "GEH Evaluation of FLEX Implementation Guidelines," Revision 1 (hereinafter NEDC-33771P, ADAMS Accession No. ML130370742) and the OCNGS values. The status report provided a discussion on the gaps that supports the applicability of the NEDC-33771P to OCNGS.

On page 10 of the Integrated Plan, General Integrated Plan Elements, in the section describing the sequence of events (SOE), the licensee stated:

> The times to complete actions in the Events Timeline are based on operating judgment, the conceptual designs, and the current supporting analyses. The final timeline will be time validated once detailed designs are completed and procedures are developed. The results will be provided in a future 6-month update.

During the audit, the licensee added calculation OC-MISC-010, "MAAP [Modular Accident Analysis Program] Analysis to Support FLEX Initial Strategy," to the licensee's ePortal. The calculation identifies it is based on the MAAP4 computer code for simulating the ELAP event. 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 NEI in a 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 MAAP is an appropriate code for the simulation of an ELAP event at your facility. This has been identified as Confirmatory Item 3.2.1.1.A in Section 4.2.

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

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

(4) In using MAAP, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP Application Guidance, Desktop Reference for Using MAAP Software, Revision 2" (Electric Power Research Institute Report 1020236). This should include response at a plant-specific level

regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included.

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

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

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

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

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

3.2.1.2 Recirculation Pump Seal Leakage Models

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

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

> After power is restored, the Recirculation Pump [RCP] isolation valves on four (4) loops can be closed to reduce the recirculation pump seal leakage. The Isolation Condensers will be used to maintain Reactor pressure and remove decay heat for an indefinite period of time.

During the audit, the licensee was requested to identify what the assumed RCP seal leakage was and the basis of the assumption. The licensee responded that isolating 4 of the 5 recirculation loops will reduce the total leakage by 20 gpm which will reduce heat input to the containment. One loop/ recirculation pump seal leakage is 5 gpm based on a maximum seal leakage of 0.75 gpm and allowance for seal degradation during the event. Additionally, a 10 gpm reactor coolant system leak was assumed. This leakage is based on using a nominal value that is conservatively higher than expected during a normal operating cycle.

The reviewer noted that the OCNGS MAAP analysis was placed in the licensee's ePortal during the audit. The RCP seal leakage was modeled as a hole that provided 35 gpm (25 gpm seal leakage plus 10 gpm reactor coolant system leakage) seal leakage at 1000 psig and declined as RPV pressure is reduced.

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 RCP seal leakage models, if these requirements are implemented as described.

3.2.1.3 Sequence of Events

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

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

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

NEI 12-06, Section 3.2.2 also states, in part, that 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."

In response to the need to identify expected time constraints, the Integrated Plan includes a discussion of time constraints on pages 10 through 12 and a SOE Timeline, Attachment 1A, on pages 57 through 60.

The August 2013 six-month status update identified the gaps between the input design values used in the NEDC-33771P values and the OCNGS values. The status report provided a discussion on the gaps that supports the applicability of the NEDC-33771P applicability to OCNGS.

During the audit, the licensee posted the MAAP analysis on the licensee's ePortal. Case 6 of the analysis used the strategy described in the Integrated Plan to cool down the RPV at 50°F per hour with the ICs until 3.8 hours when makeup to the RPV via FLEX pump was initiated. The analysis was run for 72 hours and did not result in exceeding any temperature or pressure limits on the Drywell or Torus. It was noted that the Drywell temperature was rising slowly. During the audit, the licensee indicated that containment spray via the FLEX pump would be added to the Phase 2 strategies in a future six-month update. The licensee's ePortal has a sketch that depicts the containment spray supplied by the FLEX pump.

On page 10 of the Integrated Plan, the licensee stated:

> The times to complete actions in the Events Timeline are based on operating judgment, the conceptual designs, and the current supporting analyses. The final timeline will be time validated once detailed designs are completed and procedures are developed. The results will be provided in a future 6-month update.

Further review of the final update and time validation has been identified as Confirmatory Item 3.2.1.3.A in Section 4.2.

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

3.2.1.4 Systems and Components for Consequence Mitigation

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

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

And,

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

NEI 12-06, Section 3.2.1.12 states:

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

On page 14 of the Integrated Plan, the licensee stated equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in JLD-ISG-2012-01, Section 6 and NEI 12-06, Section 11.

The Integrated Plan does not contain design information concerning the required water flow rates, the portable/FLEX pump complete head/flow characteristics, suction and discharge losses, system backpressure, elevation differences and piping losses to allow verification that the strategies will be successful. During the audit, the licensee stated that detailed design information will be submitted in a future 6-month update once they become available.

On page 59 of the Integrated Plan, the SOE timeline identifies energizing 480VAC [unit substations] USS's 1A2 and 1B2 using a portable generator. This enables restoring power to the battery chargers and isolation of the recirculation loops via the recirculation loop isolation valves.

Further technical basis or a supporting analysis is needed for the portable/FLEX diesel generator capabilities considering the capacity of the equipment. The required information is a summary of the sizing calculation for the FLEX 480 VAC diesel generators to show that they can supply the loads assumed in Phase 2. During the audit, the licensee stated that the FLEX generator sizing calculation will be submitted in a future six-month status update.

