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LR N08-0225

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

Hope Creek Generating Station
Facility Operating License No. NPF-57
NRC Docket No. 50-354

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-N08-0073, "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 Program (CAP) for the Emergency Core Cooling Systems (ECCS), Residual Heat Removal (RHR) 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, Hope Creek Generating Station has concluded that the subject systems/functions are in compliance with the Technical Specification definition of Operability, i.e., capable of performing their intended safety function and that the Hope Creek Generating Station is 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, Hope Creek Generating Station will complete its assessments of those inaccessible portions of these systems/functions during the next Refuel Outage and provide a supplement to this report with those results no later than 90 days from the completion of the next refueling outage.

The enclosure to this letter contains the Hope Creek Generating Station nine-month response to NRC GL 2008-01.

This letter contains the following new NRC commitments:

1. All evaluations 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 Hope Creek Refuel Outage RF15. **(CM-HC-2008-96)**

2. All corrective actions 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 Hope Creek Refuel Outage RF16. **(CM-HC-2008-97)**

If there are any questions regarding this response, please contact Lee Marabella at (856) 339-1208.

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

Executed on 10-13-08

Sincerely,

George P. Barnes

George P. Barnes
Site Vice President – Hope Creek

Enclosure: Hope Creek Generating Station 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
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Hope Creek Generating Station 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 Hope Creek Generating Station 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, RHR 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 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 (See Section B of enclosure); and,

(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 enclosure).

The following systems were determined to be in the scope of GL 2008-01 for Hope Creek Generating Station:

- Residual Heat Removal System (RHR) (Various modes of operation)
- High Pressure Coolant Injection (HPCI)
- Core Spray System

However, there are related issues that the nuclear industry is currently considering with respect to the overall performance of these systems (e.g., GSI-193). Resolution of these issues will continue to be pursued through the various Owner's Groups and industry leadership organizations and will not be addressed herein.

Hope Creek Generating Station 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 Hope Creek Generating Station reviewed the licensing basis with respect to gas accumulation in the Emergency Core Cooling Systems (ECCS): Residual Heat Removal System (RHR) (including Containment Spray), High Pressure Coolant Injection (HPCI) and the Core Spray 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 Hope Creek Generating Station TS have the following surveillance requirement (SR) for the core spray system, the LPCI system, and the HPCI system:

TS Section 4.5.1.a.1.a (SR): "Verifying by venting at the high point vents that the system piping from the pump discharge valve to the system isolation valve is filled with water."

This surveillance is performed at least once per 31 day frequency.

The ECCS system pumps are normally in a standby, non-operating mode. The ECCS Pump discharge piping maintains ECCS system discharge piping full of water to prevent water hammer damage to piping and to start cooling at the earliest moment. 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 pump discharge piping is full of water by adequately venting each system.

The Hope Creek Generating Station UFSAR Section 1.12.3.1, specifies that there is an ECCS discharge line fill network to ensure that the ECCS lines remain full of water, the ECCS pumps will not start pumping into voided lines, and steam will not collect in the ECCS piping to preclude the risk of waterhammer in the ECCS system pump discharge piping. Furthermore, UFSAR Section 6.3.2.2.6 specifies that the ECCS discharge line fill network is designed to maintain the ECCS pump discharge lines in a filled condition and ensure this leakage from the discharge lines is replaced.

Hope Creek Generating Station Nine-Month Response to NRC Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems

The primary fill network consists of three independent jockey pumps. Instrumentation is also provided to assist the operator in ascertaining the proper operation of the entire fill network. There exist procedures for each ECCS system jockey pump's return to service and removal from service, which includes the use of a back-up fill network consisting of the Condensate Storage and Transfer System.

Therefore, no changes to the UFSAR or TS are required based on the result of these reviews.

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

Hope Creek Generating Station has not made any changes to the licensing basis documents as a result of evaluations performed for this Generic Letter 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. Upon completion of the TSTF Traveler, Hope Creek Generating Station will consider revisions to TS, Technical Specification SR(s), and the UFSAR.

Review of the TSTF Traveler, once approved by the NRC, has been entered into the Corrective Action Program (CAP) for future review.

