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

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10 CFR 50.54(f)

LR N08-0234

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Salem Nuclear Generating Station, Units 1 and 2
Facility Operating License No. DPR-70 and DPR-75
NRC Docket Nos. 50-272 and 50-311

Subject: **Nine-Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"**

References:
1. NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems" dated January 11, 2008
2. PSEG LR- N08-0074, "Three-Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems", dated April 10, 2008
3. NRC letter from R. Ennis to W. Levis, "Hope Creek Generating Station and Salem Nuclear Generating Station, Unit Nos. 1 and 2 - Re: Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, And Containment Spray Systems, Proposed Alternative Course Of Action", dated September 8, 2008

The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2008-01 (Reference 1) to request that each licensee evaluate the licensing basis, design, testing, and Corrective Action Programs (CAP) for the Emergency Core Cooling Systems (ECCS), Decay Heat Removal (DHR) system, and Containment Spray system, to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

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The NRC, GL 2008-01 requested each licensee to submit a written response in accordance with 10 CFR 50.54(f) within nine months of the date of the GL to provide the information summarized below:

> (a) A description of the results of evaluations that were performed pursuant to the requested actions;
>
> (b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that were determined to be necessary to assure compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems; and,
>
> (c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

In summary, PSEG Nuclear has concluded that the subject systems/functions at the Salem Nuclear Generating Station (SNGS) Units 1 and 2 are in compliance with the Technical Specification definition of Operability, i.e., capable of performing their specified safety function and that the SNGS Units 1 and 2 are currently in compliance with Appendix B to 10 CFR 50, Criterion III, V, XI, XVI and XVII, with respect to the concerns outlined in GL 2008-01 regarding gas accumulation in the accessible portions of these systems/ functions. As committed in Reference 2, and approved by the NRC in Reference 3, SNGS Units 1 and 2 will complete its assessments of those inaccessible portions of these systems/functions during the next refueling outages and provide a supplement to this report with those results no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

The enclosure to this letter contains the SNGS Units 1 and 2 nine-month response to NRC GL 2008-01.

This letter contains the following new NRC commitments:

1. All evaluations pertaining to Unit 1 entered into the CAP as described in Section C of the Enclosure will be completed and a supplemental response submitted to the NRC no later than 90 days following the end of Salem Unit 1 Refuel Outage, 1R19. **(CM-U1-2008-98)**
2. All corrective actions for Salem Unit 1 initiated as a result of completing the evaluations described in Section C of the Enclosure and those discovered as a result of walkdowns of inaccessible areas, will be completed no later than the end of Salem Unit 1 Refuel Outage 1R20. **(CM-U1-2008-99)**

3. All evaluations pertaining to Unit 2 entered into the CAP as described in Section C of the Enclosure will be completed and a supplemental response submitted to the NRC no later than 90 days following the end of Salem Unit 2 Refuel Outage 2R17. **(CM-U2-2008-100)**
4. All corrective actions for Salem Unit 2 initiated as a result of completing the evaluations described in Section C of the Enclosure and those discovered as a result of walkdowns of inaccessible areas, will be completed no later than the end of Salem Unit 2 Refuel Outage 2R18. **(CM-U2-2008-101)**

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

Executed on 10/13/08

Sincerely,

Robert C. Braun
Site Vice President – Salem

Enclosure: Salem Nuclear Generating Station, Units 1 and 2 - Nine-Month Response to NRC Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems.

Attachment: List Of Commitments

C Mr. S. Collins, Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

U. S. Nuclear Regulatory Commission
Mr. R. Ennis, Project Manager – Hope Creek
Mail Stop 08B3
Washington, DC 20555-0001

USNRC Senior Resident Inspector – Salem Nuclear Generating Station

Mr. P. Mulligan, Manager IV
Bureau of Nuclear Engineering
P. O. Box 415
Trenton, NJ 08625

Salem Nuclear Generating Station, Units 1 and 2 - Nine-Month Response to NRC Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems

This enclosure contains the Salem Nuclear Generating Station (SNGS) Units 1 and 2 nine-month response to NRC Generic Letter (GL) 2008-01 "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008. In GL 2008-01, the NRC requested, "that each addressee evaluate its ECCS, DHR system, and containment spray system licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified."

The following information is provided in this response:

> "(a) A description of the results of evaluations that were performed pursuant to the requested actions;" (See Section A of this enclosure)
>
> "(b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that were determined to be necessary to assure compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems; and," (See Section B of this Attachment)
>
> "(c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule." (See Section C of this Attachment)

The following systems were determined to be in the scope of GL 2008-01 for SNGS Units 1 and 2:

- Residual Heat Removal (RHR) System - Low Head Safety Injection (LHSI) portion
- Chemical Volume Control (CVC) System - High Head Safety Injection (HHSI) portion
- Safety Injection (SJ) System - Intermediate Head Safety Injection (IHSI)
- RHR System - Shutdown Cooling (SDC) Hot Leg Suction portion
- Containment Spray (CS) System

Salem Nuclear Generating Station, Units 1 and 2 - Nine-Month Response to NRC Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems

A. EVALUATION RESULTS

Licensing Basis Evaluation

The SNGS Units 1 and 2 licensing basis was reviewed with respect to gas accumulation in the Emergency Core Cooling Systems (ECCS): CVC System - HHSI System; RHR - LHSI System and SDC Hot Leg, SJ - IHSI System and also the CS System. This review included the Technical Specifications (TS), TS Bases, Updated Final Safety Analysis Report (UFSAR), responses to NRC generic communications, Regulatory Commitments, and License Conditions.

