Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

October 13, 2008
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10 CFR 50.54(f)

U.S. Nuclear Regulatory Commission
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South Texas Project
Units 1 and 2
Docket No. STN 50-498, STN 50-499
Nine-Month Response to Generic Letter 2008-01

Reference:
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. Letter from Scott Head to NRC Document Control Desk dated April, 9, 2008, "Due Date Extension for Three-Month Response to Generic Letter 2008-01". (NOC-AE-08002287) (ML081050250)
3. Letter from David Rencurrel to NRC Document Control Desk dated May, 12, 2008, "Three-Month Response to Generic Letter 2008-01". (NOC-AE-08002284) (ML081400721)
4. Letter from Mohan C. Thadani to Edward C. Halpin dated September, 22, 2008, "South Texas Project, Units 1 and 2 – Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray System." Proposed Alternative Course of Action and Request for Additional Information (TAC Nos. Md7881 and Md7882).

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 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.

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,

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(c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule."

The enclosure to this letter contains the South Texas Project nine-month response to NRC GL 2008-01.

In summary, STP Nuclear Operating Company has concluded that based on the enclosed review of the current design basis (drawing reviews, piping walkdowns), plant specific operating experience, and procedure reviews the subject systems/functions are in compliance with the current licensing and design bases and applicable regulatory requirements.

Commitments made in this letter are listed on the Regulatory Commitment page of the enclosure.

If there are any questions or if additional information is needed, please contact Mr. Wayne Harrison at 361-972-7298.

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

Executed on October 13, 2008.

Sincerely,

G. T. Powell
Vice President,
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Enclosure:

cc:
(paper copy)

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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 South Texas Project Nuclear Operating Company (STPNOC) 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 emergency core cooling system (ECCS), Decay Heat Removal (DHR) system, and containment spray system (CSS) 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 the corrective actions determined 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 with respect to the subject systems (see Section B of this enclosure), and
c) A statement regarding which corrective actions have been completed, the schedule for the corrective actions not yet complete, and the basis for that schedule (see Section C of this enclosure).

The following systems were determined to be in the scope of GL 2008-01 for the South Texas Project (STP):

- ECCS (Safety Injection (SI) for STP)
- Decay Heat Removal (Residual Heat Removal (RHR) for STP)
- Containment Spray (CS)

Background

The ECCS consists of three independent, identical trains, each consisting of a high head safety injection (HHSI) and low head safety injection (LHSI) pumps, safety injection system (SIS) accumulators, and residual heat removal (RHR) heat exchangers (HXs) along with the associated piping, valves, instrumentation, and other related equipment. One refueling water storage tank (RWST) supports all three trains.

The RHR system consists of three independent trains, one taking suction from the hot leg of Loop 1, one from the hot leg of Loop 2, and the other from the hot leg of Loop 3. The major components in each contain a residual heat removal (RHR) pump, a RHR HX and the associated piping, valves, and instrumentation required for operational control. During system operation, reactor coolant flows from an RCS hot leg to a RHR pump, through the tube side of a RHR HX, and back to an RCS cold leg through the SI Accumulator cold-leg injection lines.

The CS system consists of three independent, identical trains, each consisting of a spray pump, valves, piping and instrumentation.

