

PSEG Nuclear LLC  
P.O. Box 236, Hancocks Bridge, NJ 08038-0236



Order EA-12-049

LR-N15-0168

**AUG 26 2015**

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Salem Generating Station Units 1 and 2  
Renewed Facility Operating License Nos. DPR-70 and DPR-75  
NRC Docket Nos. 50-272 and 50-311

Subject: PSEG Nuclear LLC's Fifth Six-Month Status Report for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)

References:

1. NRC Order Number EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012
2. PSEG Letter LR-N13-0034, "PSEG Nuclear LLC's Overall Integrated Plan for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated February 28, 2013
3. PSEG Letter LR-N15-0023, "PSEG Nuclear LLC's Fourth Six-Month Status Report for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated February 18, 2015
4. NRC letter, "Salem Nuclear Generating Station, Unit No. 1 - Relaxation of the Schedule Requirements for Order EA-12-049 'Order Modifying Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,'" dated September 15, 2014

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On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Order EA-12-049 (Reference 1) to PSEG Nuclear LLC (PSEG). NRC Order EA-12-049 was immediately effective and directed PSEG to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. In accordance with Condition IV.C.1.a of NRC Order EA-12-049, PSEG submitted an Overall Integrated Plan (OIP) for the Salem Generating Station (SGS) Units 1 and 2, on February 28, 2013 (Reference 2). Condition IV.C.2 of NRC Order EA-12-049 requires six-month status reports to delineate the progress made in implementing the requirements of the Order. Attachment 1 to this letter provides the fifth six-month status report, which summarizes progress made in implementing the requirements of NRC Order EA-12-049 at SGS since the previous update provided in Reference 3. Attachment 1 reflects the schedule relaxation granted by the NRC in Reference 4 to allow SGS Unit 1 sufficient time for implementation of plant changes to reduce reactor coolant pump seal leakage.

There are no regulatory commitments contained in this letter. If you have any questions or require additional information, please do not hesitate to contact Mr. Brian Thomas at 856-339-2022.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 26, 2015  
(Date)

Sincerely,



John F. Perry  
Vice President – Salem

Attachment 1: Salem Generating Station Units 1 and 2 Fifth Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

cc: Mr. William Dean, Director of Office of Nuclear Reactor Regulation  
Mr. Daniel Dorman, Administrator, Region I, NRC  
Ms. Carleen Parker, Project Manager, NRC  
Mr. Patrick Finney, NRC Senior Resident Inspector, Salem  
Mr. Patrick Mulligan, Chief, NJBNE  
Mr. Thomas Cachaza, Salem Commitment Tracking Coordinator  
Mr. Lee Marabella, PSEG Commitment Coordinator – Corporate

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**Attachment 1**

**Salem Generating Station Units 1 and 2 Fifth Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events**

## 1 Introduction

PSEG Nuclear LLC (PSEG) developed an Overall Integrated Plan (OIP) (Reference 1) for the Salem Generating Station (SGS) Units 1 and 2 documenting the diverse and flexible coping strategies (FLEX) in response to NRC Order EA-12-049 (Reference 2). In References 3 through 6, PSEG provided six-month status reports associated with implementation of the requirements of NRC Order EA-12-049. This report is the fifth six-month status report, which provides implementation status and progress since the previous report (Reference 6). This update follows the guidance in Section 13.2 of Nuclear Energy Institute (NEI) Report 12-06 (Reference 7), which states that the six-month status reports should include an update of milestone accomplishments since the previous report, changes to the compliance method, schedule, and the need for relief and the basis for relief, if applicable. This status report reflects the schedule relaxation request that was approved by the NRC as described in Section 5.

