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PSEG
Nuclear LLC

Order EA-12-049

LR-N16-0070

APR 2 3 2016

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

Salem Generating Station Unit 2
Renewed Facility Operating License No. DPR-75
NRC Docket No. 50-311

Subject: Salem Generating Station Unit 2 Compliance with March 12, 2012, NRC 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. NRC Letter, "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

On March 12, 2012, in response to events at the Fukushima Dai-ichi nuclear plant, the Nuclear Regulatory Commission (NRC) issued Order EA-12-049 (Reference 1) to all power reactor licensees, including 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 the reporting requirement of Condition IV.C.3 of the Order, this letter affirms that Salem Generating Station (SGS) Unit 2 has achieved full compliance with NRC Order EA-12-049, Attachment 2, "Requirements for Mitigation Strategies for

Beyond-Design-Basis Events at Operating Reactor Sites and Construction Permit Holders."

Attachment 1 to this letter provides a summary of SGS Unit 2 compliance with the Order requirements. Attachment 2 provides the response to items in the SGS mitigation strategies and spent fuel pool level instrumentation NRC audit report (Reference 2).

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 April 23, 2016
(Date)

Sincerely,

John F. Perry
Site Vice President
Salem Generating Station

Attachment 1: Salem Generating Station Unit 2 Compliance with NRC Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

Attachment 2: SGS Unit 2 Response to NRC FLEX Audit Items

cc: Mr. Daniel Dorman, Administrator, Region I, NRC
Mr. Thomas Wengert, Project Manager, NRC/NRR/DORL
Mr. John Boska, Senior Project Manager, NRC/NRR/JLD
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Attachment 1

Salem Generating Station Unit 2 Compliance with 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 2 Compliance with NRC Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

References for this attachment are identified in Section 5.

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 8, PSEG provided six-month status reports associated with implementation of the requirements of NRC Order EA-12-049. The current SGS Unit 2 strategies are described in EM-SA-100-1000, "Response to Beyond Design Basis External Events Program Document Salem Generating Station," Revision 0, which is the overall program document consistent with the configuration control guidance in Section 11.8 of Nuclear Energy Institute (NEI) Report 12-06 (Reference 9).

The original compliance milestone for SGS Unit 2 implementation of NRC Order EA-12-049 was prior to startup from the 21st refueling outage (S2R21) in fall 2015. In response to PSEG's request (Reference 10), the NRC staff approved schedule relaxation (Reference 11) to allow SGS Unit 2 to fully implement the FLEX strategies within 90 days of startup from S2R21. SGS Unit 2 entered Mode 2 (Startup) from S2R21 on November 27, 2015 and achieved full compliance with NRC Order EA-12-049 on February 25, 2016, consistent with the NRC schedule relaxation in Reference 11.

2 NRC FLEX AUDIT ITEM RESOLUTION

SGS Unit 2 responses to items identified in the NRC's interim staff evaluation (ISE) (Reference 13) and NRC audit report (Reference 14) are provided in Attachment 2.

3 MILESTONE SCHEDULE STATUS

The February 2016, six-month update (Reference 8) reported all of the SGS Unit 2 and common milestones as complete, with the exception of the compliance report being provided via this letter.

4 NRC ORDER EA-12-049 COMPLIANCE ELEMENTS SUMMARY

SGS Unit 2 compliance with NRC Order EA-12-049 (Reference 2) was achieved using the guidance in NEI 12-06, Revision 0 (Reference 9) which has been endorsed by the NRC (Reference 12), with clarifications on determining baseline coping capability and equipment quality. The significant compliance elements have been addressed for SGS Unit 2, as described below.

Strategies - Complete

SGS Unit 2 mitigation strategies are in compliance with NRC Order EA-12-049 and are documented in the SGS FLEX overall program document.

Modifications - Complete

The plant modifications required to support the FLEX strategies for SGS Unit 2 were implemented in accordance with the station design control process such that the associated systems and components are fully capable of supporting the FLEX strategies.

Equipment – Procurement, Maintenance, and Testing – Complete

The equipment required to implement the FLEX strategies for SGS Unit 2 was procured, received, initially tested and/or performance verified. The availability of FLEX equipment and connection points is administratively controlled by OP-SA-108-115-1001, "Operability Assessment and Equipment Control Program." Periodic maintenance and testing is being addressed via the PSEG Preventive Maintenance process.

Protected Storage – Complete

The storage facilities required for implementation of the SGS Unit 2 mitigation strategies have been placed within the Owner Controlled Area using the PSEG design change process. The storage configuration addresses all of the hazards identified in NEI 12-06 such that the minimum set of equipment ("N" set) will survive any of the external events associated with the applicable NEI 12-06 hazards.

Procedures – Complete

FLEX Support Guidelines (FSGs) for SGS Unit 2 have been developed and integrated with existing procedures. The FSGs and affected existing procedures have been verified and are available for use in accordance with the PSEG procedure control process.

Training – Complete

Training for SGS Unit 2 has been completed in accordance with an accepted training process, as recommended in NEI 12-06, Section 11.6.

Staffing – Complete

PSEG completed the SGS staffing assessment (Reference 15) in response to the NRC staff 10 CFR 50.54(f) information request dated March 12, 2012 (Reference 16). Administratively controlled minimum shift staffing levels are sufficient to implement multi-unit mitigation strategies. The NRC staff concluded that the staffing assessment adequately addresses the SGS response strategies (Reference 17).

National SAFER Response Center – Complete

PSEG established a contract with Pooled Equipment Inventory Company (PEICo) and has joined the Strategic Alliance for FLEX Emergency Response (SAFER) Team Equipment Committee for off-site facility coordination. It has been confirmed that PEICo is ready to support PSEG with Phase 3 equipment stored in the National SAFER Response Centers in accordance with PSEG Vendor Technical Document (VTD) 903060, Volume 1, "Salem Generating Station SAFER Response Plan."