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

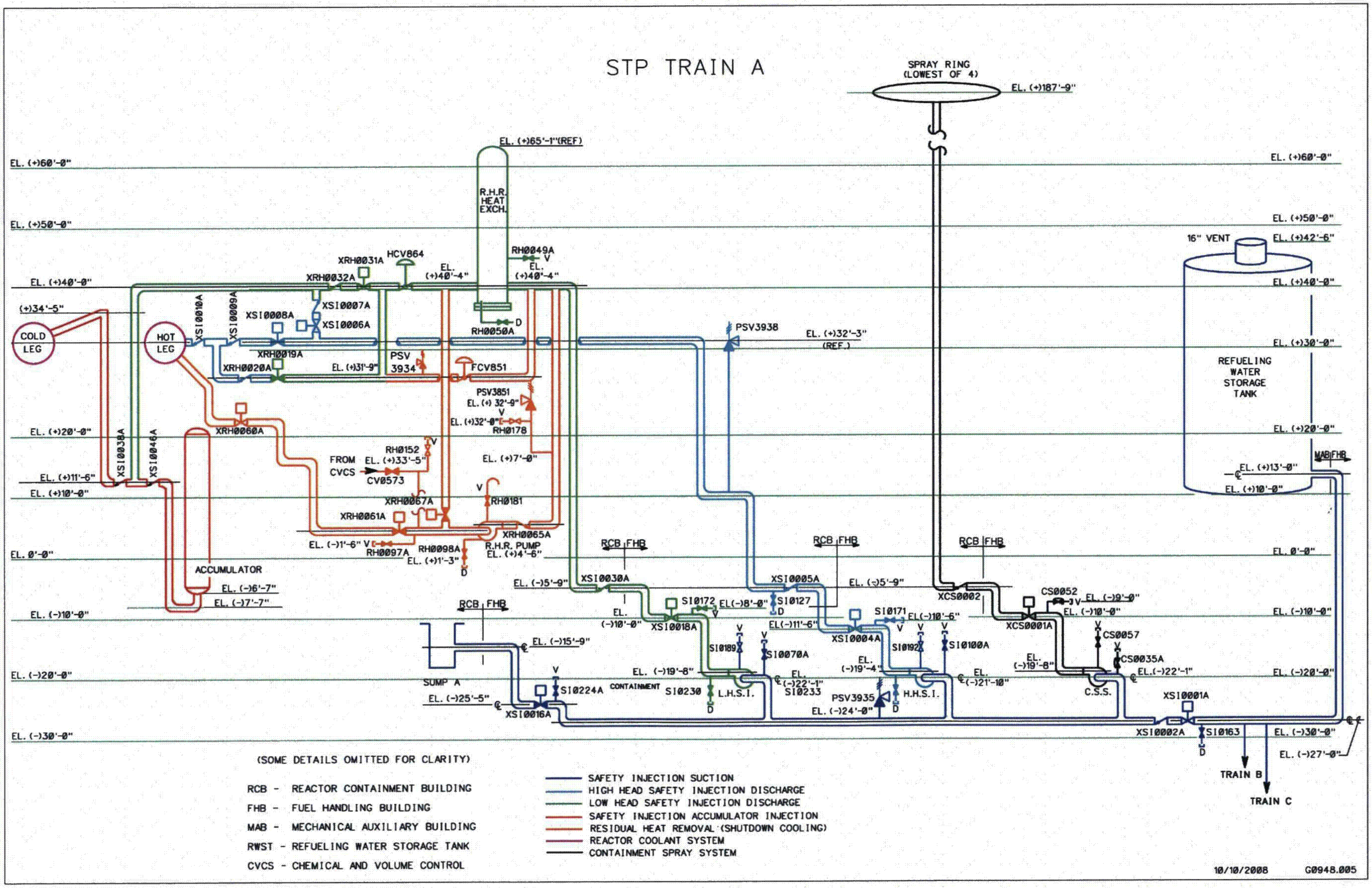
The STP three train design includes independent, dedicated High Head Safety Injection (HHSI), Low Head Safety Injection (LHSI), Containment Spray (CS) and RHR pumps. The STP design for SI, RHR, and CS is one that varies significantly from other four-loop plants (two train systems with shared flow path, pumps and/or cross connections). The STP design eliminates the cross-train connection issues on the suction lines and except for small sample and test lines, eliminates any cross-train connections on the discharge lines found in most two train designs.

The absence of any significant cross-train connections or "piggy-back" arrangements eliminates many potential sources of gas accumulation for the STP design. This arrangement also facilitates system testing and maintenance in that trains may be independently removed from service. The Refueling Water Storage Tank (RWST) suction header is the only common suction side line for the SI and CS systems. Each SI and RHR subsystem is designed to deliver flow to only one RCS loop and each CS subsystem is designed to deliver flow to the CS ring header.

The HHSI, LHSI and CS suction header piping layout promotes self-venting to the RWST. During decay heat removal operation, the RHR subsystem only takes suction from the RCS loops.

The attached simplified diagram shows relative interfaces, elevations and layout of the GL 2008-01 associated systems and components. It is not intended to be an exact representation. See diagram on next page.

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



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 STP licensing basis was reviewed with respect to gas accumulation in the SI, RHR, and CS. This review included the Technical Specifications (TS), TS Bases, Technical Requirements Manual (TRM) and TRM bases, Updated Final Safety Analysis Report (UFSAR), Design Bases Documents (DBD), 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 STP TS have the following surveillance requirement (SR):

SR 4.5.2.b Each SI subsystem shall be demonstrated OPERABLE at least once per 31 days by:

1. Verifying that the SI piping is full of water by venting the SI pump casings and accessible discharge piping high points

The STP TS Bases state the following:

> The Surveillance Requirements provided to ensure OPERABILITY of each component ensure that, at a minimum, the assumptions used in the safety analyses are met and that subsystem OPERABILITY is maintained. Surveillance Requirements for flow testing provide assurance that proper SI flows will be maintained in the event of a LOCA.