1. Summarize the results of the review of these documents:

The above documents and regulatory commitments were evaluated for compliance with applicable regulatory requirements.

The SNGS Units 1 and 2 TS have the following surveillance requirements (SR):

For Emergency Core Cooling Systems:

Section 4.5.2.b.2(SR) "Verifying that the ECCS piping is full of water by venting the ECCS pump casings and accessible discharge piping high points."

This surveillance is performed at least once per 31 days.

The ECCS pumps are normally in a standby, non-operating mode. The ECCS suction and discharge piping is maintained full by periodic venting to ensure the system will perform properly, injecting its full capacity upon demand. This will also preclude the risk of water hammer, pump cavitation, gas binding, and pumping of non-condensable gas into the reactor vessel following an initiation signal or during shutdown cooling. The 31 day frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the procedural controls governing system operation. The intent of the SR is to assure the ECCS suction and discharge piping is adequately vented.

For the Containment Spray System:

Section 4.6.2.1 (SR) "Each containment spray system shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. By verifying, that on recirculation flow, each pump develops a differential pressure of greater than or equal to 204 psid when tested pursuant to Specification 4.0.5."

The intent of the SR is to assure Containment Spray System flow path is operational at least once per 31 days and functional performance tests are performed at least once per 92 days.

The SNGS Units 1 and 2 UFSAR does not describe the means for maintaining the ECCS piping "full" or "water solid". The specific requirements are present in the SNGS Units 1 and 2 TS and plant procedures.

Therefore, no changes to the UFSAR or TS are required.

2. Summarize the changes to licensing basis documents (Corrective Actions):

SNGS Units 1 and 2 have not made any changes to the licensing basis documents as a result of evaluations performed for this GL response. The BWR/PWR Owners Groups are developing a generic Technical Specification Task Force (TSTF) Traveler for all utilities to use for Licensing Amendments and Bases revisions. After completion of the TSTF Traveler, SNGS Units 1 and 2 will consider revisions to TS, TS SR(s), and the UFSAR.

Review of the TSTF Traveler once approved by the NRC has been entered into the Corrective Actions Program (CAP) for future review. No actions are planned to revise the Containment Spray System TS.

3. Provide a detailed list of items that have not been completed, a schedule for their completion, and the basis for that schedule:

TS improvements are being addressed by the TSTF to provide an approved TSTF Traveler for making changes to individual licensee's TS related to the potential for unacceptable gas accumulation. The development of the TSTF Traveler relies on the results of the evaluations of a large number of licensees to address the various plant designs.

Salem Nuclear Generating Station, Units 1 and 2 - Nine-Month Response to NRC Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems

PSEG Nuclear is continuing to support the industry and NEI Gas Accumulation Management Team activities regarding the resolution of generic TS changes via the TSTF Traveler process. After NRC approval of the Traveler, PSEG Nuclear will evaluate its applicability to the SNGS Units 1 and 2 and evaluate adopting the Traveler to either supplement or replace the current TS requirements.

Salem Nuclear Generating Station, Units 1 and 2 - Nine-Month Response to NRC Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems

Design Evaluation

The SNGS Units 1 and 2 design basis was reviewed with respect to gas accumulation in the Emergency Core Cooling Systems: CVC System - HHSI System; RHR - LHSI System and SDC Hot Leg, SJ - IHSI System and also the CS System. This review included Design Basis Documents, Calculations, Engineering Evaluations, and Vendor Technical Manuals.

1. **Discuss the results of the review of the design basis documents. This discussion should include a description of any plant specific calculations or analyses that were performed to confirm the acceptability of gas accumulation in the piping of the affected systems, including any acceptance criteria if applicable. Note: This should describe the "as found" (pre-Generic Letter) condition prior to any corrective or enhancement actions.**

   The SNGS Units 1 and 2 design basis was reviewed with respect to gas accumulation in the subject systems. Various design basis documents were reviewed including design guidelines, calculations, engineering evaluations, design change packages and vendor technical documents.

   The ECCS systems, CVCS, RHR, SJ and also the CS system are designed, tested and operated in compliance with 10 CFR 50 Appendix A General Design Criteria, the SNGS Units 1 and 2 TS and in accordance with SNGS Units 1 and 2 UFSAR.

   Design change procedures contain detailed design review checklists to provide necessary guidance to address the fill and vent requirements for water hammer and hydraulic conditions. All safety-related modifications of the plant are performed using design changes that are independently verified to meet the requirements of the design standards and the design basis documents.

   The ECCS system monthly venting procedures assure the systems are filled with water by venting at the high point vents, which verifies system piping from the Refueling Water Storage Tank (RWST) to the system discharge isolation valve is filled with water. These procedures perform venting activities to verify the surveillance requirements of TS 4.5.2.b.2 have been satisfactorily met.

   The Containment Spray System procedure verifies each valve in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

SNGS Units 1 and 2 do not employ keep-fill systems to automatically maintain the subject systems in a filled and vented configuration.

ECCS realignments during design basis events have been evaluated as acceptable for maintaining systems full to support system operability.

Vortex effects that can potentially ingest gas into the system during design basis events are prevented by design features and water level set points that are controlled by design and operating procedures. Additionally, restrictions in maximum flow rates help prevent vortex effects during shutdown cooling operations during reduced Reactor Coolant System (RCS) inventory.