Validation - Complete

PSEG performed validation in accordance with industry-developed guidance (Reference 18) to assure required tasks, manual actions, and decisions for the SGS Unit 2 FLEX strategies are feasible and may be executed within the time constraints identified in the SGS FLEX overall program document.

FLEX Program Document - Established

The SGS FLEX overall program document has been developed in accordance with the requirements of NEI 12-06, and has been approved in accordance with PSEG's document control process.

5 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. PSEG Letter LR-N15-0168, "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)," dated August 26, 2015
8. PSEG Letter LR-N16-0043, "PSEG Nuclear LLC's Sixth 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 29, 2016
9. Nuclear Energy Institute (NEI) Report NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August 2012

10. PSEG Letter LR-N15-0223, “PSEG Nuclear LLC's Request for Relaxation from Schedule Requirements of 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 2,” dated October 23, 2015
11. NRC Letter, “Salem Nuclear Generating Station, Unit No. 2 - 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 November 9, 2015
12. NRC Interim Staff Guidance 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,” Revision 0, dated August 29, 2012
13. 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
14. NRC Letter, “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
15. 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
16. 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
17. NRC letter, “Response Regarding Licensee Phase 2 Staffing Submittals Associated with Near-Term Task Force Recommendation 9.3 Related to the Fukushima Dai-ichi Nuclear Power Plant Accident (TAC Nos. MF4310, MF4311, MF4312, MF4313, MF4321, MF4322, MF4323, MF4324, MF4325, MF4326, and MF4327)," dated September 29, 2014
18. NEI letter APC-14-17, “Validation Document for FLEX Strategies,” dated July 18, 2014

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Attachment 2

SGS Unit 2 Response to NRC FLEX Audit Items

SGS Unit 2 Response to NRC FLEX Audit Items

References for this attachment are identified in Section 3.

1 INTRODUCTION

The NRC staff's initial review and audit of the SGS mitigation strategies is documented in the Interim Staff Evaluation (ISE) dated January 24, 2014 (Reference 1). The ISE identified NRC Generic Concerns, Open Items (OIs), and Confirmatory Items (CIs) for PSEG to address as part of implementation of the requirements of NRC Order EA-12-049 (Reference 2). The NRC staff conducted an on-site audit of the SGS mitigation strategies in August 2014. The audit included a review of the Generic Concerns, OIs, and CIs, and also resulted in additional Audit Questions (AQs) and Safety Evaluation (SE) items. The NRC audit report dated October 10, 2014 (Reference 3) includes a listing of open audit items. Section 2, below, provides responses to the NRC Generic Concerns, open CIs and OIs, and includes responses to the closed items from the ISE for completeness.

2 SGS UNIT 2 RESPONSE TO NRC FLEX AUDIT ITEMS

2.1. Generic Concern – Battery Life

Item Description

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 4) and endorsed by NRC via letter to NEI dated September 16, 2013 (Reference 5).

SGS Unit 2 Response

Battery coping calculations ES-3.005, "28 VDC Beyond Design Base Event Battery Sizing Calculation," and ES-4.008, "125 VDC Salem BDBEE Battery Sizing Calculation," have been satisfactorily completed using the NRC-endorsed white paper. The calculations show that the deep load shedding strategy will provide at least six hours of battery life without charging. PSEG provided these calculations to the NRC staff as part of the audit process.

2.2. Generic Concern – MAAP

Item Description

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 7).

SGS Unit 2 Response

PSEG performed MAAP analyses of the containment response to an Extended Loss of AC Power (ELAP) event for SGS, consistent with the NRC endorsement letter to NEI (Reference 7). The results of the MAAP analyses were provided to the NRC staff as part of the audit process, in response to CI 3.2.3.A and CI 3.2.3.B (Items 2.26 and 2.27, below).

2.3. Generic Concern and SE #10 – Shutdown / Refueling Modes

Item Description

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 8) and endorsed by the NRC via letter to NEI dated September 30, 2013 (Reference 9). NRC audit item SE #10 is for PSEG to provide the revised shutdown risk processes and procedures.

SGS Unit 2 Response

PSEG revised SGS Unit 2 and common procedures to enhance shutdown risk processes and procedures consistent with the NRC-endorsed guidance (References 8 and 9). The following procedures and guidance documents have been revised and provided to the NRC staff as part of the audit process:

- OP-SA-108-115-1001, "Operability Assessment and Equipment Control Program"

- OU-AA-103, "Shutdown Safety Management Program"
- OU-SA-105, "Shutdown Safety Management Program - Salem Annex"

- S2.OP-AB.RHR-0001, "Loss of RHR"
- S2.OP-AB.RHR-0002, "Loss of RHR at Reduced Inventory"
- S2.OP-AB.LOOP-0001, "Loss of Off-Site Power"
- S2.OP-AB.FUEL-0002, "Loss of Refueling Cavity or Spent Fuel Pool Level"
- S2.OP-AB.SF-0001, "Loss of Spent Fuel Cooling"

2.4. Generic Concern and SE #11 – Preventive Maintenance (PM)

Item Description

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 10) and endorsed by NRC letter dated

October 7, 2013 (Reference 11). NRC audit report item SE #11 is for PSEG to provide the FLEX maintenance and testing program.

SGS Unit 2 Response

PSEG identified the FLEX equipment PM activities using the NRC-endorsed EPRI guidance, EPRI or PSEG templates appropriate for the equipment, and vendor recommendations. These activities are tracked and implemented using PSEG's PM process and are retrievable via the SAP work management system.

2.5. Generic Concern and OI 3.2.1.8.A – Core Sub-criticality

Item Description

Core Sub-Criticality - The Pressurized Water Reactor Owners Group (PWROG) submitted to NRC a position paper, dated August 15, 2013, via Reference 12, 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 13). The NRC audit report (Reference 3) requests completion of the Emergency Operating Procedure (EOP) setpoint calculations and a determination of how much RCP seal leakage must be considered in the ELAP analyses.