During the audit, the licensee was requested to provide a summary of non-safety related installed equipment that is used in the mitigation strategies. The licensee was also requested to include a discussion of whether the equipment is qualified to survive all ELAP events. The licensee responded that all installed equipment used for FLEX strategy is safety related except for certain existing connections. All connections are located in the reactor building which is a Seismic Class 1 structure which will enhance the survivability of the connections. All permanent piping/connections will be installed in accordance with the system classification and at a minimum be seismically robust.

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.

On pages 18 and 20 of the Integrated Plan, maintaining core cooling for Phase 1 and Phase 2 respectively, the licensee listed the following available instruments:

Key Instruments available:

REO5/19B	Reactor Level
REO5B	Reactor Level
RE02C	Core Spray Logic Reactor Level
RE02D	Core Spray Logic Reactor Level
RE03C	Reactor Pressure
RE03D	Reactor Pressure

The above instruments are located in panel 18R and 19R in the Main Control Room (MCR). Reactor Pressure and Level are fed to meters on the MCR panels. The panels are provided with DC backup power from the station batteries.

LT-IG06B	("B") Isolation condenser shell level
PI-IGO5B	("B") Steam pressure indicator
LI-211-1215	Local level indicator "B" isolation condenser shell
LI-211-1214	Local level indicator "A" isolation condenser shell
LI-622-1028	"C" fuel zone
LI-622-1029	"D" fuel zone
RE15C	Fuel Zone Reactor Pressure Input
RE15D	Fuel Zone Reactor Pressure Input

The "B" Isolation condenser shell level, reactor pressure and reactor level can be read at the remote shut down panel 480V AC "A" vault also powered from the station DC station battery "B". Isolation Condenser shell-side level can also be read locally at the isolation condensers. Currently, Torus level will not be available until AC power is restored [2.5 hours per SOE timeline].

Oyster Creek's evaluation of the FLEX strategy may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. NEI 12-06 Rev. 0 Section 3.2.1.10 and any differences will be communicated in a future 6-month update following identification.

On pages 28 (Phase 1) and 29 and 30 (Phase 2) of the Integrated Plan, for maintaining containment, the licensee listed the following available instruments:

LI-IPOOIOA	Torus Narrow Range Level
LI-IPOOIOB	Torus Narrow Range Level
LI-243-2A	Torus Wide Range Level Panel

16R LI-243-2B	Torus Wide Range Level Panel
16R PT-IP-0007	Containment Pressure Transmitter
LT-IG06B ("B")	Isolation Condenser Shell Level
PI-IGOSB ("B")	Steam Pressure Indicator
LI-211-121S	Local Level Indicator "B" Isolation Condenser Shell
LI-211-1214	Local Level Indicator "A" Isolation Condenser Shell
LI-622-1028	"C" Fuel Zone
LI-622-1029	"D" Fuel Zone
TI-664-43A	Suppression Pool Temperature Div 1
TI-664-43B	Suppression Pool Temperature Div 2

The "B" Isolation condenser shell level, reactor pressure and reactor level can be read at the remote shut down panel 480V AC "A" vault also powered from the station DC station battery "B". Isolation Condenser shellside level can also be read locally at the Isolation Condensers. Currently, Torus level will not be available until AC power is restored.

Oyster Creek's evaluation of the FLEX strategy may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. NEI 12-06, Section 3.2.1.10 and any differences will be communicated in a future 6-month update following identification.

On pages 37 and 39 of the Integrated Plan, regarding SFP cooling for Phases 1 and 2, the licensee identified SFP level indication will be per EA 12-051.

There is no indication in the identification of modifications that there will be a modification to make torus level available prior to ac power restoration. There is no discussion pertaining to having suppression pool level available prior to reinstatement of ac power, as specified in NEI 12-06, Section 3.2.1.10. During the audit, the licensee stated that with no ac, there is not a system external to the torus that can draw water from the torus or add water to the torus that will cause a level change from the normal band. Therefore, the licensee stated that it is assumed that for the time duration until ac power is restored, torus level will remain constant.

The licensee's plans in regards to instrumentation and controls as described above, includes those parameters listed in NEI 12-06, Section 3.2.1.10 (with the exception of torus level prior to ac restoration); however, the licensee did not provide justification that the instrumentation to measure the listed parameters and the associated setpoints credited in the ELAP analysis for automatic actuations and indications required for the operator to take appropriate actions are reliable and accurate in the containment harsh conditions with high moisture levels, temperature and pressure during the ELAP event. The licensee was requested to provide information that (1) includes a discussion of the analysis that is used to determine the containment temperature, pressure, and moisture profiles during the ELAP event, and (2) addresses the adequacy of the computer codes/methodologies, and assumptions used in the analysis.

During the audit, the licensee posted the MAAP analysis on the licensee's ePortal that includes containment temperature and pressure. The licensee also stated that the environmental conditions that the equipment located in the reactor building could possibly see are high temperature and humidity. Instruments located in the reactor building that are required for FLEX strategies are qualified to NUREG-0588, IEEE-279.

Case 6 of the MAAP analysis used the strategy described in the Integrated Plan to cool down the RPV at 50°F per hour with the ICs until 3.8 hours when makeup to the RPV via FLEX pump was initiated. The analysis was run for 72 hours and did not result in exceeding any temperature or pressure limits on the Drywell or Torus. It was noted that the Drywell temperature was rising slowly. During the audit, the licensee indicated that containment spray via the FLEX pump would be added to the Phase 2 strategies in a future six-month update. The licensee's ePortal has a sketch that depicts the containment spray supplied by the FLEX pump. The reviewer noted that containment temperature is not addressed; however, during the audit, the licensee stated that containment temperature could be determined using a Fluke meter on control room panels 18R and 19R.