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 Technical Specifications Task Force (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. 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 Hope Creek Generating Station, and evaluate adopting the Traveler to either supplement or replace the current TS requirements.

Hope Creek Generating Station 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 Hope Creek Generating Station design basis was reviewed with respect to gas accumulation in the Emergency Core Cooling Systems: Residual Heat Removal System (RHR) (including Containment Spray), High Pressure Coolant Injection (HPCI) and the Core Spray 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 Hope Creek Generating Station 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 requirements.

   ECCS systems, HPCI, Low Pressure Coolant Injection (LPCI), and Core Spray are designed, tested and operated in accordance with 10 CFR 50 Appendix A, the 10 CFR 50 General Design Criteria, and the Hope Creek Generating Station UFSAR and TS.

   System monthly venting procedures are in place for each system that assure the systems are filled with water by venting at the high point vents and verifying from the discharge piping to the system isolation valve is filled with water. These procedures perform venting activities to verify the Surveillance Requirements of TS 4.5.1.a.1.a have been satisfactorily met.

   The LPCI and Core Spray systems are designed to have voided pipe downstream of the first normally closed motor operated isolation valve. A portion of piping that discharges into the vessel, or lines directly connected to the vessel, will void (due to flashing) during vessel de-pressurization and are designed accordingly. It has been demonstrated by the BWROG that any voids for these sections of piping downstream of the first normally closed motor operated isolation valve will not create a waterhammer that could challenge the operability of those systems when required to mitigate any postulated events. Containment Spray discharges into a voided atmosphere and is voided by design.

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Any pressure transients occurring due to voids are accounted for in the original piping design margin. Piping design philosophy is to design piping to preclude severe waterhammer events.

The ECCS pump suction lines, with the exception of the 'C' and 'D' Shutdown Cooling suction crossties, are designed to preclude the risk of gas accumulation and subsequent intrusion in the pump suctions. This is accomplished by maintaining an adequate water level in the Torus, the ECCS pumps' suction source. Once per 24 hours, the Torus level is verified to be within TS allowable limits by Operations to fulfill the requirements of TS SR 4.5.3.1 and 4.6.2.1.a. This ensures the ECCS suction headers are sufficiently full of water.

The system review determined the 'C' and 'D' Shutdown Cooling suction crossties lines to be susceptible to voiding issues. These lines were subsequently ultrasonically tested and found to contain voids. Corrective actions have been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable.

The LPCI and Core Spray ECCS system suction headers are kept full of water by the Torus level. The check valve at the pump discharge is also located below the water levels in the CST and Torus to ensure that piping upstream of the valve is maintained full of water. The HPCI system suction header is kept full of water by the Torus level when aligned to the Torus; or the Condensate Storage Tank (CST) volume when aligned to the CST. The check valve at the pump discharge is also located below the water levels in the CST and Torus to ensure that piping upstream of the valve is maintained full of water.

In addition, the ECCS systems have a keep-fill system with dedicated jockey pumps that maintains the ECCS discharge piping pressurized to preclude the risk of voiding. Alternate keep-fill is provided by the Condensate Storage and Transfer System.

The ECCS system's design basis appropriately minimizes gas accumulation (with the exception noted above).

Hope Creek Generating Station Nine-Month Response to NRC Generic Letter 2008-01, Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems

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

The BWR Owners' Group Technical Report "ECCS Pumps Suction Void Fraction Study" determined gas volume acceptance criteria for ECCS pump suction to be a bounding 2% void fraction for continuous voiding and 10% void fraction for up to five seconds. The 2% criterion has been applied in support of system operability.

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

A detailed review of the Hope Creek Generating Station design and ECCS system discharge piping was performed to determine if there are any areas susceptible to gas accumulation. It should be noted that ECCS discharge piping (e.g., RHR, CS, HPCI) piping is designed with keep-fill systems to design against any accumulation of gas. Based on the design of the keep-fill systems an initial assessment determined that the potential for accumulation of gas, if properly filled and vented, should not occur.