The ECCS pump suction lines are designed to minimize the risk of gas accumulation and subsequent intrusion in the pump suctions. This is accomplished by maintaining an adequate water level in the RWST, the ECCS pumps' suction source. Twice every shift, the RWST volume is verified to be within TS allowable limits by Operations provided in the Operators Log. This ensures the headers are sufficiently full of water.

ECCS system pump discharge check valves prevent water in the discharge piping from pressing its way back into the RWST, thus precluding the formation of gas voids in the ends of the discharge header.

The design of the subject systems does not include specific voided piping as part of the design, except for CS pump discharge piping downstream of the injection isolation valves to the CS spray ring riser and header inside containment.

The ECCS design basis minimizes gas accumulation.

2. Discuss new applicable gas volume acceptance criteria for each piping segment in each system where gas can accumulate where no acceptance criteria previously existed and summarize the Corrective Actions, and schedule for completion of any Corrective Actions.

a) Pump Suction Piping

SNGS Units 1 and 2 CVC procedures provides assurance that the volume of gas in the pump suction piping for the affected systems is limited such that pump gas ingestion is within 5%.

A draft report, Pump Gas Ingestion Tolerance Criteria, has been issued to provide guidance for allowable gas accumulation in the pump suction piping. This PWROG program will establish interim pump gas ingestion limits to be employed by the member utilities. The interim criteria addresses pump mechanical integrity only and are as follows:

	Single-Stage	***Multi-Stage***	***Multi-Stage***
		Stiff Shaft	Flexible Shaft
Steady-State	2%	2%	2%
Transient*	5% for 20 sec.	20% for 20 sec.	10% for 5 sec.
$Q_{B.E.P.}$ Range	70%-120%	70%-140%	70%-120%
Pump Type (transient data)	WDF	CA	RLIJ, JHF
* The transient criteria are based on pump test data and vendor supplied information.			

SNGS is evaluating development of and implementation of the gas volume acceptance criteria within the above PWROG program proposed interim criteria.

b) Pump discharge piping which is susceptible to pressure pulsation after a pump start.

A joint Owner's Group program evaluated pump discharge piping gas accumulation. Gas accumulation in the piping downstream of the pump to the first closed isolation valve or the RCS pressure boundary isolation valves will result in amplified pressure pulsations after a pump start. The subsequent pressure pulsation may cause relief valves in the subject systems to lift, or result in unacceptable pipe loads, i.e., axial forces that are greater than the design rating of the axial restraint(s). The joint Owner's Group program establishes a method to determine the limit for discharge line gas accumulation to be utilized by the member utilities.

The method uses plant specific information for piping restraints and relief valve set points in the subject systems to determine the acceptable gas volume accumulation such that relief valve lifting in the subject systems does not occur and pipe loading is within acceptable limits, i.e., axial forces that are less than the design rating of the axial restraint(s).

PSEG Nuclear is evaluating implementation of this methodology for SNGS Units 1 and 2 and establishing the applicable limits for gas accumulation in the discharge piping of the CVC System - HHSI System; RHR - LHSI System and SDC Hot Leg, and SJ - IHSI System.

b) Pump discharge piping that is not susceptible to water hammer or pressure pulsation following a pump start.

1. The PWROG methodology for Containment Spray evaluates the piping response as the Containment Spray header is filled and compares the potential force imbalances with the weight of the piping. The net force resulting from the pressurization of the Containment Spray header during the filling transient is a small fraction of the dead weight of the filled piping, and therefore the filling transient is well within the margin of the pipe hangers.

   The SNGS Units 1 and 2 Containment Spray System discharge header piping was evaluated using a methodology similar to the PWROG methodology described above. Using this methodology it was determined that the force imbalances on the Containment Spray System discharge header piping are within the margin of the pipe hangers.

2. A PWROG methodology has been developed to assess when a significant gas-water waterhammer could occur during switchover to hot leg injection. The methodology concludes that: If the upstream valve has an opening time of approximately 10 seconds and the downstream path to the Reactor Coolant System (RCS) is only restricted by check valve(s), no significant waterhammer would occur. The relief valves in the subject systems would not lift and the piping restraints would not be damaged.

   The SNGS Units 1 and 2 ECCS flow path for switchover to hot leg injection has an upstream valve that has an opening time of less than 10 seconds (5.7 to 9.5 seconds) and the downstream path to the RCS is only restricted by check valves. The sequence used during switchover to hot leg injection is to stop the IHSI pump, close the cold leg recirculation injection valve and open the hot leg recirculation injection valve, then re-start the IHSI pump. This method is repeated for the second pump, if operating, by closing the cold leg recirculation isolation valve, removing the lockout from combined cold leg recirculation injection isolation valve and closing it, and then, finally, opening

the hot leg recirculation injection isolation valve. Therefore, no significant waterhammer will occur. The relief valves in the subject systems would not lift and the piping restraints would not be damaged.

d) RCS Allowable Gas Ingestion

The PWROG qualitatively evaluated the impact of non-condensable gases entering the RCS on the ability on the post-accident core cooling functions of the RCS. This evaluation assumed that 5 cubic feet of non-condensable gas at 400 psig was present in the HHSI and IHSI discharge piping concurrent with 5 cubic feet of non-condensable gas at 100 psig in the Low Head Safety Injection discharge piping. The qualitative evaluation concluded that the quantities of gas will not prevent the ECCS from performing its core cooling function.