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

3.2.1.6 Motive Power, Valve Controls and Motive Air System

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

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

And,

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

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

On pages 24, 33, and 42 of the Integrated Plan, the licensee identifies that the strategy for Phase 3 is to provide backup pumps and generators to continue with the Phase 3 strategies. On pages 54, 55, and 56 of the Integrated Plan, in the section identifying Phase 3 equipment, the licensee identifies the required replacement equipment plus items such as fuel oil, food/water, and transportation 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 motive power, valve controls, and motive air system, if these requirements are implemented as described.

3.2.1.7 Cold Shutdown and Refueling

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

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

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

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

The licensee stated that the OCNGS plans to abide by the generic resolution for refueling and cold shutdown. The licensee stated that a review is in progress to develop a plan to address potential plant-specific issues associated with implementing the generic approach. The results and conclusions of this review will be provided in a future 6-month update.

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

3.2.1.8 Use of Portable Pumps

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

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

Phase 2 of the plan includes coping strategies using on-site portable equipment and modifications to maintain core cooling. OCNGS proposed multiple ways of continuing to cool the reactor core during Phase 2. The primary strategy for maintaining core cooling is to make up water to the shell-side of the ICs from a FLEX pump taking suction from the intake or discharge canal (UHS water). The connections for makeup to the RCS, IC shell, and SFP are in the Reactor Building NW airlock. An alternate connection for the SFP makeup via 250 gpm spray is to a pipe adjacent to the North West (NW) Reactor Building (RB) stairwell. Hoses will run from the FLEX pump to the connections. The SOE timeline identifies action item 8 to provide makeup to the ICs at 1.5 hours and states that it is time critical. The SOE timeline also identifies action 12 to commence injecting into the reactor using the FLEX pump at 3.8 hours and states that it is time critical that use of the ICs and reactor makeup is required to maintain acceptable containment limits. As noted in Section 3.2.1.3 above, containment spray is going to be added to the Phase 2 strategies. The MAAP analysis indicates that after about a week, the containment temperature limit will be exceeded without a strategy added to the Integrated Plan.

Although the Integrated Plan provides a description of the use of portable pumps, insufficient technical information is presented or referenced in the plan to confirm the ability of the portable FLEX pumps to deliver the required flow through the system of flex hoses, couplings, valves, elevation changes, etc. for the configurations described. However, on page 23 of the Integrated Plan, the licensee stated that the engineering designs for compliance with NRC Order EA-12-049 are not finalized. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function guidelines of NEI 12-06. The licensee further stated that once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for OCNGS during a scheduled 6-month update.

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

Page 36 of the Integrated Plan identifies the following:

Heat load = 20.07 MBTU/hour

Time to boil starting at 125°F = 10.3 hours

Time to boil-off to top of spent fuel storage racks starting at 125°F= ~79.2 hours

Page 12 of the Integrated Plan identifies the following:

Heat load = 20.3 MBTU/hour

Time to boil starting at 125°F = 7.4 hours

Time to boil-off to top of spent fuel storage racks starting at 125°F = 68.66 hours

During the audit, the licensee was requested to discuss the significant difference in values reported on pages 12 and 36. The licensee responded that the values on page 36 were from a calculation and the values on page 12 were from the UFSAR. The licensee also stated that to be consistent, the values from the UFSAR section 9.1.3.2.3 listed on page 12 of the Integrated Plan will be used and will be corrected in the next Integrated Plan 6 month update.

On page 38 of the Integrated Plan in the section SFP cooling for Phase 2, the licensee stated:

The FLEX diesel driven portable pump will be positioned near the intake structure, and the discharge hose will be run to a pipe connection adjacent to the North West (NW) Reactor Building (RB) stairwell. This piping will be used to make-up to spent fuel pool (SFP) from the 23' (grade) elevation. On the fuel floor (119' elev.) a hose will be connected to the SFP makeup piping and ran into the SFP, utilizing restraints at the SFP handrail. At approximately T=12 hours (see SFP timeline in Phase 1), the FLEX pump will be started, the SFP make-up piping pressurized, and makeup flow established via the SFP makeup connection on the 75' elevation by opening the isolation valve located in the NW RB stairwell. The hose connected on the fuel floor will be available as an alternative flow path.

The 250 gpm spray flow will be provided by a FLEX pump taking suction from the intake structure and supplying water to the fuel pool makeup connection inside the NW airlock for the Reactor building. A fire hose will be connected to the connection located on the refuel floor, NW corner of the fuel pool, with an oscillating spray nozzle spraying over the pool.

Evaluation of the spent fuel pool area for steam and condensation has not yet been performed. The results of this evaluation and the vent path strategy, if needed, will be provided in a future 6-month update.

During the audit, the licensee provided an overview of the planned strategy for hose makeup and spray. This overview included a change in hose makeup strategy from the original plan regarding the proposed FLEX connection points. The most current strategy will have a FLEX pipe riser that will connect to the spent fuel pool system via existing robust connection at a level below the originally planned 119' elevation to allow makeup operations without requiring operators to directly access the 119' elevation and the spent fuel pool area. The licensee also provided an overview of the SFP spray strategy that would be employed, if required.

The licensee also stated that if fuel pool spray is required, procedures will address actions required for heat and radiation levels.