The review of piping drawings, including field measurements, was performed to identify areas in which potential high points could exist if venting were not sufficient. Areas for potential gas accumulation were identified and field ultrasonic testing (UT) measurements were then performed to identify if gas exists in these areas. The UTs confirmed that no gas existed in the discharge piping, also confirming the design adequacy of the keep-fill system. Therefore, there are no segments of discharge piping in which gas can accumulate, provided the keep-fill system remains in operation. Therefore, no corrective actions are required.

Hope Creek Generating Station will address gas accumulation in the discharge piping of the ECCS systems: HPCI, LPCI, or Core Spray if it is identified.

c) Downstream ECCS Piping Analysis

An assessment of ECCS piping downstream of the injection valves has been completed and a determination made that the existence of air voids in this piping except for HPCI will have no adverse

consequences related to accident conditions. Even if small voids did exist the pressure transient would not be greater than the normal injection pressure.

HPCI system simultaneously injects into Core Spray and Feedwater. The HPCI system to Core Spray injection valve is designed full of water and is vented monthly. Downstream of the HPCI to Core Spray injection valve is designed to be voided pipe. The HPCI system to Feedwater injection valve is designed full of water and is vented monthly. The Feedwater side of the valve is filled with Feedwater.

d) Affects of RCS Gas Ingestion

A conservative "worst case" scenario evaluation provided a limiting LOCA PCT heatup rate of 12 °F/s is determined for the entire U.S. BWR fleet. Using this heatup rate, 48 °F of PCT impact is assessed with a maximum of four-second delay in the ECCS actuation.

An assessment justified that gas voids passing through the core do not pose an additional safety concern mainly because of the unlikely path for air to get into the core and high void conditions in the core present during LOCA.

Assessments on the LOFW and ATWS events concluded that a delay of five seconds in ECCS flow would affect the analysis results insignificantly and have no impact on meeting the acceptance criteria. The evaluation of station blackout events indicate that a delay of ten seconds would not impact the ability of the water makeup system to maintain the vessel water level above the top of active fuel. Similarly, it is concluded that a delay of 10 seconds would have an insignificant impact on meeting the acceptance criteria in Appendix R fire safe shutdown analysis.

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

There are currently no changes to design basis documents as a result of the above evaluation. The addition of vent valves at certain locations and/or procedure changes to enhance system fill and vent activities has been entered into the CAP for implementation.

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

The P&ID and isometric drawings for each of the ECCS system flow paths were reviewed to identify vents and high points. The reviewed lines were highlighted on both 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 ECCS 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.

The only issues identified during the drawing review were system dead legs with the potential for gas accumulation. These are addressed with the results of the walkdowns in issue 6 below.

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.

Seven (7) new vent locations are currently under evaluation in the CAP to enhance filling and venting operations. Two (2) of the new locations are located on the RHR pump suction piping and five (5) are located on the RHR pump discharge piping.

There are no existing vent valves requiring modifications.

Six (6) existing vent locations identified during drawing and walkdown reviews are under evaluation in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures. Four (4) valves are in the RHR discharge piping, one (1) is in HPCI discharge piping and one (1) is in HPCI suction piping.

Six (6) existing system isolation valves are under evaluation in the CAP to be added to initial system fill and vent procedures. Four (4) valves are on Core Spray suction piping and two (2) are on RHR suction piping.

The schedule for completion of the evaluations is no later than 90 days after the completion of Refuel Outage RF15.

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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.

Walkdowns of the system piping described below were performed and included the confirmation that vent connections exist as per the existing configuration drawings and measurement of piping was performed to verify proper slope.

All non-buried High Pressure Coolant Injection (HPCI) system piping which is required to be initially water-filled from the Condensate Storage Tank (CST) and the Torus to the HPCI pump and from the HPCI pump to the HPCI discharge isolation valve to Core Spray and the discharge piping penetration into the Reactor Building Steam Tunnel upstream of Feedwater has been completely walked down. Also, the HPCI pump min-flow piping up to the first min-flow isolation valve has been walked down.

All Core Spray ECCS system piping from the Torus thru the Core Spray pumps to the Core Spray discharge isolation valves, which are required to be initially water-filled to perform its design basis function (suction and discharge piping) has been completely walked down. Furthermore, the Core Spray pump min-flow piping inside each Core Spray pump room was walked down.