SNGS Units 1 and 2 venting procedures provide assurance that the gas accumulation in any sections of the SNGS Units 1 and 2 RHR - LHSI system cold leg ensures there is less than 5 cubic feet of non-condensable gas at 100 psig at any location. SNGS Units 1 and 2 venting procedures also provide assurance that the gas accumulation in any sections of the SNGS Units 1 and 2 CVCS - HHSI cold leg injection and SJ - IHSI system cold leg and hot leg piping is less than 5 cubic feet of non-condensable gas at 400 psig at any location.

3. Summarize the changes, if any, to the design basis documents (Corrective Actions) and the schedule for completion of the Corrective Actions.

SNGS Units 1 and 2 are evaluating implementation of the above methodologies and establishing the applicable limits for gas accumulation in piping of the ECCS systems: CVC System - HHSI System; RHR - LHSI System and SDC Hot Leg; and SJ - IHSI System.

Development and implementation of the gas volume acceptance criteria has been entered into the CAP.

The schedule for completion of the corrective actions is no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

4. Discuss the results of the system P&ID and isometric drawing reviews to identify all system vents and high points.

The system flow paths, as shown on the P&ID and isometric drawings, were reviewed to identify vents and high points. The reviewed lines were highlighted on P&ID and isometric drawings. The system high points included isolated branch lines (dead legs), pump casings, valve bodies, heat exchangers, and improperly sloped piping by design (e.g. piping sloped or elevated to an un-vented high point). Vent valves referenced in system fill and vent procedures were identified on the drawings. In addition, pipe diameter transitions in horizontal lines that could trap gas such as pipe reducers and orifices were reviewed.

Potential dead legs (isolated branch lines) with the potential for gas accumulation were identified during the drawing review. These concerns have been incorporated into the CAP for evaluation, for potential confirmatory UT and for consideration of procedural changes or the addition of new vents to enhance filling and venting operations.

Potential vent locations have been identified and are being considered on the suction and discharge piping of the ECCS systems. This concern has been incorporated into the CAP for evaluation to enhance filling and venting operations.

Existing vent locations identified during drawing reviews are currently under review in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures.

5. Identify new vent valve locations, modifications to existing vent valves, or utilization of existing vent valves based on the drawing review, and summarize the Corrective Actions, and schedule for completion of the Corrective Actions.

Based on the results of the drawing review, 10 (Unit 1) and 11 (Unit 2) potential vent locations have been identified and are currently under review in the CAP for consideration to enhance fill and venting operations.

The cross-connect section of RHR system piping in both Units between the RH19 valves was identified as being not fully ventable.

The pipe section is swept free of voids using the filling and venting procedure when restoring the system post outage. A minor gas bubble in this section of the RHR piping poses no operability concerns since this section of piping is not in the direct flow path of the RHR pumps. UT's have been completed to determine if any air exists in these lines. The piping has been verified full of water. Installation of a vent valve in this section of piping for both units has been entered in the CAP for evaluation.

A total of 19 (Unit 1) and 13 (Unit 2) existing vent locations identified during drawing reviews are currently under review in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures.

The schedule for completion of the corrective actions is completion of the evaluations no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17 and implementation of the recommended enhancements no later than 90 days from the completion of the following refueling outages, 1R20 and 2R18.

6. **Discuss the results (including the scope and acceptance criteria used) of the system confirmation walkdowns that have been completed for the portions of the systems that require venting to ensure that they are sufficiently full of water.**

All CS System piping (suction and discharge piping) from the RWST to the discharge isolation valve which is required to be water-filled to perform its design basis function has been completely walked down except as noted in Section 7 below.

All CVCS - HHSI System piping (suction and discharge piping) from the RWST to the injection point which is required to be water-filled to perform its design basis function has been completely walked down except as noted in Section 7 below.

All RHR- LHSI System piping (suction and discharge piping) from the RWST to the injection point and RHR – SDC Hot Leg Suction piping which is required to be water-filled to perform its design basis function has been completely walked down except as noted in Section 7 below.

All SJ - IHSI System piping (suction and discharge piping) from the RWST to the injection point which is required to be water-filled to perform its design basis function has been completely walked down except as noted in Section 7 below.

Piping slopes were calculated by taking relative piping elevation measurements over each continuous horizontal segments of piping using an industry recognized elevation-measuring device known as a ZipLevel. All segments sloped in an improper direction of one degree or greater have been entered into the CAP and have had Ultrasonic Testing (UT) performed at the high points of the segment and verified to be full of water. All segments sloped in an improper direction of one half degree to one degree have been entered into the CAP for evaluation. All piping was either measured level (below one half degree) or sloped in the appropriate direction (e.g. towards a system vent connection) except as noted below;

The walkdowns for the Containment Spray system piping found two (Unit 1) and one (Unit 2) segments sloped in the incorrect direction.

The walkdowns for the Chemical and Volume Control System piping found four (Unit 1) and two (Unit 2) segments sloped in the incorrect direction.

The walkdowns for the RHR system piping found two (Unit 1) and three (Unit 2) segments sloped in the incorrect direction.

The walkdowns for the Safety Injection system piping found five (Unit 1) and seven (Unit 2) segments sloped in the incorrect direction.

These walkdown results are currently under review in the CAP for consideration to enhance the filling and venting operations.

During the ECCS system walkdowns, vent valves were verified to be installed in the design locations as shown on plant drawings.