STP performs TS SR 4.5.2.b to verify SI suction and discharge piping is sufficiently full.

SI, RHR, and CS testing are described in the testing evaluation of this response.

The STP UFSAR provides no criteria or requirements for maintaining the SI, RHR, or CS piping "full". The specific requirements are present in the STP TS and plant procedures. Therefore no changes to the UFSAR are required.

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

STP has not made any changes to STP licensing basis documents as a result of evaluations performed for this GL response.

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. STP 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. STP will evaluate the resolution of TS issues with respect to the changes contained in the TSTF traveler to determine applicability and further assess any changes to the TS and TS Bases.

This item will be tracked in the Corrective Action Program.

Design Evaluation

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.**

The STP design basis was reviewed with respect to gas accumulation in the subject GL systems. Various design documents were reviewed including design basis documents, calculations, drawings and vendor technical information. Conclusions from the review are detailed here.

Design drawings provide adequate detail regarding placement of vent, drain or test connections to adequately fill and/or vent the GL systems.

The RWST provides the necessary hydrostatic head pressures and water volume to ensure that the systems are maintained full.

The HHSI subsystem is gravity filled from the RWST. The subsystem is manually vented utilizing high point vents on the subsystem piping. Once the HHSI system has been filled and vented, it is kept in this condition by the head of the RWST which is the high point of the subsystem. The LHSI subsystem is initially filled utilizing the LHSI pumps. Subsystem piping is manually vented. Like the HHSI system, the LHSI suction piping is kept in this condition by the head of the RWST.

The RHR HX tubes which are subsystem high points are purged by the LHSI pump flow which is sufficient to sweep out entrapped air. The seal standpipes for reactor coolant pumps (RCPs) A, B, and C are used to maintain a static head on the RHR HXs and keep the HX tubes filled. A line is routed from each of the seal standpipes to the corresponding inlet line of the RHR HXs. This maintains this portion of the LHSI subsystem in a filled condition.

Pump suction piping from the containment recirculation sump is routed from the sump toward the pump suctions in a manner such that the lines would promote self venting into the containment atmosphere. (The emergency sumps are at a higher elevation than the SI and CS pump suctions). This arrangement will also assure that as the sump fills with spilled coolant during a LOCA, the sump suction line will also fill with coolant and not allow a void to form in the line. SI realignments during design basis events have been evaluated to ensure the system is maintained sufficiently full. Strainer performance testing addressing debris laden strainer geometry and vortexing has been performed in response to GL 2004-02.

Water level setpoints along with system design features are designed to prevent vortex effects that otherwise could potentially ingest gas into the GL systems during design basis events. The system design features include vortex breakers provided at the RWST tank outlet and at the entrance of each suction pipe from the Containment Emergency Sumps. These prevent excessive air entrainment or ingestion.

STP does not have leakage acceptance criteria specifically for gas intrusion. However, leakage criterion used for boundary valve testing between high and low pressure systems (e.g. RCS to HHSI) controls allowable leakage and reduces the potential for gas intrusion.

The STP design bases do not explicitly address the possibility of gas accumulation in systems within the scope of GL 2008-01. System calculations are generally based on pump performance data and flow delivery from the system that assume the piping to be filled. For example, the time delays estimated for delivery of flow for the various ECCS functions are based on pump start times and valve opening times. No additional allowance for the effects of gas accumulation is included in the calculations. Assumed delays due to pump start and valve actuation are conservative, which may provide margin for the effects of gas accumulation, but no explicit allowance for this purpose is included in calculations.

There is one STP design application which considers air accumulation. The CS System calculations for discharge piping inside containment evaluate the pressure pulsations and/or water hammer pressures and forces specifically due to the initial dry pipe conditions. This section of piping is empty during normal plant operation.

STPNOC has concluded that based on drawing reviews, piping walkdowns, plant specific operating experience, and procedure reviews this design is adequate and the subject systems/functions are in compliance with the current licensing and design bases and applicable regulatory requirements

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 interim allowable gas accumulation in the pump suction piping is based on limiting the gas entrainment to the pump after a pump start. A Pressurized Water Reactor Owners Group (PWROG) program established interim pump gas ingestion limits to be employed by the member utilities. The interim criteria address 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.			