SGS Unit 2 Response

PSEG responded to this item via SAP Order Operation 80108711-0080 as part of the audit process. Transmittal of Design Information (TODI) NFS 14-106 provided the EOP setpoint V.08 value of 12 hours, which is the latest time after reactor trip / start of ELAP for initiation of borated makeup to ensure core subcriticality. This setpoint was determined using the NRC-endorsed PWROG position paper on boron mixing (References 12 and 13). The setpoint calculation assumed conservative End of Life (EOL) core conditions, an initial cooldown to 420 degrees F, and the conservative assumption of no RCP seal leakage. The V.08 setpoint also accounts for a one-hour boron mixing time. The setpoint of 12 hours occurs prior to the onset of reflux cooling.

In order to address core subcriticality during an ELAP with RCP seal leakage, PSEG performed Technical Evaluation 80111831-0210, and provided it to the NRC staff as part of the audit process, in response to AQ-34 (Item 2.46, below). The evaluation uses SGS-specific RCP seal leakage rates calculated by Westinghouse, accounting for the installation of flow restricting orifices in the RCP seal leakoff lines during the fall 2015 refueling outage. Technical Evaluation 80111831-0210 concludes that the boric acid storage tanks and the FLEX boron mixing tank are capable of providing sufficient boron to establish the required boron concentration at 10.3 hours following the ELAP.

The FLEX boron mixing tank can produce sufficient boron to make up for leakage indefinitely.

2.6. OI 3.2.4.7.A - Water Sources

Item Description

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 (Reference 6) 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 (Reference 3) states that if the separation approach is used, the Hope Creek fire water cross connect valve needs to be protected to survive a tornado, and requests that the actions to switch to an alternate water supply be shown to be completed prior to Reactor Coolant System (RCS) heatup due to steam generator dryout.

SGS Unit 2 Response

PSEG Vendor Technical Document VTD 903078 Revision 2, "FLEX Water Storage Tornado Wind Hazard Evaluation," provides a basis for adequate separation of the SGS Auxiliary Feedwater (AFW) Storage Tanks and the Hope Creek Generating Station (HCGS) Fire Water tanks, based on a conservative plant-specific tornado evaluation.

Because SGS is using the separation option to demonstrate adequacy of water sources, resolution of this item also required the replacement of the HCGS fire protection cross tie valve post indicator (valve operator) with a curb box design to improve missile protection. The cross-tie pipe has an underground isolation valve at the interface to each station's system. The SGS valve (1FP-30) is located under a curb box and operated with a valve key. The HCGS valve (0-KC-V-115) had an above ground post indicator as the valve operator. In order to decrease tornado vulnerability of the HCGS valve, the post indicator was replaced with a curb box design similar to the SGS valve, as part of Design Change Package (DCP) 80111494, "Salem FLEX Generator Deployment (Canyon)."

Time validation of the ability to establish the fire protection water supply to the Salem turbine-driven AFW pumps prior to RCS heatup due to SG dryout is included in VTD 903021, "Response to Beyond Design Basis External Events FLEX Validation Document Based on NEI 12-06 Methodology Salem Generating Station."

VTD 903078 and VTD 903021 have been provided to the NRC staff as part of the audit process.

2.7. CI 3.1.1.1.A - Protection of FLEX Equipment Including FLEX Diesel Generators (DGs)

Item Description

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.

SGS Unit 2 Response

This item has been closed as part of the audit process. PSEG finalized the FLEX storage locations, including the use of alternatives to NEI 12-06 (Reference 6), as summarized in the most recent six-month status report (Reference 14).

2.8. CI 3.1.1.2.A - Deployment of FLEX Equipment

Item Description

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.

SGS Unit 2 Response

This item was addressed in the February 2014, six-month status report (Reference 15) and closed during the on-site NRC audit. The response is repeated below for convenience.

Liquefaction of the uppermost and recent geologic age site layered sediments, beyond the areas of safety related structures, could possibly occur during the seismic event; but it is expected that the material's behavior as a liquid would cease following the earthquake and would revert to a stiffness and strength needed to accommodate equipment movement onsite. In the event pathways or roadways are damaged, alternate travel routes around the potentially undermined surfaces would be implemented. In addition, Phase 3 equipment can be transported to the site via helicopter.

SGS Unit 2 Response to NRC FLEX Audit Items

2.9. CI 3.1.1.2.B - Deployment of FLEX Equipment

Item Description

The licensee does not state that the Nuclear Service Water Connections will be protected from seismic events. Confirm that this is ensured.

SGS Unit 2 Response

Discharge hoses will be routed from the diesel engine-driven FLEX Service Water (SW) pump discharge to a primary connection on the SW test header or to an alternate connection within the missile-protected Service Water Intake Structure (SWIS) in SW Bays 2 and 3, that can supply the SW nuclear headers. The SW connections are seismically robust.

2.10. CI 3.1.1.3.B - Procedural Interfaces - Seismic Hazard

Item Description

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.

SGS Unit 2 Response

To address the potential for seismically induced internal flooding hazards, PSEG reviewed large internal flooding sources that are not seismically robust and do not require AC power, e.g., gravity drainage from lakes or cooling basins for non-safety-related cooling water systems (NEI 12-06, Section 5.3.3). There are no internal flooding sources of this type that are within the SGS flood protected boundary. FLEX equipment storage locations outside of flood-protected structures were evaluated for the potential impact of failure of large, non-seismic tanks. The largest non-seismic tanks are the two demineralized water storage tanks (DWSTs), each with a 500,000 gallon capacity. The DWSTs are greater than 400 feet away from the closest outdoor FLEX equipment storage area. Significant open areas exist between the storage sites and non-seismic tanks. Due to the distances and intervening structures, it is unlikely that significant flooding and equipment damage will occur to equipment at the storage locations.

The SGS FLEX strategy does not rely on AC power for ground water mitigation within the plant flood protected areas. For a hurricane event, dewatering pumps to remove accumulated rainwater from the Canyon Area (outdoor area between the SGS Unit 2 Fuel Handling Building and Auxiliary Building) will be powered by the FLEX DG or station power (if available).