7. **Identify new vent valve locations, modifications to existing vent valves, or utilization of existing vent valves that resulted from the confirmatory walkdowns, and summarize the Corrective Actions, and the schedule for completion of the Corrective Actions, i.e., the walkdowns that have been completed, and the walkdowns not yet complete (refer to Reference 2 Three-Month Response to NRC Generic Letter 2008-01).**

Only two potential vent locations (one on Unit 1 CVC – HHSI discharge and one on Unit 2 SJ – IHSI discharge) were identified from walkdown activities as having 1 degree slope or more. UT has been performed at these locations and verified full of water. They are currently under review in the CAP for consideration to enhance filling and venting operations.

The remaining improperly sloped piping, identified from walkdown activities as having one-half degree to one degree slope, are currently under review in the CAP for consideration to enhance filling and venting operations.

No modifications to existing vent valves or utilization of existing vent valves were identified as a result of the walkdowns.

As identified in Reference 2 and approved in Reference 3, PSEG Nuclear will complete necessary confirmatory walkdowns of inaccessible piping in the SNGS Units 1 and 2 during the Salem Refueling Outages (1R19 and 2R17). A confirmatory walkdown will be performed on the piping systems inside the biological shield wall during the next refueling outages, 1R19 and 2R17.

8. Discuss the results of the fill and vent activities and procedure reviews for each system. (Note that routine periodic surveillance testing is addressed in the "Testing Evaluation" section of this template).

A review was performed on the procedures used to vent ECCS piping systems that are susceptible to void formation which are attributable to fill and vent activities.

System specific operating procedures are used to refill the ECCS systems following a system drain after outages and some maintenance activities. These procedures provide the means to fill and vent the subject systems as well as purge air and other non-condensable gases from associated designed piping high points.

Operating procedures assure systems are filled by venting to verify a solid stream of water issues from the vent. These venting activities meet the requirements of TS 4.5.2.b.2.

Enhancement considerations have been identified to some operating procedures for acceptance criteria for venting activities and venting termination guidance. All potential procedure changes are currently under review in the CAP for consideration to enhance filling and venting operations.

SNGS Units 1 and 2 use dynamic venting in the Containment Spray and the Residual Heat Removal system operating procedures.

The fill and vent procedures were reviewed to determine if venting of instrument lines was included. Backfilling of instrumentation is performed only in the RHR procedure. There is no backfilling of instrumentation performed in the other ECCS procedures. Potential changes to the fill and vent procedures for the ECCS systems are currently under review in the CAP for consideration to enhance filling and venting operations.

As a result of the reviews, procedure revisions have been identified and are discussed in Section 9 below.

9. Identify procedure revisions, or new procedures resulting from the fill and vent activities and procedure reviews that need to be developed, and summarize the Corrective Actions, and schedule for completion of the Corrective Actions. (Note that routine periodic surveillance testing is addressed in the "Testing Evaluation" section of this template).

SNGS Units 1 and 2 is considering clarifying acceptance criteria for venting activities and venting termination guidance in operating procedures within the CAP.

SNGS Units 1 and 2 is considering revising fill and vent procedures to include guidance for addressing instrumentation lines within the CAP.

SNGS Units 1 and 2 is considering adding existing vent valves to procedures identified to enhance fill and venting operations within the CAP.

No new procedures are required to control venting of the subject systems.

The schedule for the completion of these corrective actions is no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

10. Discuss potential gas intrusion mechanisms into each system for each piping segment that is vulnerable to gas intrusion.

System potential gas intrusion includes dissolved gas coming out of solution, in-leakage through vent valves when the local system pressure is less than atmospheric, inadvertent draining due to incorrect maintenance or testing procedures, inadequate post maintenance fill and vent activities, and conditions where local temperatures are at or above saturation temperature. Nitrogen-charged accumulators are connected to SJ and RHR ECCS cold leg injection lines. The RWST is not a pressurized vessel. The only pressurization the RWST provides on the ECCS system pump suction is as a result of the static head from the level of water in the vessel. The nitrogen-charged Spray Additive Tank is connected to the CS system.

11. Ongoing Industry Programs

Ongoing industry programs are planned in the following areas which may impact the conclusions reached during the Design Evaluation of the SNGS Units 1 and 2 relative to gas accumulation.

The activities will be monitored to determine if additional changes to the SNGS Units 1 and 2 designs may be required or desired to provide additional margin.

12. Provide a detailed list of items that have not been completed, a schedule for their completion, and the basis for that schedule.

SNGS Units 1 and 2 are evaluating implementation of the PWROG program methodologies and establishing the applicable limits for gas accumulation in piping of the ECCS systems: CVC System - HHSI System; RHR - LHSI System and SDC Hot Leg; and SJ - IHSI System. Development and implementation of the gas volume acceptance criteria has been entered into the CAP. The schedule for completion of the evaluations is no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

The cross-connect section of RHR system piping in both Units between the RH19 valves was identified as being not fully ventable. The pipe section is swept free of voids using the filling and venting procedure when restoring the system post outage. A minor gas bubble in this section of the RHR piping poses no operability concerns since this section of piping is not in the direct flow path of the RHR pumps. UT's have been completed to determine if any air exists in these lines. The piping has been verified full of water. Installation of a vent valve in this section of piping for both units has been entered in the CAP for evaluation. Based on the results of the drawing review, ten (Unit 1) and eleven (Unit 2) potential vent locations have been identified and are currently under review in the CAP for consideration to enhance fill and venting operations.