The Integrated Plan identifies piping from the 23 foot elevation to the refueling floor ending in a hose connection and a branch connection to the SFP makeup piping at the 75 foot elevation. The licensee identified on page 35 of the Integrated Plan that the makeup system for the SFP is not a Seismic Category 1 system. During the audit, the licensee was requested to address if the makeup system was seismically robust as required to be available per NEI 12-06, Section 3.2. The licensee responded that the connections are located in a seismic Class 1 building, and all permanent piping/connections will be installed in accordance with the system classification and at a minimum be seismically robust.

During the audit, the licensee was requested to identify if there is any equipment or instrumentation in the SFP area that could be affected by the high heat and humidity in an unvented room with a boiling SFP. The licensee responded that no critical instrumentation is located in the area of the SFP. The new fuel pool level instruments will be designed to operate in the ELAP environment.

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

On page 27 of the Integrated Plan, regarding maintaining containment, the licensee stated:

> Coping strategies for primary containment in Phase 1 will be to remove decay heat via the Isolation Condensers (ICs) to minimize heat input to primary containment. The ICs remove decay heat with no loss of inventory from the reactor coolant system and no addition of heat to the suppression pool. As long as the shell side of the ICs is replenished (Phase 2) with sufficient water, they will remove adequate decay heat to maintain core cooling and limit the heat input to the containment.
>
> During Phase 1, containment integrity is maintained by normal design features of the containment, such as the containment isolation valves. In accordance with NEI 12-06, the containment is assumed to be isolated following the event.
>
> Reliable Hardened Vent System (RHVS) will be available for use to vent containment. The Hardened Vent Containment Isolation valves will be operated by an independent DC system to ensure reliability. Monitoring of containment (drywell) pressure and temperature will be available via normal plant instrumentation. Early venting of the containment (BWROG EOP Revision [Emergency Planning Guidelines] EPG/[Severe Accident Guidelines] SAG Rev.3) will serve to limit containment pressure rise and Torus temperature rise.
>
> BWROG EOP Revision EPG/SAG Rev.3, containing items such as guidance to allow early venting and to maintain steam driven injection equipment available during emergency depressurization, is approved and will be implemented in time to support the Oyster Creek compliance date.

It is not clear why the licensee refers to BWROG EOP Revision EPG/SAG Rev.3, containing items such as guidance to allow early venting and to maintain steam driven injection equipment available during emergency depressurization. OCNGS does not have any steam driven injection equipment. The generic evaluation provided in NEDC-33771P Revision 0 does not indicate a need for early venting with utilization of ICs.

During the audit the licensee addressed this concern by identifying that the Integrated Plan used a generic response. The licensee also stated that required changes will modify the Integrated Plan for the implementation of EPG/SAG Revision 3 as it will be applied to Oyster Creek.

On page 29 of the Integrated Plan, regarding maintaining containment for Phase 2, the licensee stated:

> Oyster Creek will utilize portable equipment to provide shell-side makeup to the Isolation Condenser. Utilization of the Isolation Condenser as the RPV Pressure Control Mechanism will eliminate the need for [electromatic relief valve] EMRV operation and the subsequent heat addition to the containment.
>
> During Phase 2, Isolation Condenser makeup will be provided by the FLEX pumps taking suction from the UHS (Intake or Discharge canal). The pumps have the capacity to make up to the Reactor and the Isolation Condenser shells. The new seismic connections are in the conceptual design phase and will be located inside the reactor building NW airlock. This central location will provide connections for the Reactor, Isolation Condenser shell and Spent Fuel Pool makeup. The FLEX pumps will take suction from the Intake canal, and hoses will be run to the new connections.

During the audit, the licensee clarified that one pump will provide water to the ICs, RPV, containment spray, and the SFP.

Reviewer evaluation of the MAAP analysis posted on the ePortal during the audit indicates that containment temperature limits would not be reached for over 7 days. The reviewer also noted that a sketch depicting containment spray supplied from a FLEX pump was added to the ePortal during the audit.

The Integrated Plan statement that, "currently Torus level will not be available until AC power is restored," implies that a modification will be made. However, there is no indication in the identification of modifications that there is a modification to make Torus level available prior to AC power restoration.

During the audit the licensee addressed this concern by explaining that with no AC there is not a system external to the Torus that can draw water from the Torus or add water to the Torus that will cause a level change to the normal band. Therefore, it is assumed that for the time duration until AC power is restored torus level will remain constant.

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 containment functions strategies, if these requirements are implemented as described.

3.2.4 Support Functions

3.2.4.1 Equipment Cooling - Cooling Water

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

> *Plant procedures/guidance should specify actions necessary to assure that equipment functionality can be maintained (including support systems or alternate method) in an ELAP/LUHS or can perform without ac power or normal access to the UHS.*

Cooling functions provided by such systems as auxiliary building cooling water, service water, or component cooling water may normally be used in order for equipment to perform their function. It may be necessary to provide an alternate means for support systems that require ac power or normal access to the UHS, or provide a technical justification for continued functionality without the support system.

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

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to water for 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, [high pressure coolant injection] HPCI and [reactor core isolation cooling system] 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.

During the audit, the licensee was requested to provide justification that the instrumentation to measure the listed parameters and the associated set points credited in the ELAP analysis for automatic actuations and indications required for the operator to take appropriate actions are reliable and accurate. The licensee responded that Procedure 331.1, "Control Room and Old Cable Spreading Room Heating, Ventilation and Air Conditioning System," addresses Instruments sensitive to temperature Increases in the main control room. Instrumentation used by FLEX contained in control room panels 18R and 19R may be affected at temperatures of approximately 104°F. Procedure 331.1 contains actions to maintain temperatures below this point. This procedure will be updated to use portable generators to power temporary ventilation installed to maintain Control Room temperatures.