SGS Unit 2 Response to NRC FLEX Audit Items

2.11. CI 3.1.1.4.A - Considerations in Using Offsite Resources - Seismic Hazard - Flooding Hazard - High Winds Hazard - Snow, Ice and Extreme Cold Hazard

Item Description

Equipment staging areas for deployment of offsite equipment from SAFER will be finalized in a future 6 month update.

SGS Unit 2 Response

PSEG finalized the equipment staging areas as described in Vendor Technical Document (VTD) 903060 Volume 1, "SAFER Response Plan for Salem Generating Station," and EM-SA-100-1000, "Response to Beyond Design Basis External Events Program Document Salem Generating Station." These documents have been provided to the NRC staff as part of the audit process.

Onsite Staging Area "B" at the northeast corner of the site is a minimum of 350' x 250', which is large enough to accommodate the on-site staging area required by SAFER for SGS and HCGS. The area would be utilized at approximately 20 to 24 hours after the initiating event and notification to the offsite organization (SAFER). By this time, additional personnel utilizing the debris removal equipment would be capable of restoring the on-site staging and deployment areas and routes to a usable status. This would include, if required, grading the soil after a seismic event, removal of snow and ice, and removal of debris after a flooding or high wind event. For extreme cold, the equipment is designed to be able to operate under extreme cold conditions or equipped with keep warm systems to ensure their availability.

2.12. CI 3.1.2.2.A - Deployment of FLEX Equipment - Flooding Hazard

Item Description

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.

SGS Unit 2 Response

This item was closed to SE #6 (Item 2.42, below) as part of the audit process.

SGS Unit 2 Response to NRC FLEX Audit Items

2.13. CI 3.1.4.2.A - Deployment of FLEX Equipment - Flooding Hazard

Item Description

The licensee should address the formation of frazil ice and means to cope with it.

SGS Unit 2 Response

This item was closed as part of the audit process. Suction hoses will be placed in the river and water will be drawn through strainers to limit pump damage and blockage from debris and frazil ice.

2.14. CI 3.1.4.2.B – Deployment of FLEX Equipment – Snow, Ice and Extreme Cold Hazards

Item Description

The licensee should address manual operations required by plant personnel during periods of snow, ice, and extreme cold hazards.

SGS Unit 2 Response

This item was closed as part of the audit process. PSEG integrated the FLEX capabilities into existing site cold weather procedures and established periodic FLEX equipment status checks that include diesel keep warm systems and verification that access to equipment is not impaired by snow or ice. The following procedures were revised to support outdoor FLEX equipment operational functionality and deployment during periods of cold weather including snow and ice:

- OP-AA-108-111-1001, “Severe Weather and Natural Disaster Guidelines”
- SC.OP-PT.ZZ-0002, “Station Preparations for Seasonal Conditions”
- SC.OP-PM.FLX-0001, “FLEX Standby Equipment Status Checks”
- MA-AA-716-002-1002, “Facilities Maintenance Guidelines”

SGS Unit 2 Response to NRC FLEX Audit Items

2.15. CI 3.1.5.2.A - Deployment of FLEX Equipment - High Temperature Hazard

Item Description

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.

SGS Unit 2 Response

This item was closed during the audit process based on walkdowns and the use of air-cooled FLEX equipment. CI 3.2.4.2.C (Item 2.30, below) provides additional information regarding GOTHIC analyses of temperatures in plant areas during an ELAP.

2.16. CI 3.1.5.3.A – Procedural Interfaces – High temperature Hazard

Item Description

The licensee should specify the peak temperature for which FLEX equipment would be expected to operate.

SGS Unit 2 Response

This item was closed during the audit process based on equipment being procured to operate in expected temperatures. CI 3.2.4.2.C (Item 2.30, below) provides additional information regarding GOTHIC analyses of temperatures in plant areas during an ELAP.

2.17. CI 3.2.1.A - RCS Cooling and Heat Removal, and RCS Inventory Control Strategies

Item Description

The licensee should specify which analysis performed in WCAP-17601-P (Reference 16) 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.

The NRC audit report (Reference 3) identifies the licensee input needed regarding applicability of WCAP-17601-P to SGS:

> "Demonstrate how the Salem RCP seal leakage rate will meet the rate assumed in Section 5.2 (of WCAP-17601-P). Also, update the ELAP

parameters comparison to show the Salem SG PORVs steam flow rate in percent of full power steam flow."

SGS Unit 2 Response

PSEG provided a revised ELAP parameters comparison table as part of the audit process. Revision 2 of the table reflects the plant-specific calculation of RCP seal leakage which is currently used as the basis for the SGS FLEX strategy in lieu of the WCAP-17601-P values. The plant-specific RCP seal leakage flow rates at 2250 psia (14.5 gpm per pump) and 1500 psia (15.2 gpm per pump) are lower than the WCAP-17601-P peak flow rate of 21 gpm per pump that was used in the initial development of the SGS FLEX strategy.

Revision 2 of the ELAP parameters comparison table also provides SGS Steam Generator Power-operated Relief Valve (SG PORV) (MS10 valve) steam flow rate in percent of full power steam flow, i.e., four SG PORVs with a combined capacity of 10% of full power steam flow.

2.18. CI 3.2.1.1.A and SE #5 - Computer Code Used for ELAP Analysis

Item Description

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.

SGS Unit 2 Response

PSEG provided a response to the NRC's position on the use of NOTRUMP (Reference 17) as part of the audit process. The use of NOTRUMP as it applies to the SGS FLEX strategy is limited to the flow conditions prior to initiation of reflux cooling. The onset of reflux cooling is considered to occur when the one-hour centered moving average of the steam generator U-bend flow quality has increased to a value of 0.1 in any one loop. This definition of reflux cooling is consistent with the NRC staff's letter to the PWROG (Reference 17) regarding the use of NOTRUMP and the PWROG-14027-P (Reference 18) scaling methodology to evaluate ELAP events. Reflux cooling precedes core uncovery during an ELAP scenario and prevention of reflux cooling is a conservative means of demonstrating adequate core cooling via the FLEX strategies, e.g., as shown in WCAP-17601-P (Reference 16).