## 2 Milestone Accomplishments

The following SGS FLEX milestones have been completed:

- Submit Integrated Plan - PSEG submitted the SGS FLEX OIP to the NRC via Reference 1.
- Develop Strategies - PSEG has developed FLEX strategies as described in the SGS FLEX OIP and has identified design, analysis, procurement, and programmatic actions necessary to achieve compliance with NRC Order EA-12-049. Changes to the FLEX strategies involving changes to methods of compliance with NEI 12-06 are addressed in Section 4.
- Develop Modifications –PSEG has developed the plant modifications needed to support implementation of the SGS FLEX strategies.
- Develop FLEX Support Guidelines (FSGs) – PSEG developed the draft FSGs to implement the strategies.
- Perform Staffing Analysis - PSEG completed an analysis of the staffing needed to implement the SGS FLEX strategies during a beyond-design-basis external event, and transmitted the staffing assessment report to the NRC via Reference 8.
- Develop Training Plan - PSEG developed training materials and schedules, and has begun training personnel on the SGS FLEX strategies.
- Develop Strategies/Contract with Regional Response Center (RRC) - PSEG Nuclear is a member of the Strategic Alliance for FLEX Emergency Response (SAFER) and has a SAFER response plan to coordinate delivery of additional equipment from the National SAFER Response Centers (formerly known as Regional Response Centers).
- Emergency Preparedness (EP) Communications Improvements - PSEG has established communications capability to support the SGS FLEX strategies in response to the NRC's 10 CFR 50.54(f) information request (Reference 9).

### 3 Milestone Schedule Status

The following table provides an update of SGS FLEX OIP milestones. The table provides the milestone activity status and indicates whether the original expected completion date has changed. The dates are planning dates subject to change as design and implementation details are developed. The revised milestone target completion dates reflect the compliance schedule relaxation for SGS Unit 1 described in Section 5.

<b>Milestone</b>	<b>Original Target Completion Date</b>	<b>Activity Status</b>	<b>Revised Target Completion Date</b>
<b>Submit Overall Integrated Plan</b>	Feb 2013	Complete	
<b>Six-Month Status Update</b>	Aug 2013	Complete	
	Feb 2014	Complete	
	Aug 2014	Complete	
	Feb 2015	Complete	
	Aug 2015	Complete With This Report	
	Feb 2016	Not Started	
<b>Develop Strategies</b>	May 2013	Complete	
<b>Modifications</b>			
Develop Modifications – Unit 1	Dec 2013	Complete	Jul 2015
Implement Modifications – Unit 1	Oct 2014	Started	May 2016
Develop Modifications – Unit 2	Dec 2013	Complete	Jun 2015
Implement Modifications – Unit 2	Oct 2015	Started	Nov 2015
<b>Flex Support Guidelines (FSGs)</b>			
Develop FSGs – Unit 1	Dec 2013	Complete	Mar 2015
Approve FSGs – Unit 1	N/A (milestone added)	Started	May 2016
Validation Walk-throughs or Demonstrations of FLEX Strategies and Procedures – Unit 1	Nov 2014	Started	Nov 2015

<b>Milestone</b>	<b>Original Target Completion Date</b>	<b>Activity Status</b>	<b>Revised Target Completion Date</b>
Develop FSGs – Unit 2	Dec 2013	Complete	Mar 2015
Approve FSGs – Unit 2	N/A (milestone added)	Started	Nov 2015
Validation Walk-throughs or Demonstrations of FLEX Strategies and Procedures – Unit 2	Nov 2015	Started	Nov 2015
<b>Perform Staffing Analysis</b>	Dec 2013	Complete	Jun 2014
<b>Develop Training Plan</b>	Jun 2014	Complete	
<b>Implement Training</b>			
Unit 1 Training	Dec 2014	Started	May 2016
Unit 2 Training	Dec 2014	Started	Nov 2015
<b>Develop Strategies/Contract with National SAFER Response Centers (formerly known as Regional Response Centers)</b>	Oct 2013	Complete	Oct 2014
<b>Procure Equipment</b>			
Unit 1 Procurement	Dec 2013	Complete	Jun 2015
Unit 2 Procurement	Dec 2013	Started	Sep 2015
<b>Create Maintenance Procedures</b>	May 2014	Started	Nov 2015
<b>Emergency Preparedness (EP) Communications Improvements</b>	Jun 2014	Complete	Nov 2014
<b>Unit 1 Implementation Outage</b>	Oct 2014	Not Started	May 2016

<b>Milestone</b>	<b>Original Target Completion Date</b>	<b>Activity Status</b>	<b>Revised Target Completion Date</b>
<b>Unit 1 Report to NRC When Full Compliance is Achieved</b>	Feb 2015	Not Started	Jul 2016
<b>Unit 2 Implementation Outage</b>	Oct 2015	Not Started	Nov 2015
<b>Unit 2 Report to NRC When Full Compliance is Achieved</b>	Feb 2016	Not Started	Jan 2016

#### **4 Changes to Compliance Method**

PSEG identified changes to the method of compliance with NEI 12-06 in the August 2014 status report (Reference 5). Additional details of changes to the original FLEX strategies have been communicated as part of the mitigation strategies audit process. The changes described in the August 2014 status report are repeated below with revision bars to indicate changes to outdoor FLEX equipment storage and an additional alternative to NEI 12-06 regarding N+1 FLEX hoses and cables.