These conservative criteria will be applied until further data supports a change. These criteria will be applied as necessary during the pipe slope data evaluations. These values will be used in conjunction with other factors such as $NPSH_R$, duration of gas flow, and transients for which the system is credited to provide a basis for system evaluation.

Suction line configuration can affect the amount of gas transported to the pump and the "consistency" of the flow (bubbly, slug, etc). While it is acknowledged that sections with inverted "U" shaped piping configurations can trap air if not properly vented, the suction piping for SI, CS and RHR does not contain any inverted "U" configurations.

Suction line configuration is consistent with good engineering design for the placement of a pump in a pipe network. The SI, CS and RHR suction sources are at a higher elevation than the pumps to ensure adequate available NPSH and maintain the suction pipe continuously filled under a positive static head.

Nuclear and non-nuclear operating experience has shown this configuration to be one that prevents a pump from becoming air bound or losing its prime. When a pump's suction source is at a higher elevation than the pump, there is no operating experience which supports the conjecture that voids due to unfavorable pipe slope or pipe bow in an otherwise full, nominally horizontal pipe cause a pump to lose its prime. Any gas in this pipe would most likely be from the system not being properly restored from maintenance.

In addition, the SI, CS and RHR pumps are started with their minimum flow lines open. These lines are from the pump discharge to either the RWST or the pump suction line. This configuration ensures that flow through the pumps does not stop (due to head degradation) as voids pass through the pump suction. That is, the minimum flow line pipe configuration ensures that gas in the suction pipe does not accumulate at the pump.

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

A PWROG 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 may 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.

STP will evaluate this methodology for STP and, if necessary, establish the applicable limits for gas accumulation in the discharge piping of the subject systems.

Note that the original STP design basis for the CS system included hydraulic transients for the system piping downstream of the pump discharge motor operated isolation valves, and this will remain as part of the design basis.

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

A PWROG methodology has been developed to assess when a significant gas-water hydraulic transient 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 RCS is only restricted by check valve(s), no significant water hammer would occur, i.e., none of the relief valves in the subject systems would lift, or none of the piping restraints would be damaged.

The STP SI flow path for switchover to hot leg injection has an upstream valve that has an opening time of approximately 10 seconds and the downstream path to the RCS is only restricted by check valves. Therefore, consistent with the PWROG program methodology, no significant water hammer will occur i.e., none of the relief valves in the subject systems would lift, or none of the piping restraints would be damaged.

d) RCS Allowable Gas Ingestion

The PWROG qualitatively evaluated the impact of non-condensable gases entering the RCS on the ability of 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 discharge piping concurrent with 5 cubic feet of non-condensable gas at 100 psig in the LHSI discharge piping. The qualitative evaluation concluded that these are quantities of gas that will not prevent the SIS from performing its core cooling function.

STP reviewed the conclusions of this evaluation and determined they are applicable to STP. Results of this industry evaluation will be utilized as necessary during the pipe slope data evaluations.

3. Summarize the changes, if any, to the design basis documents

To date, STP has not made any changes to STP design basis documents as a result of evaluations performed for this GL response.

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

The piping and isometric drawings for the SI, RHR and CS were reviewed to identify vents and high points. Specifically, the following flow paths were reviewed:

- Residual Heat Removal flow path
  - Reactor Coolant Hot Leg to Cold Leg
- Safety Injection flow path
  - RWST to Safety Injection Pumps Suction
  - Safety Injection Pumps to Reactor Coolant System cold legs

- Accumulator flow path
  - Accumulators to Reactor Coolant Cold Legs
- Recirculation flow path
  - Containment sump to Safety Injection Pumps suction
  - Safety Injection Pumps discharge to Reactor Coolant Hot Legs
- Containment Spray flow path
  - RWST to Containment Spray Pump suction
  - Containment Spray Pump discharge to spray headers.
  - Containment sump to Containment Spray Pump suction

Each flow path was reviewed line by line to identify system vents and high points. The lines were reviewed on P&IDs and isometric drawings. The system review included branch lines, valves, pumps, and heat exchangers. Pipe diameter transitions in horizontal lines that could trap gas such as pipe reducers and orifices were also reviewed.