The schedule for completion of the corrective actions shall have two parts as follows:

1. Completion of the evaluations no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17 and;

2. Implementation of the recommended enhancements no later than 90 days from the completion of the following refueling outages, 1R20 and 2R18.

A total of 19 (Unit 1) and 13 (Unit 2) existing vent locations identified during drawing reviews are currently under review in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures.

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The schedule for completion of the corrective actions is no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

Only two potential vent locations (one on Unit 1 CVC – HHSI discharge and one on Unit 2 SJ – IHSI discharge) were identified from walkdown activities as having 1 degree slope or more. UT has been performed at these locations and verified full of water. They are currently under review in the CAP for consideration to enhance filling and venting operations.

The remaining improperly sloped piping, identified from walkdown activities as having one-half degree to one degree slope, are currently under review in the CAP for consideration to enhance filling and venting operations.

As identified in Reference 2, PSEG Nuclear will complete necessary confirmatory walkdowns of inaccessible piping in the SNGS Units 1 and 2 during the Salem Refueling Outages (1R19 and 2R17). A confirmatory walkdown will be performed on the piping systems inside the biological shield wall during the next refueling outages.

SNGS Units 1 and 2 are considering clarifying acceptance criteria for venting activities and venting termination guidance in operating procedures within the CAP.

SNGS Units 1 and 2 are considering revising fill and vent procedures to include guidance for addressing instrumentation lines within the CAP. The schedule for the completion of these corrective actions is no later than 90 days after completion of the 1R19 and 2R17 refueling outage.

The basis for the schedule of the activities is that the activities are enhancement and confirmatory actions only and do not require immediate resolution. The current 31 day ECCS venting procedures ensure the systems are maintained full of water. The actions will coincide with the planned follow-up response scheduled for no later than 90 days after completion of the 1R19 and 2R17 Refueling Outages. The installation of potential vent valves will be completed to support submittal of an updated response no later than 90 days from the completion of the 1R20 and 2R18 refueling outages. This will allow proper planning of the recommended actions.

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Testing Evaluation

1. **Discuss the results of the periodic venting or gas accumulation surveillance procedure review.**

   Periodic (monthly) ECCS venting procedures specify vent points to ensure the subject system piping is full of water for each ECCS system. The procedures ensure that a solid stream of water is observed from the vent valves.

   There is no consistent observation time, however, acceptance criteria is met by water issuing from vents.

   The Containment Spray System (CS) is not included in the periodic monthly testing since the design of the system precludes gas accumulation that can affect CS pump operation or result in water hammer. Monthly surveillance procedures assure CS is available by verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position.

2. **Identify procedure revisions, or new procedures resulting from the periodic venting or gas accumulation surveillance procedure review that need to be developed.**

   No new procedures resulting from the periodic venting or gas accumulation surveillance procedure review have been identified.

   The following change to existing procedures has been identified:

   > There is no consistent observation time for the solid flow and acceptance criteria. Procedure revisions for periodic surveillance venting to provide consistent observation times and acceptance criteria have been identified.

   These issues have been entered into the CAP.
   No actions are planned to revise the Containment Spray System Technical Specifications or surveillance procedures.

3. **Discuss how procedures adequately address the manual operation of the RHR system in its decay heat removal mode of operation. Include how the procedures assure that the RHR system is sufficiently full of water to perform its decay heat removal safety function (high point venting or UT) and how pump operation is monitored by plant personnel (including a description of the available instrumentation and alarms).**

During RHR shutdown cooling operation, coolant flows from the RCS to the RHR pumps, through the tube side of the residual heat exchangers and back to the RCS. The inlet line to the RHR System loop begins at the hot leg of one reactor coolant loop and the return line is connected to the four reactor coolant cold legs.

The RHR shutdown cooling operating procedure performs manual switchover to shutdown cooling. Pressurizer level and RWST level are monitored for any valve leakage while opening RH1 and RH2. RHR discharge valves are throttled open at RCS temperatures of 350 degrees or less to pressurize the suction piping at the RHR pump. During heat up of the RHR system heat exchanger inlet and outlet temperatures are monitored.

The RHR shutdown cooling function have associated alarms in the Control Room, warning plant personnel of valve and pump issues. If plant personnel receive an alarm, the RHR alarm response procedure directs them to a specific shutdown cooling abnormal condition procedure that provides specific steps to respond to the alarm.

Surveillance procedures vent the RHR pump suction and discharge piping high points outside of the containment. Should any gas be detected, it is recorded in the procedure and a notification is initiated.

4. **Summarize the results of the procedure reviews performed to determine that gas intrusion does not occur as a result of inadvertent draining due to valve manipulations specified in the procedures, system realignments, or incorrect maintenance procedures.**

Procedures for system realignments, maintenance and testing were reviewed for potential gas intrusion. The operating procedures at SNGS refer to the fill and venting procedures that are required to be performed prior to declaring the system operable after maintenance has been performed to assure the system is full of water.

Maintenance practices and procedures were reviewed and no issues were identified which would result in inadvertent draining due to valve manipulations specified in the procedures, system realignments, or incorrect maintenance procedures.

5. **Describe how gas voids are documented (including the detection method such as venting and measuring or UT and void sizing and post venting checks), dispositioned (including method(s) used such as static or dynamic venting), and trended, if found in any of the subject systems.**

SNGS ECCS monthly fill and vent procedures state if air is found in the system during the venting process to document the presence of air, estimate the vented air volume, and any additional pertinent information in the record copy of the procedure.