During the audit, the licensee was requested to provide information on the adequacy of the ventilation provided in the battery room to prevent hydrogen gas accumulation and protect the batteries from the effects of extreme high and low temperatures. The licensee identified technical evaluations and calculations regarding hydrogen buildup and ventilation requirements during the audit that addressed the blocking open of doors and installation of portable fans. The licensee also responded that Battery Room conditions will be evaluated and a strategy will be developed to maintain acceptable conditions. The strategy and associated support analyses will be submitted in a future six-month update. This has been identified as Confirmatory Item 3.2.4.2.A in Section 4.2.

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

3.2.4.3 Heat Tracing

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

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

The Integrated Plan does not address heat tracing for freeze protection of piping, instrument lines and equipment. During the audit, the licensee was requested to provide information to demonstrate conformance with NEI 12-06, Section 3.2.2, Guideline (12). The licensee responded that:

> Outdoors
> Oyster Creek identified no potential for freezing of piping or instrument lines required for the FLEX strategies. The external connection used for FLEX is via suction hose and discharge hose that will be deployed at the time of the event. The suction point is a protected section of the discharge tunnel and not subject to ambient freezing.
>
> Indoors
> Current site procedures require monitoring of reactor building temperatures, action are required to maintain temperature above the point where freezing could affect instrumentation. With a loss of all ventilation the introduction of cold air at high flow rates will be removed and building temps should begin to rise based on stored heat in structures and 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 heat tracing, if these requirements are implemented as described.

3.2.4.4 Accessibility - Lighting and Communication

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

> *Plant procedures/guidance should identify the portable lighting (e.g., flashlights or headlamps) and communications systems necessary for ingress and egress to plant areas required for deployment of FLEX strategies.*
>
> Areas requiring access for instrumentation monitoring or equipment operation may require portable lighting as necessary to perform essential functions.
>
> Normal communications may be lost or hampered during an ELAP.

Consequently, in some cases, portable communication devices may be required to support interaction between personnel in the plant and those providing overall command and control.

The licensee's plans for the development of guidance and strategies with regard to the provision of portable lighting provided no information to demonstrate there is reasonable assurance that the guidance and strategies developed will conform to the guidance of NEI 12-06 Section 3.2.2 (8) regarding provisions for portable lighting devices. The licensee addressed this concern during the audit process by stating that plant procedures are being developed to provide guidance for plant personnel to have all necessary equipment for the performance of FLEX activities. Existing emergency procedures include provisions for temporary lighting and periodic checks of equipment storage to verify lighting equipment and batteries are available and functional. The licensee also noted that all operators currently carry flash lights as standard personnel protective equipment.

The NRC staff has reviewed the licensee communications assessment (ADAMS Accession Nos. ML12306A199 and ML13056A135) in response to the March 12, 2012 50.54(f) request for information letter for OCNGS and, as documented in the staff analysis (ADAMS Accession No. ML13114A067) has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. Therefore, there is reasonable assurance that the guidance and strategies developed by the licensee will conform to the guidance of NEI 12-06 Section 3.2.2, Guideline (8) regarding communications capabilities during an ELAP. Verification of required upgrades has been identified as Confirmatory Item 3.2.4.4.A in Section 4.2.

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

3.2.4.5 Protected and Internal Locked Area Access

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

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

The licensee's Integrated Plan provided insufficient information related to the development of guidance and strategies with regard to the access to the protected area and internal locked areas to demonstrate conformance with NEI 12-06. Updated information provided by the licensee as part of the audit response addressed this issue by stating that keys for access to the plant are available to security, the shift manager and to the radiation protection group. The licensee further stated that plant areas requiring access as part of the FLEX response, have been evaluated and it has been determined that sufficient keys are available.

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 access to locked areas, if these requirements are implemented as described.

3.2.4.6 Personnel Habitability - Elevated Temperature

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

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

On page 44 of the Integrated Plan, in the section regarding safety functions support for Phase 1, the licensee stated:

> Control room habitability
> Under ELAP conditions with no mitigating actions taken, initial analysis projects the Control Room to surpass 110°F (the assumed maximum temperature for efficient human performance as described in NUMARC 87-00 (Reference 1)).
>
> The Phase 1 FLEX strategy is to block open the Main Control Room door, observation room door and the back door. The outside door to the back hallway will be opened and the door by the MUX room will be opened to provide air flow from the outside.
>
> Battery room habitability
> Battery room HVAC doors will be blocked open to provide initial ventilation.
>
> Refuel floor habitability
> Initial ventilation to the SFP area is by opening the Reactor Building roof hatch air lock and the railroad airlock small doors. This will provide air flow to the refuel floor.

On page 46 of the Integrated Plan, in the section regarding Safety Functions Support for Phase 2, the licensee stated:

Exelon Generation Company, LLC (Exelon) intends on maintaining Operational command and control within the Main Control Room. Habitability conditions will be evaluated and a strategy will be developed to maintain Main Control Room habitability. The strategy and associated support analyses will be submitted in a future 6-month update.

Phase 2 with 480VAC power restored utilizes temporary fans/ blowers in conjunction with the blocked open doors to provide forced flow.