The SGS Phase 1 strategy is based on an alternative to initial conditions 1 and 3 of NEI 12-06 Section 3.2.1.3. Initial condition 1 states that no specific initiating event is used, and initial condition 3 states “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 available.” The SGS FLEX strategy includes event-dependent consideration of cooling water availability, e.g., the Seismic Class I auxiliary feedwater storage tank (AFST) is assumed to remain available following a seismic event, but may become unavailable due to tornado missile damage. Based on the capability to align diverse water supplies depending on the specific hazard, the SGS FLEX strategy is consistent with the overarching goal of reasonable protection of equipment such that no single event results in failure of the strategy.

SGS is using an alternative to the criteria of NEI 12-06 Section 7.3.1, “Protection of FLEX Equipment,” which recommends protection of FLEX equipment from high wind hazards via storage in a structure or in diverse locations. Two FLEX DGs, electrical connections and distribution equipment will be stored in the canyon area (i.e., the area between the Salem Unit 2 fuel handling building and auxiliary building). This equipment and their associated connections will be stored outdoors and provided with protection

from external hazards to minimize the probability that a single event would damage all of the FLEX equipment needed to mitigate the event.

SGS is using an alternative to the criteria of NEI 12-06 Section 8.3.1, "Protection of FLEX Equipment," which recommends storage of the N FLEX equipment within a structure to provide protection against snow, ice and extreme cold hazards. FLEX equipment stored outdoors is designed for extreme high and low temperatures for the site and will be protected as required by the manufacturer, e.g., equipped with direct heating features to ensure it will function when called upon.

Outdoor storage locations consist of the following:

- canyon area
- west of SGS – inside the protected area
- east of the SGS oil water separator area – outside the protected area and within the vehicle barrier system
- northwest corner of the Hope Creek Unit 2 reactor building, north of SGS – inside the protected area

An additional set of debris removal and towing equipment will be stored at a separate on-site location.

#### N+1 FLEX Hoses and Cables

PSEG plans to use NEI's recommended alternative to NEI 12-06 regarding N+1 hoses and cables (Reference 24) as endorsed by the NRC in Reference 25.

### **5 Need for Relief/Relaxation and Basis for the Relief/Relaxation**

The original schedule requirement for SGS Unit 1 implementation of NRC Order EA-12-049 was prior to startup from the 23<sup>rd</sup> refueling outage (S1R23) in fall 2014. PSEG requested schedule relaxation via Reference 10 to defer full compliance with NRC Order EA-12-049 by one refueling outage, i.e., prior to startup from S1R24 in spring 2016. The NRC granted the schedule relaxation via Reference 11 to enable PSEG to address recalculated reactor coolant pump seal leakage rates that exceed the Westinghouse generic values assumed in the original SGS FLEX OIP. PSEG will implement plant changes to reduce RCP seal leakage rates to values that are compatible with the assumptions of the SGS mitigation strategies. Implementation of these changes is scheduled for the fall 2015 outage for SGS Unit 2 and the spring 2016 outage for SGS Unit 1. PSEG is proceeding with completion of other design, equipment procurement and programmatic changes to support the ability to implement the SGS mitigation strategies.



## 6 Open Items from Overall Integrated Plan and Draft Safety Evaluation

Resolution of items identified in the NRC’s interim staff evaluation (ISE) for SGS (Reference 12) and NRC audit report (Reference 13) is being addressed as part of the mitigation strategies audit process. A summary and status of the ISE items and Safety Evaluation (SE) items from the NRC audit report are provided below.