Gas voids found during periodic testing are documented in the CAP. Post venting UT is not normally performed as fluid flow from the vent is confirmed. Voids found during periodic testing are trended in the CAP to determine possible sources and frequency of development.

Periodic venting results to confirm that the systems are full of water are documented in the procedure and maintained in the Document Control Records Management System (DCRMS) that allows trending to be performed.

Trending ECCS voiding is not an assigned Specialty Program function performed at Salem for gas intrusion issues.

Explain here or in the "Corrective Actions Evaluation" section the threshold (acceptance criteria) for entry into the Corrective Action Program (CAP) and how the CAP addresses disposition and trending. For gas voids less than the CAP threshold, if applicable, describe how these gas voids are documented and trended as a means to detect system changes that may be indicative of degradation leading to future gas voiding.

Periodic venting results to confirm that the systems are full of water are documented in the procedure and maintained in the Document Control Records Management System (DCRMS) that allows trending to be performed. If acceptance criteria are added to the surveillance procedures, these results will be maintained and trended as described above.

6. Provide a detailed list of items that have not been completed, a schedule for their completion, and the basis for that schedule.

Procedure revision has been identified to address monthly venting performed for the ECCS systems. There is no consistent observation time for the solid flow and acceptance criteria. These enhancements are entered into the CAP to be taken under consideration for adding performance time and acceptance criteria.

Periodic venting results to confirm that the systems are full of water are documented in the procedure and maintained in the Document Control Records Management System (DCRMS). Enhancing the monthly fill and vent procedures for the purposes of trending has been identified and is entered into the CAP for evaluation.

The schedule for the completion of these corrective actions is no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

The basis for the schedule of the activities is that the activities are enhancement and confirmatory actions only and do not require immediate resolution. The current 31 day ECCS venting procedures ensure the systems are maintained full of water. The actions will coincide with the planned follow-up response scheduled for no later than 90 days after completion of the 1R19 and 2R17 Refueling Outages. The installation of potential vent valves will be completed to support submittal of an updated response no later than 90 days from the completion of the 1R20 and 2R18 refueling outages. This will allow proper planning of the recommended actions.

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Corrective Actions Evaluation

1. **Summarize the results of the reviews regarding how gas accumulation has been addressed at your site.**

   ECCS venting and operating procedures have been reviewed. All non-outage walkdowns have been completed. All segments sloped in an improper direction of one degree or greater have been entered into the CAP and have had Ultrasonic Testing (UT) performed at the high points of the segment and verified to be full of water. All ECCS system vent locations have been verified in the field.

   SNGS Units 1 and 2's CAP is used to document gas intrusion/accumulation issues as potential nonconforming conditions. Existing procedures for the Emergency Core Cooling Systems (ECCS): CVC System - HHSI System; RHR - LHSI System and SDC Hot Leg, SJ - IHSI System require a notification to be initiated and the Control Room Supervisor notified if any gas is detected. As part of PSEG Nuclear's CAP, notifications related to plant equipment are evaluated for potential impact on operability and reportability. Therefore, SNGS Units 1 and 2's review concluded that issues involving gas intrusion/accumulation are properly prioritized and evaluated under the CAP.

2. **Provide a detailed list of items that have not been completed, a schedule for their completion, and the basis for that schedule.**

   See Section C, issue 2 below.

Conclusion

Based upon the above, PSEG Nuclear has concluded that SNGS Units 1 and 2 is in conformance with its commitments to 10 CFR 50, Appendix B, Criterion III, V, XI, XVI, and XVII, as described in the Licensee Quality Assurance Program or any identified deviations that have not yet been corrected are entered into the SNGS Units 1 and 2 CAP for tracking and final resolution, as described in Section C of this Enclosure.

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B. DESCRIPTION OF NECESSARY CORRECTIVE ACTIONS

The following corrective actions were determined to be necessary to assure compliance with the applicable regulations:

The cross-connect section of piping of the RHR system between the RH19 valves was identified as not fully ventable. UT's have been completed to determine if any air exists in these lines. The piping has been verified full of water.

Only two potential vent locations (one on Unit 1 CVC – HHSI discharge and one on Unit 2 SJ – IHSI discharge) were identified from walkdown activities as having 1 degree slope or more. UT has been performed at these locations and verified full of water.

C. CORRECTIVE ACTION SCHEDULE

1. Summarize the corrective actions that have been completed as a result of the evaluations discussed above.

The cross-connect section of piping of the RHR system between the RH19 valves was identified as not fully ventable. UT's have been completed to determine if any air exists in these lines. The piping has been verified full of water.

Only two potential vent locations (one on Unit 1 CVC – HHSI discharge and one on Unit 2 SJ – IHSI discharge) were identified from walkdown activities as having 1 degree slope or more. UT has been performed at these locations and verified full of water.

2. Summarize the corrective actions to be completed including the scope, schedule, and a basis for that schedule.

The BWR/PWR Owners Groups are developing a generic Technical Specification Task Force (TSTF) Traveler for all utilities to use for Licensing Amendments and Bases revisions. After completion of the TSTF Traveler, Salem Nuclear Generating Station Units 1 and 2 will consider revisions to TS, TS SR(s), and the UFSAR.

Review of the TSTF Traveler once approved by the NRC has been entered into the CAP for future review.

SNGS Units 1 and 2 is evaluating implementation of the PWROG program methodologies and establishing the applicable limits for gas accumulation in piping of the ECCS systems: CVC System - HHSI System; RHR - LHSI System and SDC Hot Leg; and SJ - IHSI System.