Because the strategy and associated support analyses have not been completed, there is insufficient information to conclude that the habitability limits of the control room will be maintained in all Phases of an ELAP. The licensee addressed this concern during the audit by stating:

Procedures will be developed to perform any actions to ensure control room habitability is kept below 104°F during the event (opening doors, installing fans, etc.). Long term habitability will be assured by monitoring of control room conditions, heat stress countermeasures, and rotation of personnel to the extent feasible. At Oyster Creek, the impact to habitability would be primarily from elevated temperatures. Initially, there would be some delay in the control room air temperature increasing to outside air temperature. Therefore, the Oyster Creek FLEX Support Guidelines will provide guidance for control room staff to evaluate the control room temperature and take actions as necessary. Oyster Creek is storing bottled water on site as part of the miscellaneous items to support the FLEX strategy. In addition, current general site training includes a module on the recognition of dehydration along with methods to cope. Additional information will be provided in a future six-month update.

Procedure 331.1 "Control Room and Old Cable Spreading Room Heating, Ventilation and Air Conditioning System" currently contains guidance for temperature control using portable fans. The use of portable generators to power the portable fans will be incorporated into the current procedures.

During the audit, the licensee revised their strategy for makeup to the SFP. Makeup will be established at the 75 foot elevation through a hose connection tying into the SFP makeup system. It will not be necessary to access the SFP 119 foot elevation to establish makeup. If SFP spray is required, the licensee stated during the audit that procedures will address actions required for heat and radiation levels. They also noted that the spray strategy has been modified to move spray attack to the south east corner of the refuel floor which is the furthest point from the SFP on the 119 foot elevation.

The licensee's approach described above, as currently understood, is consistent with the guidance found in NEI 12-06, as endorsed by JLD-ISG-2012-01, and provides reasonable assurance that the requirements of Order EA-12-049 will be met with respect to personnel habitability in elevated temperatures, 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 [net positive suction head] NPSH can be demonstrated and, for example, that the water does not gravity drain back to the UHS. Alternate water delivery systems can be considered available on a case-by-case basis. In general, all CSTs should be used first if available. If the normal source of makeup water (e.g., CST) fails or becomes exhausted as a result of the hazard, then robust demineralized, raw, or borated water tanks may be used as appropriate.

Heated torus water can be relied upon if sufficient NPSH can be established. Finally, when all other preferred water sources have been depleted, lower water quality sources may be pumped as makeup flow using available equipment (e.g., a diesel driven fire pump or a portable pump drawing from a raw water source). Procedures/guidance should clearly specify the conditions when the operator is expected to resort to increasingly impure water sources.

The Integrated Plan identifies the intake or discharge canal as the water source for strategies for maintaining adequate core cooling, reactor makeup and SFP cooling. The water in the canals is from Barnegat Bay which is an arm of the Atlantic Ocean. During the audit, the licensee was requested to discuss the quality of this water (e.g., suspended solids) and provide justification that its use will not result in blockage to an extent that would inhibit adequate flow to the core, or block cooling water to the SFP.

The licensee responded that the Intake suction hose for the portable FLEX pumps has a coarse suction strainer. In addition, the licensee stated that the procedures governing use of the portable FLEX pumps during a BDBEE have not been developed. Furthermore, as the procedural guidance for use of the portable FLEX pumps is developed, concerns such as priority of water source and actions to be taken to ensure coolant flow across fuel assemblies will be addressed. Exelon identified this as an action that required further analysis. This action is covered by Confirmatory Item 3.1.3.2.A.

During the audit, the licensee was requested to discuss the possibility of use of the torus as a water source. The licensee responded that there are no plans to use torus water since there is no access for the FLEX pump to take suction and modifications are not planned.

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

3.2.4.8 Electrical Power Sources/Isolations and Interactions

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

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

Page 19 of the Integrated Plan in the section regarding maintaining core cooling, the licensee stated:

> 480V AC power will be restored using modified spare breaker frames with cables adapted to plug into a portable 3-phase 480V AC generator. This will allow repowering the 480V AC USS 1 A2 and IB2 and restore the battery chargers for the station batteries and provide power to the MCCs to operate valves and other essential loads.

On page 54 of the Integrated Plan, in the listing of portable equipment for Phase 3, the licensee identified a diesel generator with 2 MW output at 4160 V AC, three phase. This generator is not discussed in the Integrated Plan strategies for Phase 3. During the audit, the licensee identified that the 4160 V ac generator was inadvertently added to the list of equipment for Phase 3 as part of a generic listing of equipment. This will be corrected in a future six-month update.

It is understood that the modifications above are "conceptual," but the licensee has included a description of the modification and a reference drawing depicting the modification configuration. In the information presented, there was insufficient information available regarding electrical isolations and interactions.

The licensee was requested to describe how electrical isolation will be maintained such that (a) Class 1E equipment is protected from faults in portable/FLEX equipment and (b) multiple sources do not attempt to power electrical buses. The licensee responded that 480V dc secondary breakers will be open and racked out per procedures to isolate the vital USS's and sources that will supply power will be procedurally controlled. Also, the licensee stated the portable diesel generators will have overload protection built on the generator skid. The NRC staff will confirm the procedures to isolate the vital USS's from the generator, and ensure that the diesel generator is equipped with overload protection on the generator skid. This is identified as Confirmatory Item 3.2.4.8.A in Section 4.2.