The results of the drawing reviews identified some locations as needing review in regards to potential gas accumulation. These locations were evaluated by comparing against fill and vent guidance, historical system performance, existing analysis, and/or system monitoring and testing performed. No new vent valves were identified as needing to be added. However, it was determined that some changes could be made to system procedures to provide additional assurance the piping would be maintained sufficiently full. A further discussion regarding procedure changes is provided in item 8.

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.

Regarding utilization of existing vent valves, RHR vent valve, RH-0155, in the Mechanical Auxiliary Building on the return line to the RWST will be included in the applicable venting procedures.

This activity will be tracked in the station Corrective Action Program and will be scheduled for completion by October 11, 2009.

No new vent valves or modifications to existing vent valves have been identified.

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.**

Confirmatory walkdowns of all SI, CS and RHR System piping have been completed in Unit 1. In Unit 2 all SI, CS and RHR system piping has been walked down except for those SI and RHR system piping that are inside the bio-shield wall, in the reactor containment building, a posted high radiation area during all plant modes.. No discrepancies were found between the as-built field conditions and the drawings relevant to gas accumulation issues. All vent valves are installed at the proper location circumferentially as well as proper location along the length of the pipe. All horizontal piping was found to be nominally level with no discernible change in elevation detected through visual inspection.

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 [5] Three-Month Response to NRC Generic Letter 2008-01).**

To date, no new vent locations or modifications to existing vent valves have been identified as a result of the confirmatory walkdowns. Confirmatory walkdowns at STP are visual confirmation that the installed piping configuration matches the respective P&ID and isometric piping drawing(s). These confirmatory walkdowns did not include measurement of pipe slope.

STP will complete the slope surveys and evaluations associated with the accessible piping for all systems on both units by January 30, 2009.

STP will perform the remaining piping slope surveys of normally inaccessible piping in the STP Unit 1 containment during 1RE15, currently scheduled to begin in October 2009.

STP will perform the remaining piping slope surveys of normally inaccessible piping inside containment for STP Unit 2 during 2RE14, currently scheduled to begin in March of 2010.

This information above is also provided to address the Staff's requests as stated in Reference 4.

8. **Discuss the results of the fill and vent activities and procedure reviews for each system.**

Following outages and significant maintenance activities, operating procedures are used to refill the subject systems. These procedures coupled with surveillance test procedures provide the means to fill and vent the subject systems as well as purge air and other non condensable gases from associated piping and components. Venting activities for the subject systems are controlled by approved operating procedures. Fill and vent of the RHR system is governed by 0POP02-RH-0001, "Residual Heat Removal System Operation", fill and vent of the SI system is covered by 0POP02-SI-0001, "Safety Injection Accumulators", and 0POP02-SI-0002, "Safety Injection System Initial Lineup", and fill and vent of the CS system is governed by 0POP02-CS-0001, "Containment Spray Standby Lineup". Partial fill and vent is governed by 0POP01-ZO-0010, "Partial System Fill and Vent (General)". No new procedures are required to control venting of the subject systems.

A review was performed of the procedures used to vent the subject system piping during fill and vent activities. The fill and vent procedures were found to adequately fill and vent the subject system piping and components using existing vents.

The fill and vent procedures were evaluated to determine if the sequence of steps was effective and whether or not adequate acceptance criteria for the completion of venting were provided. In each case, the sequence of steps was found to be effective. Although explicit acceptance criteria for the completion of venting were not included in the procedures, operator training provides confidence that each vent location is completely and correctly vented.

The fill and vent procedures were reviewed to determine if venting of instrument lines was included. It was found that instrument venting for the SI, CS and RHR systems is addressed in the fill and vent procedure for each system. For the dynamic venting portion of the RHR fill and vent procedure, fill and vent of the instruments occurs before the dynamic venting ("flow sweeps") which reduces its effectiveness. The procedure will be revised to also vent the instruments after the flow sweeps are complete. The partial fill and vent procedure (used when the maintenance boundaries differ from those in the system fill and vent procedure) did not include steps for instrument venting. The procedure will be revised to include steps to vent affected instruments.

The application of fill and vent procedures to system restoration following maintenance during plant operation was evaluated. For the systems in question, the system fill and vent procedures assume a general draining of the system and do not include guidance for isolating specific components. STP has a specific procedure (0POP01-ZO-0010) that can be used if the boundaries assumed in the system fill and vent procedures cannot be used.