SGS Unit 2 Response to NRC FLEX Audit Items

2.19. CI 3.2.1.1.B and SE #9 - Computer Code Used for ELAP Analysis

Item Description

The licensee utilized the existing analyses in WCAP-17601-P (Reference 16) 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.

SGS Unit 2 Response

PSEG revised the timelines using plant-specific evaluations that include resolution of RCP seal leakage issues, and performed timeline validation documented in Vendor Technical Document VTD 903021, "Response to Beyond Design Basis External Events FLEX Validation Document Based on NEI 12-06 Methodology Salem Generating Station." VTD 903021 uses NEI guidance (Reference 19) with consideration of human factors and has been provided to the NRC staff as part of the audit process.

2.20. CI 3.2.1.2.A and SE #2 - Reactor Coolant Pump Seal Leakage Rates

Item Description

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.

SGS Unit 2 Response

PSEG installed ¼-inch diameter flow restricting orifices in the SGS Unit 2 RCP seal leakoff lines, via Design Change Package (DCP) 80112919, "DCP Fukushima – Install RCP Seal Orifices." The generic leakage rate of 21 gpm per pump originally used to develop the SGS FLEX strategy has been superseded by a Westinghouse calculation of plant-specific leakage based on the installation of the orifices. PSEG provided a response to this item as part of the audit process. A margin assessment to address leakage rate uncertainty based on plant specific attributes of the SGS FLEX strategies is summarized below.

RCS Cooldown - The SGS FLEX timeline assumes the initial RCS cooldown is initiated within two hours of an ELAP, consistent with generic Westinghouse assumptions. Vendor Technical Document VTD 903021, "Response to Beyond Design Basis External Events FLEX Validation Document Based on NEI 12-06

Methodology Salem Generating Station," shows a margin of 30 minutes based on time validation.

RCS Makeup Time - PSEG Technical Evaluation 80111831-0220 uses the methodology of PWROG-14027-P (Reference 18) to determine a plant-specific time to reflux cooling of approximately 17.4 hours. The time to reach reflux cooling conditions provides significant margin with respect to the SGS FLEX timeline value of eight hours to begin RCS injection. In addition, actual times for RCS makeup would depend on the scenario that results in the ELAP, with eight hours considered to be a maximum value. SGS can allocate resources in response to low level as indicated by Reactor Vessel Level Instrumentation (RVLIS) or Pressurizer level. FLEX Support Guideline FSG-1 has a caution statement: "IF RVLIS < 74% then reallocate resources to implement the FSG-1 RCS makeup strategy immediately."

Boration Sources and Makeup Capacity - The boric acid storage tanks (BASTs) and FLEX boric acid mixing tank are capable of producing sufficient boron to establish the required shutdown margin before the EOP setpoint V.08 time of 12 hours to initiate boration following reactor trip, and maintain subcriticality indefinitely. FLEX charging pump capacity of 56 gpm at high pressures is greater than the 40 gpm capacity recommended for a four-loop Westinghouse plant by WCAP-17601-P.

PSEG reduced SGS Unit 2 RCP seal leakage during an ELAP via installation of flow restricting orifices. The resulting plant-specific calculated flow rates at 2250 psia (14.5 gpm per pump) and the peak value at 1500 psia (15.2 gpm per pump) are lower than the generic WCAP-17601-P peak flow rate of 21 gpm per pump. The plant-specific leakage rates and FLEX capabilities provide margin to accommodate uncertainty in calculated leakage rates.

2.21. CI 3.2.1.2.B - Reactor Coolant Pump Seal Leakage Rates

Item Description

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.

SGS Unit 2 Response

PSEG provided a response to the NRC staff as part of the audit process, based on design changes to install four high pressure nitrogen bottles per SG PORV (MS10 valve), via Design Change Package (DCP) 80110419, permitting automatic or manual operation of each valve from the main control room. This will support the FLEX strategy of performing a symmetrical RCS cooldown beginning at 2 hours following the ELAP (T+2 hours) and completing the initial cooldown at T+4 hours. With the enhanced capability to control SG pressure (and therefore RCS temperature) using the nitrogen-backed SG PORVs, the RCP seal package components would be expected to perform as designed during the ELAP event.

2.22. CI 3.2.1.5.A - Monitoring Instrumentation and Controls

Item Description

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.

SGS Unit 2 Response

This item was closed during the audit process based on use of instrumentation as described in S1(2).OP-FS.FLX-0007(Q), “Loss of Vital Instrumentation or Control Power” (FSG-7).

2.23. CI 3.2.1.6.A - Sequence of Events

Item Description

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 (Reference 3) subsequently stated that the NRC staff reviewed the changes and have no concerns, and requested that the changes be issued on the docket in an update to the Overall Integrated Plan.

SGS Unit 2 Response

The SGS FLEX timeline will be included with the Final Integrated Plan submittal following SGS Unit 1 compliance with NRC Order EA-12-049.

2.24. CI 3.2.1.9.A - Use of Portable Pumps

Item Description

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.

SGS Unit 2 Response

This item was closed during the NRC audit process. EM-SA-100-1000, "Response to Beyond Design Basis External Events Program Document Salem Generating Station," contains tables identifying FLEX equipment, including equipment shared with Hope Creek Generating Station (HCGS).

2.25. CI 3.2.2.A - Spent Fuel Pool Cooling Strategies

Item Description

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.

SGS Unit 2 Response

This item was closed during the NRC audit process. EM-SA-100-1000, "Response to Beyond Design Basis External Events Program Document Salem Generating Station," describes the SFP make-up configuration.

SGS Unit 2 Response to NRC FLEX Audit Items

2.26. CI 3.2.3.A – Containment Cooling

Item Description

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.