The licensee was requested to provide a summary of the sizing calculation for the FLEX generators to show that they can supply the loads assumed in Phases 2 and 3. The licensee responded that the FLEX generator sizing calculation will be submitted in a future six- month update. They also stated that the technical product process (i.e., ECR and/or Tech EVAL etc.) will ensure that the portable diesel generator will be properly sized when purchased. The NRC staff will confirm/review technical basis and/or calculations provided as basis for the generator sizing. This is identified as confirmatory item 3.2.4.8.B in Section 4.2.

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

The Integrated Plan does not discuss a refueling plan. The only mention in the Integrated Plan is identification of a Ford F-750 truck for towing vehicles, refueling portable equipment and debris removal. Information is missing on the fuel oil storage and volume, fuel oil capacity of the truck, supply pathway, and fuel needs of the DGs and diesel driven FLEX pumps. The licensee addressed these concerns during the audit by stating:

> The current 15,000 gallon seismic and missile protected EDG fuel oil tank will be used as the primary source of fuel oil. Procedures will be developed to use this source.
>
> Equipment capacities for fuel and consumption rates:
>
> The pump trailer has 250 Gallons of onboard storage. Fuel consumption rate of 13 gallons per hour at full flow. FLEX Truck has two one hundred gallon storage tanks with an onboard transfer system. Electrical generators have yet to be purchased. FLEX procedure being developed for fuel oil transfer is to contain a table with equipment location, estimated fuel consumption rate, and time from start or last fill.
>
> Refueling routes.
> All the refuel routes for Phase 2 FLEX are located in the sites protected area. No travel is required through security barriers that might impede fuel delivery while using the 15,000 gallon EDG fuel tank. The diesel fuel oil storage tank is located directly adjacent to the FLEX circular deployment path. A debris removal plan is being developed for the circular deployment path.
>
> Ongoing fuel needs and Insure fuel quality.
> 15,000 gallons of fuel will be utilized from the emergency diesel generator storage tank and will be maintained by procedure at a quality required to supply the site emergency diesel generators.
> Fuel supplied by the RCC will be of a quality as that stated in the agreement with the RCC.
> As conditions allow the sites vendor would resume deliveries of fuel oil with the quality insured and tested as described in station procedures.

> PMs for equipment with fuel storage capability.
> The diesel fuel oil that is stored in the FLEX equipment pumps, large generators, and truck fuel oil storage and transfer system will have PMs developed to maintain diesel fuel oil on the equipment and to [be] replaced on a timed interval.

Furthermore, during the audit process, the licensee stated that flex fueling procedures are being develop for fuel oil transfer, which will contain a table with equipment location, estimated fuel consumption rate, and time from start or last fill.

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 fuel oil supplies, if these requirements are implemented as described.

3.2.4.10 Load Reduction to Conserve DC Power

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

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

On page 16 of the Integrated Plan, in the section regarding maintaining core cooling, the licensee stated:

> Current battery coping times per UFSAR section 8.3.2.1.1 and section 8.3.2.1.2 are 8 hours for the "C" battery (power for "B" Isolation Condenser) and 3 hours for the "B" battery (power for the "A" Isolation Condenser). A DC load analysis is being performed to determine the battery coping time with no actions and with battery load shed. Oyster Creek currently does not have a battery load shed procedure.

The additional development work to determine battery coping time with no actions and with battery load shed has been identified as Confirmatory Item 3.2.4.10.A in Section 4.2.

During the audit, the licensee stated that they will not credit any battery with a coping time in excess of 8 hours.

During the audit, the licensee was requested to discuss which components change state when loads are shed and actions needed to mitigate resultant hazards (for example, allowing hydrogen release from the main generator, disabling credited equipment via interlocks, etc.). The licensee responded that loads that are shed would have repositioned on loss of all ac to their safety related position. Furthermore, all valves and components that have a fail-safe position require a manual reset to change position; therefore this is not an issue for OCNGS. The licensee concluded that no manual actions are required to mitigate transient conditions.

The reviewer noted that the SOE identifies Action 5 at 25 minutes to vent the main generator. This removes the concern with load shedding the emergency seal oil pump and releasing hydrogen.

During the audit process, the licensee stated that load profiles will be developed during detail design development and will be posted at 6 month updates once received.

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, if these requirements are implemented as described.

3.3 PROGRAMMATIC CONTROLS

3.3.1 Equipment Maintenance and Testing

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

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

NEI 12-06, Section 11.5 states:

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

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

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

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

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

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

    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.

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[1] Testing includes surveillances, inspections, etc.

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.

On Page 14 of the Integrated Plan, in the section regarding programmatic controls, the licensee stated that OCNGS will implement an administrative program for FLEX to establish responsibilities, as well as testing & maintenance requirements. This will establish responsibilities, maintenance and testing requirements for all components associated with FLEX. The licensee further stated that equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in NEI 12-06 section 11.

The NRC staff reviewed the Integrated Plan for OCNGS 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 licensee informed the NRC of their plans to abide by this generic resolution and of the licensee's plans to address potential plant specific issues associated with implementing this resolution. The NRC staff will evaluate the resulting program through the audit and inspection processes.

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

3.3.2 Configuration Control

NEI 12-06, Section 11.8 provides that:

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

contain the basis for the ongoing maintenance and testing programs chosen for the FLEX equipment.

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

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

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

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

On page 14 of the Integrated Plan, in the section regarding programmatic controls, the licensee stated that OCNGS will implement a plant system where a designation will be assigned to FLEX equipment which requires configuration controls associated with systems. This will establish responsibilities, maintenance and testing requirements for all components associated with FLEX. Unique identification numbers will be assigned to all components added to the FLEX plant system. Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in NEI 12-06 section 11.