Development and implementation of the gas volume acceptance criteria has been entered into the CAP.

The schedule for completion of the corrective actions is no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17. The cross-connect section of piping of the RHR system between the RH19 valves was identified as not fully ventable. UT's have been completed to determine if any air exists in these lines. The piping has been verified full of water. Installation of a vent valve in this section of piping for both units has been entered in the CAP for evaluation.

Based on the results of the drawing review, ten (Unit 1) and eleven (Unit 2) potential vent locations have been identified and are currently under review in the CAP for consideration to enhance fill and venting operations.

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A total of 19 (Unit 1) and 13 (Unit 2) existing vent locations identified during drawing reviews are currently under review in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures.

The schedule for completion of the corrective actions is completion of the evaluations no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17, and implementation of the recommended enhancements no later than 90 days from the completion of the following refueling outages, 1R20 and 2R18.

Only two potential vent locations (one on Unit 1 CVC – HHSI discharge and one on Unit 2 SJ – IHSI discharge) have been identified from walkdown activities as having 1 degree slope or more, and are currently under review in the CAP for consideration to enhance filling and venting operations.

The remaining improperly sloped piping, identified from walkdown activities as having one-half degree to one degree slope, are currently under review in the CAP for consideration to enhance filling and venting operations.

As identified in Reference 2 and approved by the NRC in Reference 3, PSEG Nuclear will complete necessary confirmatory walkdowns of inaccessible piping in the SNGS Units 1 and 2 during the Salem Refueling Outages (1R19 and 2R17). A confirmatory walkdown will be performed on the piping systems inside the biological shield wall during the next refueling outages, 1R19 and 2R17.

SNGS Units 1 and 2 is considering clarifying acceptance criteria for venting activities and venting termination guidance in operating procedures within the CAP.

SNGS Units 1 and 2 is considering revising fill and vent procedures to include guidance for addressing instrumentation lines within the CAP. Procedure revision has been identified to address monthly venting performed for the ECCS systems. There is no consistent observation time for the solid flow and acceptance criteria. These enhancements are entered into the CAP to be taken under consideration for adding performance time and acceptance criteria.

Periodic venting results to confirm that the systems are full of water are documented in the procedure and maintained in the Document Control Records Management System (DCRMS). Enhancing the monthly fill and

vent procedures for the purposes of trending has been identified and is entered into the CAP for evaluation.

The schedule for the completion of these corrective actions is no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

The basis for the schedule of the activities is that the activities are enhancement and confirmatory actions only and do not require immediate resolution. The current 31 day ECCS venting procedures ensure the systems are maintained full of water. The actions will coincide with the planned follow-up response scheduled for no later than 90 days after completion of the 1R19 and 2R17 Refueling Outages. The installation of potential vent valves will be completed to support submittal of an updated response no later than 90 days from the completion of the 1R20 and 2R18 refueling outages. This will allow proper planning of the recommended actions.

Ongoing industry programs are planned which may impact the conclusions reached during the Design Evaluation of the SNGS Units 1 and 2 relative to gas accumulation. The activities will be monitored to determine if additional changes to the SNGS Units 1 and 2 designs may be required or desired to provide additional margin.

CONCLUSION

PSEG Nuclear has evaluated the accessible portions of those SNGS Units 1 and 2 systems that perform the functions described in this GL and has concluded that these systems are Operable, as defined in the SNGS Units 1 and 2 TS and are in conformance to our commitments to the applicable General Design Criteria (GDC), as stated in the SNGS Units 1 and 2 UFSAR.

The open actions cited above are considered to be enhancements to the existing programs/processes/procedures for assuring continued Operability of these subject systems.

As committed in Reference 2, and approved by the NRC in Reference 3, SNGS Units 1 and 2 will complete its assessments of those inaccessible portions of these systems/functions during the next refueling outages and provide a supplement to this report with those results no later than 90 days from the completion of the next refueling outages, 1R19 and 2R17.

Attachment
LR-N08-0234

List of Commitments
Salem Generating Station Units 1 and 2

The following table identifies those actions committed to by PSEG. Any other statements in this letter are provided for information purposes and are not considered regulatory commitments.

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (YES/NO)	PROGRAM-MATIC (YES/NO)
Unit 1: All evaluations pertaining to Unit 1 entered into the CAP as described in Section C of the Enclosure will be completed and a supplemental response submitted to the NRC no later than 90 days following the end of Salem Unit 1 Refuel Outage. **(CM-U1-2008-98)**	End of 1R19 + 90 days	Yes	No
Unit 1: All corrective actions for Salem Unit 1 initiated as a result of completing the evaluations described in Section C of the Enclosure and those discovered as a result of walkdowns of inaccessible areas, will be completed no later than the end of Salem Unit 1 Refuel Outage. **(CM-U1-2008-99)**	End of 1R20	Yes	No
Unit 2: All evaluations pertaining to Unit 2 entered into the CAP as described in Section C of the Enclosure will be completed and a supplemental response submitted to the NRC no later than 90 days following the end of Salem Unit 2 Refuel Outage. **(CM-U2-2008-100)**	End of 2R17 + 90 days	Yes	No
Unit 2: All corrective actions for Salem Unit 2 initiated as a result of completing the evaluations described in Section C of the Enclosure and those discovered as a result of walkdowns of inaccessible areas, will be completed no later than the end of Salem Unit 2 Refuel Outage. **(CM-U2-2008-101)**	End of 2R18	Yes	No