SGS Unit 2 Response

PSEG provided Technical Evaluations of the SGS MAAP containment analyses to the NRC staff as part of the audit process, as follows:

Technical Evaluation 80111831-0030 evaluated containment response to an ELAP during Modes 5 and 6 (Cold Shutdown and Refueling). The Mode 5 and 6 MAAP analysis indicates that containment pressure can be maintained below the design pressure of 47 psig and well below the test pressure of 54 psig using the installed containment vent paths through the personnel airlocks.

Technical Evaluation 80111831-0040 evaluated containment response to an ELAP in Modes 1 through 4 (Power Operation to Hot Shutdown) and concluded that containment pressure can be maintained substantially below the design pressure using only FLEX RCS cooldown via the steam generators. Technical Evaluation 80111831-0041 confirmed that the conclusion of 80111831-0040 remains valid with consideration of plant-specific RCP seal leakage.

2.27. CI 3.2.3.B - Containment Functions Strategies

Item Description

In the audit and review, the licensee stated that SGS plans to use the MAAP analysis to complete the FLEX strategies and timelines. Review these analyses when available.

SGS Unit 2 Response

PSEG provided the Technical Evaluations of the MAAP analyses results as part of the audit process, as summarized above in response to CI 3.2.3.A – Containment Cooling (Item 2.26).

SGS Unit 2 Response to NRC FLEX Audit Items

2.28. CI 3.2.4.2.A - Ventilation - Equipment Cooling

Item Description

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.

SGS Unit 2 Response

This item was closed as part of the NRC audit process based on Technical Evaluation 80111831-0020 (high temperature) and 80111831-0080 (low temperature).

2.29. CI 3.2.4.2.B - Ventilation - Equipment Cooling

Item Description

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.

SGS Unit 2 Response

This item was closed as part of the NRC audit process, based on the Phase 2 FLEX strategy to re-energize the battery room exhaust fans prior to placing the batteries on charge.

2.30. CI 3.2.4.2.C - Ventilation - Equipment Cooling

Item Description

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.

SGS Unit 2 Response

PSEG completed Technical Evaluation 80111831-0020, "UPDATED - Unit 1 and 2 Evaluation of Salem GOTHIC Results," to document the results of GOTHIC analyses of temperatures during an ELAP, and provided the evaluation to the NRC staff as part of the audit process. The results of the GOTHIC analyses summarized in Technical

Evaluation 80111831-0020 show that with the actions listed below, the SGS FLEX strategy can be implemented without impact to equipment or personnel.

1. Opening the TDAFP room door within 30 minutes of an ELAP, and installing a portable fan in the doorway at approximately 10 hours.

2. Restoration of the #11/21 Switchgear and Penetration Area Ventilation, at approximately 24 hours following an ELAP.

3. Restoration of the #12 Control Area Ventilation fan, at approximately 24 hours following an ELAP. NOTE - #22 Control Area Fan is not required since the Control Room Envelope is a common area.

2.31. CI 3.2.4.4.A – Communications

Item Description

Confirm that upgrades to the site's communications systems have been completed.

SGS Unit 2 Response

This item was closed as part of the NRC audit process, based on review of Design Change Package (DCP) 80110936, "Salem Communications Upgrade," and related equipment enhancements.

2.32. CI 3.2.4.6.A - Personnel Habitability - Elevated Temperature

Item Description

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.

SGS Unit 2 Response

This item is addressed by Technical Evaluation 80111831-0020, "UPDATED - Unit 1 and 2 Evaluation of Salem GOTHIC Results," which was provided to the NRC staff as part of the audit process. The results of Technical Evaluation 80111831-0020 are described in response to CI 3.2.4.2.C - Ventilation - Equipment Cooling (Item 2.30, above).

SGS Unit 2 Response to NRC FLEX Audit Items

2.33. CI 3.2.4.6.B - Personnel Habitability

Item Description

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.

SGS Unit 2 Response

This item is addressed by Technical Evaluation 80111831-0020, "UPDATED - Unit 1 and 2 Evaluation of Salem GOTHIC Results," which was provided to the NRC staff as part of the audit process. The results of Technical Evaluation 80111831-0020 are described in response to CI 3.2.4.2.C - Ventilation - Equipment Cooling (Item 2.30, above).

2.34. CI 3.2.4.8.A - Electrical Power Sources/Isolations and Interactions

Item Description

The licensee stated that diesel generator sizing calculations are in progress. The results will be communicated in a future six-month update.

SGS Unit 2 Response

PSEG Calculation ES-15.019, "FLEX Electrical System Analysis – Salem 1 and 2," has been provided to the NRC staff as part of the audit process (text only) and demonstrates that the FLEX Diesel Generators (DGs) are appropriately sized to support the FLEX strategies.

2.35. CI 3.2.4.8.B - Electrical Power Sources/Isolations and Interactions

Item Description

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.

SGS Unit 2 Response

PSEG Calculation ES-15.019, "FLEX Electrical System Analysis – Salem 1 and 2," has been provided to the NRC staff as part of the audit process (text only) and addresses protective device selection and coordination.

2.36. CI 3.2.4.8.C – Minimum DC Bus Voltage

Item Description

Confirm the analyses address the minimum voltage that must be maintained on the dc buses and its basis.

SGS Unit 2 Response

Battery coping calculations ES-3.005, "28 VDC Beyond Design Base Event Battery Sizing Calculation" and ES-4.008, "125 VDC Salem BDBEE Battery Sizing Calculation" address the battery voltages to support the FLEX strategies and have been provided to the NRC staff as part of the audit process.

2.37. CI 3.2.4.9.A - Portable Equipment Fuel

Item Description

Confirm that sufficient fuel is available considering the fuel consumption rate for each FLEX piece of equipment.

SGS Unit 2 Response

This item was closed as part of the audit process. Technical Evaluation 80111831-0060, "Evaluation of FLEX Portable Equipment Fuel Usage Against NEI 12-06 Requirements," has been provided to the NRC staff and concludes that installed sources of fuel can supply FLEX equipment for 5.45 days after an ELAP, after which offsite resources are assumed available to resupply the diesel fuel oil.