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.

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

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

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

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

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

On page 14 of the Integrated Plan, in the section describing the training plan, the licensee stated that training materials for FLEX will be developed for all station staff involved in implementing FLEX strategies. For accredited training programs, the Systematic Approach to Training will be used to determine training needs. For other station staff, a training overview will be developed per change management plan.

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

3.4 OFFSITE RESOURCES

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

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

comparable/consistent with that of similar on-site FLEX equipment.

9) Provisions to ensure that equipment determined to be unavailable/non-operational during maintenance or testing is either restored to operational status or replaced with appropriate alternative equipment within 90 days.
10) Provision to ensure that reasonable supplies of spare parts for the off-site equipment are readily available if needed. The intent of this provision is to reduce the likelihood of extended equipment maintenance (requiring in excess of 90 days for returning the equipment to operational status).

On pages 14 and 15 of the Integrated Plan, in the section describing the RRC plan, the licensee provided a description of the offsite resources availability. The licensee stated that OCNGS has contractual agreements in place with the SAFER. Per that agreement, the industry will establish two RRCs to support utilities during beyond design basis events. Each RRC will hold five sets of equipment, four of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Equipment will be moved from a RRC to a local Assembly Area, established by the SAFER team and the utility. Communications will be established between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's playbook, will be delivered to the site within 24 hours from the initial request.

The licensee’s use of off-site resources, as described above, conforms to the guidance found in NEI 12-06, Section 12.2, with regard to the capability to obtain equipment and commodities to sustain and backup the site’s coping strategies (Guideline 1). However, insufficient information has been included to provide reasonable assurance that guidance will be established to conform to the remaining items of NEI 12-06, Section 12.2 (Guidelines 2 through 10). This has been identified as Confirmatory Item 3.4.A in Section 4.2.

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

4.0 OPEN ITEMS AND CONFIRMATORY ITEMS

4.1 OPEN ITEMS

Item Number	Description	Notes
None	None	None

4.2 CONFIRMATORY ITEMS

Item Number	Description	Notes
3.1.1.3.A	Confirm that the licensee develops a reference source describing what actions should be taken if instruments were lost due to a seismic event.	

3.1.1.4.A	Confirm the location of the off-site staging area(s) and acceptability of the access routes considering the seismic, flooding, high wind and snow, ice and extreme cold hazard.	
3.1.2.2.A	Confirm that if temporary flood barriers are used, they are stored such that they can be easily deployed.	
3.1.3.1.A	Verify that the separation of the planned outdoor storage areas is sufficient to preclude damage of both sets of FLEX equipment.	
3.1.3.1.B	Confirm qualified storage locations for the hurricane and extreme snow and icing hazards are identified.	
3.1.3.2.A	Confirm that the licensee's evaluation of water quality and resulting action are sufficient to preclude blockage of flow to the core or SFP.	
3.2.1.1.A	Confirm that benchmarks are identified and discussed that demonstrate that MAAP is an appropriate code for the simulation of an ELAP event at your facility.	
3.2.1.1.B	Confirm that the collapsed level remains above Top of Active Fuel (TAF) and the cool down rate remains within technical specifications limits.	
3.2.1.1.C	Confirm that MAAP is used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper.	
3.2.1.1.D	Confirm that the licensee identifies and justifies the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP Application Guidance, Desktop Reference for Using MAAP Software, Revision 2" (Electric Power Research Institute Report 1020236). This should include response at a plant-specific level regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included. a. Nodalization b. General two-phase flow modeling c. Modeling of heat transfer and losses d. Choked flow e. Vent line pressure losses f. Decay heat (fission products / actinides / etc.)	
3.2.1.1.E	Confirm that the specific MAAP analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan is identified and available on the ePortal for NRC staff to view. Alternately, a comparable level of information may be included in the supplemental response. In either case, the analysis should include a plot of the collapsed vessel level to confirm that TAF is not reached (the elevation of the TAF should be provided) and a plot of the temperature cool down to confirm that the cool down is within technical specifications limits.	
3.2.1.3.A	The SOE final timeline will be time validated once detailed designs are completed and procedures are developed. The	

	licensee should provide the results for NRC staff review.	
3.2.4.2.A	The licensee stated that battery room ventilation to address high/low temperatures and prevention of hydrogen buildup will be addressed through procedure changes and that the proposed methods of ventilation, open doors and fans, will be confirmed during the detailed design process.	
3.2.4.4.A	The NRC staff has reviewed the licensee communications assessment (ADAMS Accession Nos. ML12306A199 and ML13056A135) in response to the March 12, 2012 50.54(f) request for information letter for OCNGS and, as documented in the staff analysis (ADAMS Accession No. ML13114A067) has determined that the assessment for communications is reasonable, and the analyzed existing systems, proposed enhancements, and interim measures will help to ensure that communications are maintained. Verification of required upgrades has been identified as a confirmatory item.	
3.2.4.8.A	Confirm the procedures to isolate the vital USS's from the generator, and ensure that the diesel generator is equip with overload protection in the generator skid.	
3.2.4.8.B	Confirm/review technical basis and/or calculations provided as basis for the generator sizing.	
3.2.4.10.A	Confirm completion of analysis to determine battery coping time with no actions and with battery load shed.	
3.4.A	NEI 12-06, Section 12.2 lists minimum capabilities for offsite resources for which each Licensee should establish the availability. Confirm implementation of Guidelines 2 through 10 in NEI 12-06, Section 12.2.	