All RHR ECCS system piping (LPCI) as well as Containment Spray, and Torus Spray piping from the Torus, thru the RHR pumps, to the LPCI discharge isolation valves and the Containment and Torus Spray isolation valves, which are required to be initially water-filled to perform its design basis function (suction and discharge piping) has been completely walked down. Also, the RHR pump min-flow piping inside the 'A' and 'B' RHR pump rooms was walked down.

Slope measurements were obtained by taking relative piping elevation measurements over each continuous horizontal segments of piping using a laser level or a ZipLevel. Any segment identified as having slopes in an improper direction, or representative segments for redundant trains, had UTs performed (See issue 7 below). The criterion for UT measurements was high points of a segment with a differential elevation greater than 0.2 inches (which is based on the accuracy of the ZipLevel measuring device). All piping was either measured level or sloped in the appropriate direction (e.g. towards a system vent connection) except as noted below:

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The walkdown for the HPCI system piping found four (4) segments sloped in an improper direction.

The walkdown for the Core Spray system piping found twelve (12) segments sloped in an improper direction.

The walkdown for the RHR system piping found twelve (12) segments sloped in the improper direction.

All existing ECCS vent valves were walked down and identified to be properly installed.

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).**

Ultrasonic Testing was performed at high points that met the slope criteria. Gas voiding was identified in two (2) locations. These locations are in the RHR pump suction piping and require either a vent valve and/or procedure changes to facilitate venting. Corrective actions have been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable.

No modifications to existing vent locations or utilization of existing vent locations are necessary as a result of the walkdowns.

As committed to in Reference 2, and approved by the NRC in Reference 3, Hope Creek Generating Station will complete its necessary confirmatory walkdowns of the inaccessible portions of these systems by startup from the next Refuel Outage at Hope Creek (RF15) and will provide a supplement to this response within [90] days thereafter. The walkdown of the horizontal segment connecting HPCI to Feedwater located in the Reactor Building steam tunnel and the confirmation of the RHR vent valve in a Pipe Chase will be performed during the RF15 refueling outage. This activity has been added to the CAP. This line is included in the HPCI monthly venting procedure. This segment was not accessed online due to high radiation levels existing in the area of concern. The line vent connections have already been verified as being installed properly, via digital images taken by system operators.

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The piping in the Reactor Building steam tunnel will be accessible during the next Hope Creek (RF15) refueling outage at which point a confirmatory walkdown to measure pipe sloping will be performed.

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 for procedures used to fill and vent ECCS piping systems susceptible to void formation 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 system discharge piping is filled by venting operations to verify a solid stream of water issuing from the vent. These venting activities verify the requirements of TS 4.5.1.a.1.a have been satisfactorily met.

As a result of the reviews, new procedures, procedure revisions and some filling and venting, activities that are not proceduralized have been identified. These activities are discussed in issue 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).**

Six (6) existing vent locations identified during drawing and walkdown reviews are under evaluation in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures. Four (4) valves are in the RHR discharge piping, one (1) is in HPCI discharge piping and one (1) is in HPCI suction piping.

Six (6) existing system isolation valves are under evaluation in the CAP to be added to initial system fill and vent procedures. Four (4) valves are on Core Spray suction piping and two (2) are on RHR suction piping.

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Drawing reviews, procedure reviews and confirmatory system walkdowns determined the 'C' and 'D' Shutdown Cooling suction crosstie lines to be susceptible to voiding issues. These lines were subsequently ultrasonically tested and found to contain voids. Corrective actions have been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable.

Enhancement considerations have been identified to some operating procedures including venting termination guidance and addition of some venting points and processes. All of these procedure change considerations are documented in the CAP for evaluation.

There is presently no backfilling of instrumentation performed in ECCS procedures. The addition of backfilling of instrumentation to ECCS system fill and vent procedures has been entered into the CAP for evaluation.

Gas quantification during the performance of fill and vent procedures has been entered into the CAP for evaluation.

Jockey pumps are currently filled and vented, however, no formal procedure exists for the filling and venting of the jockey pumps for startup or post maintenance. Future development of a procedure has been identified and has been entered into the CAP for evaluation.