ID	Item Ref.	Description	Status
1.	Generic Concern – Battery Life	SGS is currently working on extending the battery duty cycle, and is following the industry position on battery life as outlined in the Nuclear Energy Institute (NEI) white paper dated August 27, 2013 (Reference 14) and endorsed by NRC via letter to NEI dated September 16, 2013 (Reference 15).	Complete. Coping analyses for 28 VDC and 125 VDC batteries have been satisfactorily completed using the NRC-endorsed white paper.
2.	Generic Concern - MAAP	SGS is using the Modular Accident Analysis Program (MAAP) to complete the development of FLEX timelines and strategies, consistent with the NRC endorsement letter to NEI dated October 3, 2013 (Reference 16).	Complete. MAAP analyses are used for containment response for SGS, consistent with the NRC endorsement letter to NEI, and show acceptable results.
3.	Generic Concern – Shutdown / Refueling Modes	SGS will enhance shutdown risk processes and procedures using the supplemental guidance provided in the NEI position paper entitled “Shutdown / Refueling Modes,” dated September 18, 2013 (Reference 17) and endorsed by the NRC via letter to NEI dated September 30, 2013 (Reference 18). NRC audit item SE #9 is for PSEG to provide the revised shutdown risk processes and procedures.	In progress – to be completed prior to Order EA-12-049 compliance.

ID	Item Ref.	Description	Status
4.	Generic Concern – Preventive Maintenance (PM)  SE #11	As part of the development of FLEX maintenance and testing programs, SGS will use the EPRI Technical Report entitled “Nuclear Maintenance Applications Center: Preventative Maintenance Basis for FLEX Equipment,” transmitted to NRC via NEI letter dated October 3, 2013 (Reference 19) and endorsed by NRC letter dated October 7, 2013 (Reference 20). NRC audit report item SE #11 is for PSEG to provide the FLEX maintenance and testing program.	In progress - PSEG has created PM tasks for FLEX equipment using the SGS PM process and NRC-endorsed EPRI guidance.
5.	Generic Concern – Core Sub-criticality OI 3.2.1.8.A	Core Sub-Criticality - The Pressurized Water Reactor Owners Group (PWROG) submitted to NRC a position paper, dated August 15, 2013, via Reference 21, which provides test data regarding boric acid mixing under single-phase natural circulation conditions and outlined applicability conditions intended to ensure that boric acid addition and mixing would occur under conditions similar to those for which boric acid mixing data is available. The licensee should address the clarifications in the NRC endorsement letter dated January 8, 2014 (Reference 22). The NRC audit report requests completion of the Emergency Operating Procedure setpoint calculations and a determination of how much RCP seal leakage must be considered in the ELAP analyses.	In progress as part of resolution of RCP seal leakage, to be completed prior to compliance with Order EA-12-049.
6.	OI 3.2.4.7.A	Water Sources - The licensee appears to use a probability approach to reach a conclusion that at least one of the three tanks depended on for SG makeup will survive an ELAP event. NEI 12-06 guidance does not give probability as an option. The licensee should determine if a water supply would be available after a tornado event by analyzing the tornado characteristics for the site compared to the separation characteristics of the tanks. This is an alternate approach from the strategies identified in NEI 12-06. The NRC audit report includes request to show that actions to switch to an alternate water supply can be completed prior to RCS heatup due to steam generator dryout.	In progress with completion pending time validation of transfer to alternate water supply, prior to compliance with Order EA-12-049.