2.38. CI 3.2.4.10.A - Load Reduction to Conserve DC Power

Item Description

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.

SGS Unit 2 Response

This item is addressed by Technical Evaluation 80111831-0051, "Salem Unit 2 ELAP DC Coping Analysis," which has been provided to the NRC staff as part of the audit process. Technical Evaluation 80111831-0051 reviewed loads de-energized during the deep load shed to preserve 28 V and 125 V battery life. The evaluation concluded that the load shed would not cause conditions that would prevent implementation of the FLEX Phase 1 or Phase 2 strategies, and that equipment required to implement the Phase 1 or Phase 2 strategies would be available when required.

2.39. CI 3.3.2.A - Configuration Control

Item Description

The licensee should provide the single line diagrams of the proposed electrical systems. As part of this item the NRC audit report (Reference 3) requested PSEG to address potential personnel hazards regarding the orientation of disconnecting blades in the FLEX power receptacles.

SGS Unit 2 Response

PSEG provided the single line diagrams as part of the audit process, and they are included in EM-SA-100-1000, "Response to Beyond Design Basis External Events Program Document Salem Generating Station." PSEG provided the following information in response to the personnel safety aspect of this item:

"The disconnects equipped with receptacles for attaching portable cables are all orientated such that the potential power feed side is wired to the non-blade side of the receptacle. Below is a description of the orientation used.

- If the FLEX bus is the power source, the power cable to the disconnect is wired to the stationary side (non-blade side).

- If the plant bus is energized (normal configuration, no ELAP), the plant equipment is wired to the stationary side (non-blade side) of the disconnect.

The portable cable connections between disconnects are normally wired to the blade side of the disconnect. Portable cables will be installed prior to closing any disconnects (procedurally controlled)."

2.40. CI 3.4.A - Offsite Resources

Item Description

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.

SGS Unit 2 Response

PSEG provided Vendor Technical Document (VTD) 903060 Volume 1, "SAFER Response Plan for Salem Generating Station," to the NRC staff as part of the audit process. The NRC issued their staff assessment of the National SAFER Response Centers in a letter to NEI dated September 26, 2014 (Reference 20), which concluded that SAFER has taken the appropriate actions to support site responses to a beyond-design-basis external event, and "licensees can reference the SAFER program and implement their SAFER Response Plans to meet the Phase 3 requirements of Order EA-12-049."

2.41. SE #1 - RCS Venting

Item Description

NRC staff needs to complete its review of FSG-8.

SGS Unit 2 Response

PSEG provided draft FLEX Support Guidelines (FSGs) during the on-site audit and has since provided approved FSG's on the e-portal. PSEG assumes that this item is pending NRC approval unless additional PSEG action is requested.

2.42. SE #6 - Permanent Staging of the FLEX Generators in the SGS Unit 2 Canyon (an Alternate to NEI 12-06)

Item Description

Provide an evaluation of the susceptibility to damage for the FLEX generators. Demonstrate that the construction of the canyon wall is viable.

SGS Unit 2 Response

The SGS FLEX strategy uses three 480 V FLEX Diesel Generators (DGs) to provide Phase 2 power for both SGS units, and includes pre-staging of two DGs in the outdoor storage area between the SGS Unit 2 Fuel Handling Building and Auxiliary

Building (Canyon Area). The pre-staged DG's are protected from NEI 12-06 external hazards.

As described in the most recent six-month update (Reference 14), 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. The two pre-staged DGs in the Canyon Area are in the eastern most area of the canyon, surrounded on all four sides by the Fuel Handling Building and Auxiliary Building. FLEX equipment in the Canyon Area, including the DGs, are designed for a site specific wind speed of 200 mph that has an exceedance probability of 10^{-7} for this location.

Design Change Package (DCP) 80111494, Supplement 7, "Salem Generating Station Canyon Area High Wind Hazard FLEX Equipment Storage and Deployment," includes a tornado missile evaluation specifically for the Canyon Area configuration. Based on this evaluation, a 1" solid steel rod traveling at 26 feet/sec is used to design the hardened protection of FLEX equipment and connections located in the sheltered Canyon Area. The FLEX DGs pre-staged in the Canyon Area are hardened to provide protection from this missile impact and are secured to protect against tornado wind speeds. The two FLEX DGs stored outside of the Canyon Area are not missile protected but are separated by 1200 feet or greater to ensure a single tornado does not impact more than one stored FLEX DG. Therefore, at least one of the unprotected FLEX DGs will be available for deployment to the canyon area following a tornado event.

DCP 80111494, "Salem FLEX Generator Deployment (Canyon)," included the restraint and evaluation of gas bottles stored on the Auxiliary Building roof, to ensure that they would not become tornado missiles.

NEI 12-06 Section 5.3.1(1)(c) states that FLEX equipment may be stored outside a structure provided it is evaluated for seismic interactions to ensure equipment is not damaged by non-seismically robust components or structures. Storing or pre-staging FLEX DGs in the canyon area satisfies the requirements of Section 5.3.1(1)(c). The structures surrounding the canyon area are Seismic I buildings designed to withstand a Safe Shutdown Earthquake. There are no non-seismically robust components or structures positioned to interact with stored FLEX DGs in the Canyon Area. DCP 80111494 provided bracing systems for the DGs in the Canyon Area to resist seismic and wind loads.

In the event a flood is predicted from a hurricane, two additional DGs (one N and one N+1) will be moved to the Canyon Area and flood protected via a temporary flood barrier (HESCO wall) and de-watering pumps. The feasibility of flood protecting the pre-staged and portable DGs as an anticipatory measure is addressed in Vendor Technical Document VTD 903021, "Response to Beyond Design Basis External Events FLEX Validation Document Based on NEI 12-06 Methodology Salem

Generating Station." DCP 80111494 evaluated the effects of constructing the HESCO wall on SGS structures, systems, and components (i.e., building walls and underground commodities), and determined there is no adverse impact.