A Core Spray isolation valve leakage test procedure was identified that did not require the system fill and vent procedure to be performed. This has been added to the CAP for evaluation.

Revision of ECCS monthly fill and vent procedures to add direction to Operators to write a notification upon identification of gas during system monthly fill and vent operations has been entered into the CAP for evaluation.

The review of procedures is complete.

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

System potential gas intrusion includes 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.

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11. Ongoing Industry Programs

Ongoing industry programs are planned in the following areas that may impact the conclusions reached during the Design Evaluation of the Hope Creek Generating Station relative to gas accumulation.
The activities will be monitored to determine if additional changes to the Hope Creek Generating Station design 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.

Seven (7) new vent locations are currently under evaluation in the CAP to enhance filling and venting operations. Two (2) of the new locations are located on the RHR pump suction piping and five (5) are located on the RHR pump discharge piping.

Six (6) existing vent locations identified during drawing and walkdown reviews are under evaluation in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures. Four (4) valves are in the RHR discharge piping, one (1) is in HPCI discharge piping and one (1) is in HPCI suction piping.

Six (6) existing system isolation valves are under evaluation in the CAP to be added to initial system fill and vent procedures. Four (4) valves are on Core Spray suction piping and two (2) are on RHR suction piping.

Drawing reviews, procedure reviews and confirmatory system walkdowns determined the 'C' and 'D' Shutdown Cooling suction crosstie lines to be susceptible to voiding issues. These lines were subsequently ultrasonically tested and found to contain voids. Corrective actions have been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable. A root cause investigation of this condition is in progress. Long-term corrective actions will be developed and implemented in RF16.

Enhancement considerations have been identified to some operating procedures including venting termination guidance and addition of some venting points and processes. All of these procedure change considerations are documented in the CAP for evaluation.
There is presently no backfilling of instrumentation performed in ECCS procedures.

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The addition of backfilling of instrumentation to ECCS system fill and vent procedures has been entered into the CAP for evaluation.

Gas quantification during the performance of fill and vent procedures has been entered into the CAP for evaluation.

Jockey pumps are currently filled and vented, however, no formal procedure exists for the filling and venting of the jockey pumps for startup or post maintenance. Future development of a procedure has been identified and has been entered into the CAP for evaluation.

An isolation valve leakage test procedure was identified that did not require the system fill and vent procedure to be performed. This has been added to the CAP for evaluation.

Addition of direction to Operators to write a notification upon identification of gas during system monthly fill and vent operations has been entered into the CAP for evaluation.

Ongoing industry programs are planned which may impact the conclusions reached during the Design Evaluation of the Hope Creek Generating Station relative to gas accumulation. The activities will be monitored to determine if additional changes to the Hope Creek Generating Station design may be required or desired to provide additional margin.

The schedule for the completion of these corrective actions is no later than 90 days from the completion of the next refueling outage, Hope Creek Generating Station RF15.

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 actions will coincide with the planned supplemental response scheduled for no later than 90 days after completion of the Hope Creek Generating Station RF15 Refueling Outage. 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 Hope Creek Generating Station RF16 refueling outage. This will allow proper planning of the recommended actions. All ECCS Systems have been confirmed operable by testing, and all surveillance requirements are current.

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Testing Evaluation

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

   Periodic (monthly) venting procedures specify vent points that are used 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 connections.

   There is no monthly suction piping venting performed for the ECCS systems.

   There is no consistent observation time for the solid flow provided in the ECCS monthly fill and vent procedures.

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 surveillance procedures have been identified.

   Procedure revisions have been identified and discussed in Design Evaluation Section, issue 12.

3. **Discuss how procedures adequately address the manual operation of the RHR system in its Residual heat removal mode of operation. Include how the procedures assure that the RHR system is sufficiently full of water to perform its Residual 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).**

   The RHR shutdown cooling operating procedure performs a fill and vent of the suction piping and differential pressure is monitored on the discharge piping during pre-warming to ensure piping is not voided during this evolution.

   A caution exists in the procedure that warns plant personnel if the differential between the injection line pressure and reactor pressure approaches zero then voiding is occurring in the injection line piping.