ID	Item Ref.	Description	Status
7.	CI 3.1.1.1.A	Protection of FLEX Equipment including FLEX diesel generators (DGs) - The licensee needs to finalize its evaluation of the use of the SGS auxiliary building and the use of the Hope Creek Generating Station, Unit 2 reactor building for permanent FLEX equipment storage.	Complete. Response provided as part of the audit process.
8.	CI 3.1.1.2.A	Deployment of FLEX Equipment - The licensee should complete a review of deployment routes between the proposed equipment storage locations and the areas the equipment will be moved to and evaluate the potential for soil liquefaction.	Complete – response provided in the February 2014 six-month update (Reference 4).
9.	CI 3.1.1.2.B	Deployment of FLEX Equipment - The licensee does not state that the Nuclear Service Water Connections will be protected from seismic events. Confirm that this is ensured.	Complete. Response provided as part of audit process.
10.	CI 3.1.1.3.B	Procedural Interfaces - Seismic Hazard - The licensee's integrated plan did not provide any information on: 1) non-robust internal flooding sources that do not require ac power; 2) the use of ac power to mitigate ground water in critical locations.	Complete. Response provided as part of audit process.
11.	CI 3.1.1.4.A	Considerations in Using Offsite Resources - Seismic Hazard - Flooding Hazard - High Winds Hazard - Snow, Ice and Extreme Cold Hazard - Equipment staging areas for deployment of offsite equipment from SAFER will be finalized in a future 6 month update.	Complete. Response provided as part of audit process.
12.	CI 3.1.2.2.A	Deployment of FLEX Equipment - Flooding Hazard – Finalization of proposed changes to the deployment of FLEX equipment during a hurricane induced flooding condition will be provided in a future 6 month update.	Complete. Response provided as part of audit process.
13.	CI 3.1.4.2.A	Deployment of FLEX Equipment- Flooding Hazard - The licensee should address the formation of frazil ice and means to cope with it.	Complete. Response provided as part of audit process.
14.	CI 3.1.4.2.B	The licensee should address manual operations required by plant personnel during periods of snow, ice, and extreme cold hazards.	Complete. Response provided as part of audit process.

ID	Item Ref.	Description	Status
15.	CI 3.1.5.2.A	The licensee should confirm that there is no need for backup ventilation with respect to protection of FLEX equipment during high temperature hazards and what the impacts of high temperature hazards would be on the deployment of the FLEX equipment in such conditions.	Complete. Response provided as part of audit process.
16.	CI 3.1.5.3.A	The licensee should specify the peak temperature for which FLEX equipment would be expected to operate.	Complete. Response provided as part of audit process.
17.	CI 3.2.1.A	The licensee should specify which analysis performed in WCAP-17601-P (Reference 23) is applicable to SGS and justify the use of that analysis by identifying and evaluating the important parameters and assumptions demonstrating that they are representative of SGS and appropriate for simulating the ELAP transient.	In progress as part of resolution of RCP seal leakage, to be completed prior to compliance with Order EA-12-049.
18.	CI 3.2.1.1.A  SE #5	Computer Code Used for ELAP Analysis - Reliance on the NOTRUMP code for the ELAP analysis of Westinghouse plants is limited to the flow conditions prior to reflux condensation initiation. Verify that the code is not used beyond these flow conditions. This includes specifying an acceptable definition for the onset of reflux condensation cooling. NRC audit item SE #5 pertains to resolution of differences between NOTRUMP and NRC simulations of an ELAP using the TRACE code.	In progress as part of resolution of RCP seal leakage, to be completed prior to compliance with Order EA-12-049.
19.	CI 3.2.1.1.B  SE #9	The licensee utilized the existing analyses in WCAP-17601-P to develop its sequence of events and time constraints. The licensee will validate the response times at a future time. NRC audit item SE #9 is for PSEG to provide validation and verification procedures which also address human factors concerns.	In progress - to be completed prior to Order EA-12-049 compliance.
20.	CI 3.2.1.2.A  SE #2	Reactor Coolant Pump Seal Leakage Rates - Confirm that the RCP seal initial maximum leakage rate used in the analysis is greater than or equal to the upper bound expectation for the ELAP event (21 gpm/seal) discussed in the PWROG white paper addressing the RCP seal leakage for Westinghouse plants. NRC audit item SE #2 pertains to higher than expected leakage rates identified by Westinghouse.	In progress as part of resolution of RCP seal leakage, to be completed prior to compliance with Order EA-12-049.