2.43. SE #7 - Feeding Steam Generators from the Turbine Building Basement

Item Description

Provide the evaluation and timeline of the ability to pump water from the turbine building basement to the steam generators.

SGS Unit 2 Response

PSEG provided Technical Evaluations 80111831-0120, "Time Required to Flooding the Turbine Building for FLEX Submersible Pump Operation" and 80111831-0130, "Time Required To Fill the Demineralized Water / Auxiliary Feedwater Alternate Piping" to the NRC staff as part of the audit process. These evaluations conclude that, at a flood level of greater than two feet above grade, sufficient water will flood the hotwell area through one set of double door vents to support the use of the submersible pumps. Based on a 15 minute time to flood the hotwell to a usable depth and a 15 minute time to fill the Demineralized Water / Auxiliary Feedwater alternate feed line, sufficient time exists to establish an alternate Auxiliary Feedwater supply prior to steam generator dryout (loss of feedwater for > 55 minutes). Validation of the ability to meet the 55 minute time constraint with margin is documented in Vendor Technical Document VTD 903021, "Response to Beyond Design Basis External Events FLEX Validation Document Based on NEI 12-06 Methodology Salem Generating Station."

2.44. SE #8 - Equipment Habitability for Steam Generator Power-operated Relief Valve Operation

Item Description

Provide the evaluation of the functionality of the SG PORVs.

SGS Unit 2 Response

PSEG provided the evaluation of Steam Generator Power-operated Relief Valve (SG PORV) (MS10 valve) functionality via Technical Evaluation 80111831-0020, "UPDATED - Unit 1 and 2 Evaluation of Salem GOTHIC Results," as part of the response to CI 3.2.4.2.C, Ventilation - Equipment Cooling (Item 2.30, above). Based on a comparison of GOTHIC temperature results and component data, Technical Evaluation 80111831-0020 concludes that operation of the SG PORVs is not challenged during an ELAP.

SGS Unit 2 Response to NRC FLEX Audit Items

2.45. AQ-29 – Decay Heat Curve

Item Description

The NRC staff needs to review the plant-specific auxiliary feedwater storage tank technical evaluation, for water supplies for decay heat removal, which was not completed. Provide the technical evaluation for the AFST usage. Address how AFST volume and other analyses were calculated where decay heat is an input. Was the same ANS model used for these purposes, or were different models used for other applications, and how are they justified?

SGS Unit 2 Response

PSEG provided Technical Evaluation 80111831-0100, "Evaluation of Auxiliary Feedwater Storage Tank (AFST) Capability to Supply Aux Feedwater During ELAP Cooldown," to the NRC staff as part of the audit process. The decay heat curve used in 80111831-0100 utilizes ANS 5.1-1979 plus two sigma, consistent with assumption 4.2.1(4) in WCAP-17601-P (Reference 16), and the curve incorporates plant-specific parameters and assumes three year full power operation as part of the decay heat calculation. The computation of AFST water consumption in Technical Evaluation 80111831-0100 provides conservative results relative to the generic evaluation presented in WCAP-17601-P.

2.46. AQ-34 – Portable Boron Mixing Tank

Item Description

The NRC staff is looking for an evaluation showing that one 1000 gallon tank will provide sufficient volume to feed both units. Also, if the batch stream is diluted, there is a concern as to how the licensee can measure the flowrate of the pure water stream if there is no power.

SGS Unit 2 Response

PSEG provided Technical Evaluation 80111831-0210, "Salem Response to NRC Mitigating Strategies Audit Question AQ-34, Portable Boron Mixing Tank," to the NRC staff as part of the audit process. A single 1000 gallon portable boron mixing tank is required to produce concentrated boric acid for both Salem units to restore RCS inventory, make-up for RCS inventory loss due to RCP seal leakage, and maintain shutdown margin. The capability of the portable boron mixing tank combined with the available Boric Acid Storage Tank (BAST) level exceeds the required boric acid inventory to establish and maintain adequate shutdown margin and maintain RCS inventory, ensuring natural circulation flow in the RCS is maintained throughout the event.

The FLEX charging pump is a 56 gpm positive displacement pump with a 2-valve suction manifold. Each leg of the manifold contains a flow meter capable of allowing measurement and control of borated and non-borated water sources. The flow meters receive power from the pump skid FLEX power and will provide indication when required.

3 REFERENCES

1. 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
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. 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
4. 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)
5. NRC letter to NEI, "Battery Life White Paper Endorsement," dated September 16, 2013 (ADAMS Accession No. ML13241A188)
6. Nuclear Energy Institute (NEI) Report NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August 2012
7. NRC letter to NEI, "Mitigation Strategies Order EA-12-049, NEI Position Paper: MAAP Endorsement Letter," dated October 3, 2013 (ADAMS Accession No. ML13275A318)
8. NEI Position Paper, "Shutdown / Refueling Modes," dated September 18, 2013 (ADAMS Accession No. ML13273A514)
9. 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)
10. 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)

SGS Unit 2 Response to NRC FLEX Audit Items

11. 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)
12. 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)
13. 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)
14. PSEG Letter LR-N16-0043, "PSEG Nuclear LLC's Sixth 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 29, 2016
15. 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
16. 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
17. NRC letter to PWROG Regarding NOTRUMP dated June 16, 2015 (NRC ADAMS Accession No. ML15061A442)
18. PWROG-14027-P, "No. 1 Seal Flow Rate for Westinghouse Reactor Coolant Pumps Following Loss of All AC Power Task 3: Evaluation of Revised Seal Flow Rate on Time to Enter Reflux Cooling and Time at which the Core Uncovers," Revision 3, April 2015
19. NEI letter APC-14-17, "Validation Document for FLEX Strategies," dated July 18, 2014
20. NRC letter, "Staff Assessment of National SAFER Response Centers Established in Response to Order EA-12-049," dated September 26, 2014 (ADAMS Accession No. ML14265A107)