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To avoid this condition the differential should be maintained greater than one-half of that initially observed throughout the entire pre-warming evolution. If voiding is occurring, steps are provided to control the voiding and prevent additional voiding.

Furthermore, the RHR shutdown cooling function have associated alarms in the Control Room, warning plant personnel of issues, such as drywell pressure, valve issues, and pump issues. If the control room receives an alarm, the alarm response procedure provides appropriate guidance.

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.**

A Core Spray isolation valve leakage test procedure was identified that did not require the system fill and vent procedure to be performed. This has been added to the CAP for evaluation.

The system operating procedures at Hope Creek provide sufficient steps to fill and vent prior to making the systems operable, with the exception to that identified above for the 'C' and 'D' RHR suction crosstie piping.

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.**

Hope Creek HCPI, LPCI, and Core Spray monthly fill and vent procedures state if air is found in the system during the venting process immediately notify the Shift Manager and Control Room Supervisor. Periodic venting is initiated until the System Manager has evaluated the situation.

Procedures do not currently address void sizing.

Post-venting ultrasonic testing is not performed as fluid flow from the vent is confirmed.

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.

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.

See corrective actions evaluation section below.

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

Seven (7) new vent locations are currently under evaluation in the CAP to enhance filling and venting operations. Two (2) of the new locations are located on the RHR pump suction piping and five (5) are located on the RHR pump discharge piping.

Six (6) existing vent locations identified during drawing and walkdown reviews are under evaluation in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures. Four (4) valves are in the RHR discharge piping, one (1) is in HPCI discharge piping and one (1) is in HPCI suction piping.

Six (6) existing system isolation valves are under evaluation in the CAP to be added to initial system fill and vent procedures. Four (4) valves are on Core Spray suction piping and two (2) are on RHR suction piping.

Drawing reviews, procedure reviews and confirmatory system walkdowns determined the 'C' and 'D' Shutdown Cooling suction crosstie lines to be susceptible to voiding issues. These lines were subsequently ultrasonically tested and found to contain voids. Corrective actions have

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been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable.

Enhancement considerations have been identified to some operating procedures including venting termination guidance and addition of some venting points and processes. All of these procedure change considerations are documented in the CAP for evaluation.
There is presently no backfilling of instrumentation performed in ECCS procedures. The addition of backfilling of instrumentation to ECCS system fill and vent procedures has been entered into the CAP for evaluation.

Gas quantification during the performance of fill and vent procedures has been entered into the CAP for evaluation.

Jockey pumps are currently filled and vented, however, no formal procedure exists for the filling and venting of the jockey pumps for startup or post maintenance. Future development of a procedure has been identified and has been entered into the CAP for evaluation.

An isolation valve leakage test procedure was identified that did not require the system fill and vent procedure to be performed. This has been added to the CAP for evaluation.

Addition of direction to Operators to write a notification upon identification of gas during system monthly fill and vent operations has been entered into the CAP for evaluation.

Ongoing industry programs are planned which may impact the conclusions reached during the Design Evaluation of the Hope Creek Generating Station relative to gas accumulation. The activities will be monitored to determine if additional changes to the Hope Creek Generating Station design may be required or desired to provide additional margin.

The schedule for the completion of these corrective actions is no later than 90 days from the completion of the next refueling outage, Hope Creek Generating Station RF15.

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 actions will coincide with the planned supplemental response scheduled for no later than 90 days after completion of the Hope

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Creek Generating Station RF15 Refueling Outage. 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 Hope Creek Generating Station RF16 refueling outage. This will allow proper planning of the recommended actions. All ECCS Systems have been confirmed operable by testing, and all surveillance requirements are current.

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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. Ultrasonic testing was performed at high points that met the slope criteria. Gas voiding was identified in two (2) locations. These locations are in the RHR pump suction piping and require either a vent valve and/or procedure changes to facilitate venting. Corrective actions have been taken to sufficiently fill these two lines. All ECCS system vent locations have been verified in the field, except one (1) vent location on RHR in the Pipe Chase.