ID	Item Ref.	Description	Status
21.	CI 3.2.1.2.B	<p>Reactor Coolant Pump Seal Leakage Rates - In some plant designs, such as those with 1200 to 1300 psia SG design pressures and no accumulator backing of the main steam system power-operated relief valve actuators, the cold legs could experience temperatures as high as 580°F before cooldown commences. This is beyond the 550°F qualification temperature of the O-rings used in the RCP seals. For those Westinghouse designs, a discussion of the information (including the applicable analysis and relevant seal leakage testing data) should be provided to justify that (1) the integrity of the associated O-rings will be maintained at the temperature conditions experienced during the ELAP event, and (2) the seal leakage rate of 21 gpm/seal used in the ELAP is adequate and acceptable.</p>	<p>Complete. Response provided as part of the audit process, based on design changes in progress to provide accumulators for the main steam power-operated relief valves.</p>
22.	CI 3.2.1.5.A	<p>Monitoring Instrumentation and Controls - The review identified a concern with the level of accuracy of the FLEX instrumentation to ensure that electrical equipment remains protected (from an electrical standpoint- e.g., power fluctuations) and with the ability of this instrumentation to provide operators with accurate information ensure the maintenance of core cooling, containment, and spent fuel cooling. The licensee should confirm the accuracy of portable equipment instrumentation as it relates to equipment protection and operator information for maintenance of FLEX strategies.</p>	<p>Complete. Response provided as part of the audit process.</p>
23.	CI 3.2.1.6.A	<p>Sequence of Events - During the NRC audit process the licensee summarizes the changes in its mitigation strategies for Phase 1 and Phase 2. The evaluation for implementing these changes will be communicated in a future 6 month update. The NRC audit report subsequently requested this be addressed by docketed submittal of a revision to the integrated plan.</p>	<p>In progress. Docketing of the Final Integrated Plan is planned after full compliance with Order EA-12-049.</p>

ID	Item Ref.	Description	Status
24.	CI 3.2.1.9.A	Use of Portable Pumps - The Integrated Plan provides a table depicting the FLEX equipment to be deployed and states that the quantity does not reflect the NEI 12-06 spare capability (N+1) guidance. The licensee should specify how many pieces of equipment will be available for an ELAP/Loss of Ultimate Heat Sink (UHS), and this should meet N+1 requirements unless an alternative approach is proposed.	Complete. Response provided as part of the audit process.
25.	CI 3.2.2.A	Spent Fuel Pool Cooling Strategies - In the audit and review, the licensee provided additional information regarding the SFP makeup during an ELAP event. It stated that a new 4" FLEX hose is being evaluated as replacement for SFP makeup. This connection would be upstream of 1(2)SF9 and would allow water from SW, AFW, and the FLEX boron mixing tank pump discharges to be aligned for SFP makeup. The proposed connection point is in the Auxiliary Building in the SFP pump area. Additionally, a spray pipe system is being re-evaluated. The licensee should provide details of the final configuration, including flow rates, and this information should be included in a six-month update.	Complete. Response provided as part of the audit process.
26.	CI 3.2.3.A	The licensee committed to perform further containment analysis to demonstrate that containment integrity can be maintained up until a point in time when containment cooling can be restored during Phase 3.	Complete. Response provided as part of the audit process.
27.	CI 3.2.3.B	Containment Functions Strategies - In the audit and review, the licensee stated that SGS plans to use the Modular Accident Analysis Program analysis to complete the FLEX strategies and timelines. Review these analyses when available.	Complete. Response provided as part of the audit process.

ID	Item Ref.	Description	Status
28.	CI 3.2.4.2.A	Ventilation - Equipment Cooling - The licensee has provided insufficient details of the ventilation provided in the battery room to support a conclusion that there is reasonable assurance that the effects of elevated or lowered temperatures in the battery room, especially if the ELAP is due to a high or low temperature hazard, have been considered. Confirm the adequacy of the ventilation provided in the battery room to protect the batteries from the effects of elevated or lowered temperatures.	Complete. Response provided as part of the audit process.
29.	CI 3.2.4.2.B	Ventilation - Equipment Cooling - The licensee provided a discussion on how hydrogen concentration in the battery rooms will be mitigated when the batteries are being recharged during Phases 2 and 3. The licensee will provide strategies to repower installed battery room exhaust fans or portable fans for ventilation.	Complete. Response provided as part of the audit process.
30.	CI 3.2.4.2.C	Ventilation - Equipment Cooling - The licensee stated that GOTHIC modeling and room heat-up calculations are being developed for plant strategic areas including the TDAFW rooms. The results of the modeling and analyses will be communicated in a future 6 month update.	Complete. Response provided as part of the audit process.
31.	CI 3.2.4.4.A	Communications - Confirm that upgrades to the site's communications systems have been completed.	Complete. Response provided as part of the audit process.
32.	CI 3.2.4.6.A	Personnel Habitability - Elevated Temperature – Confirm the maximum environmental room temperatures at ELAP coping periods greater than the 4-hours assumed in NUMARC 87-00, and confirm that measures are in place to ensure personnel habitability, as needed.	Complete. Response provided as part of the audit process, in response to CI 3.2.4.2 items.
33.	CI 3.2.4.6.B	Personnel Habitability - The licensee stated that formal analyses would be performed to support the initial actions taken to provide cooling for the MCR until Phase 2 actions can be implemented. The results of the modeling and analyses will be communicated in a future 6 month update.	Complete. Response provided as part of the audit process, in response to CI 3.2.4.2 items.