Hope Creek Generating Station's CAP is used to document gas intrusion/accumulation issues as potential nonconforming conditions. Existing procedures for the Emergency Core Cooling Systems including Residual Heat Removal System (RHR), High Pressure Coolant Injection (HPCI) and the Core Spray System require notification of the Shift Manager and Control Room Supervisor, if air is found in the system during the venting process. As part of Hope Creek Generating Station's CAP, notifications related to plant equipment are evaluated for potential impact on operability and reportability. Therefore, Hope Creek Generating Station's review concluded that issues involving gas intrusion/accumulation are properly prioritized and evaluated under the CAP for evaluation.

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

As identified in PSEG Nuclear 3-month response to NRC GL 2008-01 (Reference 2), PSEG Nuclear will complete necessary confirmatory walkdowns of inaccessible piping in the Hope Creek Generating Station during the Hope Creek Refueling Outage RF15. The walkdown of the horizontal segment connecting HPCI to Feedwater located in the Reactor Building steam tunnel and the confirmation of one (1) RHR vent connection in a Pipe Chase will be performed during the RF15 refueling outage.

Seven (7) new vent locations are currently under evaluation in the CAP to enhance filling and venting operations. Two (2) of the new locations are located on the RHR pump suction piping and five (5) are located on the RHR pump discharge piping.

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Six (6) existing vent locations identified during drawing and walkdown reviews are under evaluation in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures. Four (4) valves are in the RHR discharge piping, one (1) is in HPCI discharge piping and one (1) is in HPCI suction piping.

Six (6) existing system isolation valves are under evaluation in the CAP to be added to initial system fill and vent procedures. Four (4) valves are on Core Spray suction piping and two (2) are on RHR suction piping.

Drawing reviews, procedure reviews and confirmatory system walkdowns determined the 'C' and 'D' Shutdown Cooling suction crosstie lines to be susceptible to voiding issues. These lines were subsequently ultrasonically tested and found to contain voids. Corrective actions have been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable.

Enhancement considerations have been identified to some operating procedures including venting termination guidance and addition of some venting points and processes. All of these procedure change considerations are documented in the CAP for evaluation.

There is presently no backfilling of instrumentation performed in ECCS procedures. The addition of backfilling of instrumentation to ECCS system fill and vent procedures has been entered into the CAP for evaluation.

Gas quantification during the performance of fill and vent procedures has been entered into the CAP for evaluation.

Jockey pumps are currently filled and vented, however, no formal procedure exists for the filling and venting of the jockey pumps for startup or post maintenance. Future development of a procedure has been identified and has been entered into the CAP for evaluation.

An isolation valve leakage test procedure was identified that did not require the system fill and vent procedure to be performed. This has been added to the CAP for evaluation.

Revision of ECCS monthly fill and vent procedures to add direction to Operators to write a notification upon identification of gas during system monthly fill and vent operations has been entered into the CAP for evaluation.

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Ongoing industry programs are planned which may impact the conclusions reached during the Design Evaluation of the Hope Creek Generating Station relative to gas accumulation. The activities will be monitored to determine if additional changes to the Hope Creek Generating Station design may be required or desired to provide additional margin.

The schedule for the completion of these corrective actions is no later than 90 days from the completion of the next refueling outage, Hope Creek Generating Station RF15.

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 actions will coincide with the planned supplemental response scheduled for no later than 90 days after completion of the Hope Creek Generating Station RF15 Refueling Outage. 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 Hope Creek Generating Station RF16 refueling outage. This will allow proper planning of the recommended actions. All ECCS Systems have been confirmed operable by testing, and all surveillance requirements are current.

Conclusion

Based upon the above, PSEG Nuclear has concluded that Hope Creek Generating Station 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 Hope Creek Generating Station CAP for tracking and final resolution, as described in Sections B and 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:

Drawing reviews, procedure reviews and confirmatory system walkdowns determined the 'C' and 'D' Shutdown Cooling suction crosstie lines to be susceptible to voiding issues. These lines were subsequently ultrasonically tested and found to contain voids. Corrective actions have been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable. Short-term corrective actions have been put in place to monitor and confirm that the RHR system is operable.