ID	Item Ref.	Description	Status
34.	CI 3.2.4.8.A	Electrical Power Sources/Isolations and Interactions - licensee stated that diesel generator sizing calculations are in progress. The results will be communicated in a future six-month update.	In progress pending revision to the diesel generator sizing calculations.
35.	CI 3.2.4.8.B	Electrical Power Sources/Isolations and Interactions – The licensee discussed use of electrical equipment such as 480 VAC DG Power Distribution, 480 VAC "A" Vital Bus, 230 VAC DG Power Distribution, associated cablings and connectors. Confirm that electrical isolation will be maintained such that (a) Class 1E equipment is protected from faults in portable/FLEX electrical equipment and (b) multiple sources do not attempt to power electrical buses.	In progress pending revision to the diesel generator sizing calculations.
36.	CI 3.2.4.8.C	Electrical Power Sources/Isolations and Interactions - Confirm the analyses address the minimum voltage that must be maintained on the dc buses and its basis.	Complete. Response provided as part of the audit process.
37.	CI 3.2.4.9.A	Portable Equipment Fuel - Confirm that sufficient fuel is available considering the fuel consumption rate for each FLEX piece of equipment.	Complete. Response provided as part of the audit process.
38.	CI 3.2.4.10.A	Load Reduction to Conserve DC Power - The licensee should describe the results of the final battery load shed analyses, including which functions are lost, plant components that will change state, and the effects of components changing state.	In progress. Evaluation is completed for Unit 1 and will be documented for Unit 2 prior to Order EA-12-049 compliance.
39.	CI 3.3.2.A	Configuration Control - The licensee should provide the single line diagrams of the proposed electrical systems. As part of this item the NRC audit report requested PSEG to address potential personnel hazards regarding the orientation of disconnecting blades in the FLEX power receptacles.	Complete. Response provided as part of the audit process.
40.	CI 3.4.A	Offsite Resources - The licensee's Integrated Plan addressed the use of off-site resources to obtain equipment and commodities to sustain and backup the site's coping strategies (NEI 12-06, Section 12.2, Guideline 1). The licensee should provide information on how the plan addresses implementation guidelines 2 through 10.	Complete. Response provided as part of the audit process.



ID	Item Ref.	Description	Status
41.	SE #1	RCS Venting: NRC staff needs to complete its review of FSG-8.	Complete (i.e., no PSEG action at this time).
42.	SE #6	Permanent staging of the FLEX generators in the SGS Unit 2 canyon (an alternate to NEI 12-06): Provide an evaluation of the susceptibility to damage for the FLEX generators. Demonstrate that the construction of the canyon wall is viable.	Complete. Section 4 discusses the alternative to NEI 12-06. Additional details have been provided as part of the audit process.
43.	SE #7	Feeding steam generators from the turbine building basement: Provide the evaluation and timeline of the ability to pump water from the turbine building basement to the steam generators.	Complete. Response provided as part of the audit process.
44.	SE #8	Equipment habitability for steam generator power-operated relief valve operation: Provide the evaluation of the functionality of the SG PORVs.	Complete. Response provided as part of the audit process under CI 3.2.4.2.

## **7 Potential Draft Safety Evaluation Impacts**

Impacts to the NRC Safety Evaluation (SE) of SGS compliance with Order EA-12-049 are being addressed as part of the mitigation strategies audit process. Section 6 above includes a description and status of SE items identified as open in the NRC audit report (Reference 13).

## **8 References**

1. PSEG letter LR-N13-0034, "PSEG Nuclear LLC's Overall Integrated Plan for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated February 28, 2013
2. NRC Order Number EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012
3. PSEG Letter LR-N13-0175, "PSEG Nuclear LLC's First Six-Month Status Report for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated August 25, 2013
4. PSEG Letter LR-N14-0027, "PSEG Nuclear LLC's Second Six-Month Status Report for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated February 25, 2014
5. PSEG Letter LR-N14-0187, "PSEG Nuclear LLC's Third Six-Month Status Report for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated August 26, 2014
6. PSEG Letter LR-N15-0023, "PSEG Nuclear LLC's Fourth Six-Month Status Report for the Salem Generating Station in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated February 18, 2015
7. Nuclear Energy Institute (NEI) Report NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August 2012
8. PSEG letter LR-N14-0141, "Salem Generating Station's Response to March 12, 2012, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, Enclosure 5,

- Recommendation 9.3, Emergency Preparedness – Staffing, Requested Information Items 1, 2, and 6 - Phase 2 Staffing Assessment,” dated June 16, 2014
9. US Nuclear Regulatory Commission (NRC) letter, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated March 12, 2012
  10. PSEG letter LR-N14-0173, "PSEG Nuclear LLC's Request for Relaxation from NRC Order EA-12-049, 'Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events' – Salem Generating Station Unit 1," dated July 31, 2014
  11. NRC letter, "Salem Nuclear Generating Station, Unit No. 1 - Relaxation of the Schedule Requirements for Order EA-12-049 'Order Modifying Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,'" dated September 15, 2014
  12. NRC letter, "Salem Nuclear Generating Station, Unit Nos. 1 and 2 – Interim Staff Evaluation and Audit Report Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC Nos. MF0868 and MF0869), dated January 24, 2014
  13. NRC Letter to PSEG, "Salem Nuclear Generating Station, Unit Nos. 1 and 2- Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0868, MF0869, MF0913, and MF0914)," dated October 10, 2014
  14. NEI letter to NRC, "EA-12-049 Mitigating Strategies Resolution of Extended Battery Duty Cycles Generic Concern," dated August 27, 2013 (ADAMS Accession No ML13241A186)
  15. NRC letter to NEI, "Battery Life White Paper Endorsement," dated September 16, 2013 (ADAMS Accession No. ML13241A188)
  16. NRC letter to NEI, "Mitigation Strategies Order EA-12-049, NEI Position Paper: MAAP Endorsement Letter," dated October 3, 2013 (ADAMS Accession No. ML13275A318)
  17. NEI Position Paper, "Shutdown / Refueling Modes," dated September 18, 2013 (ADAMS Accession No. ML13273A514)
  18. NRC letter to NEI, "Endorsement Letter: Mitigation Strategies Order EA-12-049, NEI Position Paper: Shutdown / Refueling Modes," dated September 30, 2013 (ADAMS Accession No. ML13267A382)
  19. NEI letter to NRC, "EA-12-049 Mitigating Strategies Resolution of FLEX Equipment Maintenance and Testing Templates," dated October 3, 2013 (ADAMS Accession No. ML13276A573)

20. NRC letter to NEI, "Maintenance and Testing Endorsement Letter in Regards to Mitigation Strategies Order EA-12-049," dated October 7, 2013 (ADAMS Accession No. ML13276A224)
21. Westinghouse proprietary position paper, "Westinghouse Response to NRC Generic Request for Additional Information (RAI) on Boron Mixing in Support of the Pressurized Water Reactor Owners Group (PWROG)," transmitted to NRC via letter dated August 16, 2013 (ADAMS Accession No. ML13235A135)
22. NRC letter to PWROG, "Boron Mixing Endorsement Letter in Regards to Mitigation Strategies Order EA-12-049," dated January 8, 2014 (ADAMS Accession No. ML13276A183)
23. Westinghouse Report WCAP-17601-P Revision 0, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs," dated August 2012
24. NEI letter to NRC, "Alternative Approach to NEI 12-06 Guidance for Hoses and Cables," dated May 1, 2015 (ADAMS Accession No. ML15126A135)
25. NRC letter to NEI "Endorsement of NEI Alternate Approach for Spare Hoses and Cables," dated May 18, 2015 (ADAMS Accession No. ML15125A442)