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C. CORRECTIVE ACTION SCHEDULE

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

At present, corrective actions identified in the evaluation are in progress. UTs have been performed and assessments are being made dependent upon the results. Two (2) voids were identified during these inspections and steps were taken to sufficiently fill these lines. The changes to procedures to preclude this condition have been identified and have been entered in the CAP.

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

Seven (7) new vent locations are currently under evaluation in the CAP to enhance filling and venting operations. Two (2) of the new locations are located on the RHR pump suction piping and five (5) are located on the RHR pump discharge piping.

Six (6) existing vent locations identified during drawing and walkdown reviews are under evaluation in the CAP for consideration to be added to enhance filling and venting operations and surveillance procedures. Four (4) valves are in the RHR discharge piping, one (1) is in HPCI discharge piping and one (1) is in HPCI suction piping.

Six (6) existing system isolation valves are under evaluation in the CAP to be added to initial system fill and vent procedures. Four (4) valves are on Core Spray suction piping and two (2) are on RHR suction piping.

Drawing reviews, procedure reviews and confirmatory system walkdowns determined the 'C' and 'D' Shutdown Cooling suction crosstie lines to be susceptible to voiding issues. These lines were subsequently ultrasonically tested and found to contain voids. Corrective actions have been taken to sufficiently fill these two lines and a technical evaluation has been completed to verify past operability of as-found conditions of the 'C' and 'D' RHR pumps. The evaluation concluded the 'C' and 'D' RHR pumps were able to perform their design functions and were operable. A root cause investigation of this condition is in progress. Long-term corrective actions will be developed and implemented in RF16.

Enhancement considerations have been identified to some operating procedures including venting termination guidance and addition of some venting points and processes. All of these procedure change considerations are documented in the CAP for evaluation.

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There is presently no backfilling of instrumentation performed in ECCS procedures. The addition of backfilling of instrumentation to ECCS system fill and vent procedures has been entered into the CAP for evaluation.

Gas quantification during the performance of fill and vent procedures has been entered into the CAP for evaluation.

Jockey pumps are currently filled and vented, however, no formal procedure exists for the filling and venting of the jockey pumps for startup or post maintenance.

Future development of a procedure has been identified and has been entered into the CAP for evaluation.

An isolation valve leakage test procedure was identified that did not require the system fill and vent procedure to be performed. This has been added to the CAP for evaluation.

Addition of direction to Operators to write a notification upon identification of gas during system monthly fill and vent operations has been entered into the CAP for evaluation.

Ongoing industry programs are planned which may impact the conclusions reached during the Design Evaluation of the Hope Creek Generating Station relative to gas accumulation. The activities will be monitored to determine if additional changes to the Hope Creek Generating Station design may be required or desired to provide additional margin.

The schedule for the completion of these corrective actions is no later than 90 days from the completion of the next refueling outage, Hope Creek Generating Station RF15.

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 actions will coincide with the planned supplemental response scheduled for no later than 90 days after completion of the Hope Creek Generating Station RF15 Refueling Outage. 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 Hope Creek Generating Station RF16 refueling outage. This will allow proper planning of the recommended actions. All ECCS Systems have been confirmed operable by testing, and all surveillance requirements are current.

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CONCLUSION

Hope Creek Generating Station has evaluated the accessible portions of those systems that perform the functions described in this GL and has concluded that these systems are Operable, as defined in the Hope Creek Generating Station TS and are in conformance with our commitments to the applicable General Design Criteria, as stated in the Hope Creek Generating Station UFSAR.

As committed in Reference 2, and approved by the NRC in Reference 3, Hope Creek Generating Station will complete its evaluation of the inaccessible portions of these systems by startup from the next Refuel Outage at Hope Creek (RF15) and will provide a supplement to this response within 90 days thereafter.

Completion of the evaluations and establishing corrective actions as summarized above meets the requirements of the actions specified in the three-month response to the GL 2008-01 (Reference 2).

Attachment

LR-N08-0225

List of Commitments
Hope Creek Generating Station

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)
All evaluations 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 Hope Creek Refuel Outage. **(CM-HC-2008-96)**	End of RF15 + 90 days	Yes	No
All corrective actions 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 Hope Creek Refuel Outage. **(CM-HC-2008-97)**	End of RF16	Yes	No