The review also considered dynamic venting and vacuum fill considerations. STP currently uses both vacuum fill and dynamic venting for fill and vent of the RHR system depending on system conditions. The vacuum fill was determined to be adequate based on STP system history and adequate sequencing of steps. The dynamic venting was evaluated with regard to flowrate, duration and sequence of steps and was judged to be adequate. Recent system history supports this assessment. No procedure changes were required.

The fill and vent procedures were also reviewed to determine if additional validation methods were needed to provide adequate assurance that the systems are sufficiently full of water. Based on this review and STP's operating history, it has been determined that no additional validation methods (such as UT) are necessary. The criteria for completion of venting, the sequencing of steps in the procedures and the physical system configuration ensure the piping is sufficiently full of water.

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.

The review identified several beneficial changes to the following procedures:

0POP02-RH-0001, "Residual Heat Removal System Operation",
0POP01-ZO-0010, "Partial System Fill and Vent (General)",
0POP02-SI-0001, "Safety Injection Accumulators",
0POP02-SI-0002, "Safety Injection System Initial Lineup", and
0POP02-CS-0001, "Containment Spray Standby Lineup".

These beneficial revisions to these procedures will be tracked in the condition report resulting from the Generic Letter evaluation and are planned to be issued no later than October 11, 2009.

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

Upon review of the subject system piping, STP identified that for the SI system potential gas intrusion mechanisms include dissolved gas coming out of solution (e.g. accumulator back-leakage and/or intersystem leakage), and conditions where local temperatures are at or above saturation temperature.

Review of the RHR system showed that potential gas intrusion mechanisms including dissolved gas coming out of solution from SI Accumulator back-leakage and/or intersystem leakage are the potential sources. Gas introduced into the RHR system would collect in the U-tube area of the RHR heat exchangers. Procedure changes and hardware changes have been made in the past to address this issue. Additional procedure enhancements are proposed as a result of this GL review.

Nitrogen-saturated water from the Safety Injection Accumulators is maintained at approximately 650 psig. If leakage through closed valves or check valves occurs, the process fluid has the potential to migrate to a lower pressure section allowing the nitrogen to come out of solution. Monitoring of trends in accumulator pressure and level changes by the control room operators and system engineers allows for timely recognition of abnormal leakage. Upon recognition, that trend would be reported in the corrective action program which allows for a determination of operability implications, evaluation of cause and issue resolution.

Another potential high-pressure source is leakage past the first check valves from any of the RCS cold leg and hot leg injection lines. This source, like the accumulators, can depressurize causing hydrogen or other entrained gases to come out of solution.

The safety injection check valve test header is inter-connected to all the cold leg and hot leg injection lines. While these flow paths are normally isolated, leakage past closed valves has been observed historically. If leakage occurs past the check valves and the safety injection test header isolation valves, then this water can further depressurize and entrained gases could come out of solution.

Due to the adverse impact of gases coming out of solution from migration of higher-pressure fluids to lower pressures, the safety injection check valve test header is typically maintained in the isolated position. This action prohibits a potentially continuous and un-monitored build up of gases in the discharge piping.

Leakage from the RCS can be detected by the daily RCS leakrate calculation (RCS inventory balance) which allows timely indication of increasing trends in leakage. That trend identification would be reported in the corrective action program which allows for a determination of operability implications, evaluation of cause and issue resolution. Additionally, observing a change in safety injection accumulator level, an increase in RWST level, and/or a change in residual heat removal system pressure can identify RCS leakage or other degrading material conditions.

The Containment Spray System is not vulnerable to gas intrusion. This system connects only to the suction line from the RWST and discharges to the Reactor Containment Building. There are no credible gas intrusion mechanisms due to its limited interconnection.

11. Ongoing Industry Programs

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

- Gas Transport in Pump Suction Piping

  The PWROG has initiated testing to provide additional knowledge relative to gas transport in large diameter piping. One program performed testing of gas transport in 6-inch and 8-inch piping. Another program will perform additional testing of gas transport in 4-inch and 12-inch low temperature systems and

4-inch high temperature systems. This program will also integrate the results of the 4-inch, 6-inch, 8-inch and 12-inch testing.

- Pump Acceptance Criteria

  Long-term industry tasks were identified that are intended to provide additional tools to address GL-2008-01 with respect to pump gas void ingestion tolerance limits.

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

STP will continue to participate in industry initiatives to improve the understanding of gas accumulation issues and development of technical information on which to base design and operating practices. At the time of this submittal, those programs are not finalized and no final time frame for issue resolution is provided.

STP will complete the confirmatory walkdown of remaining Unit 2 SI and RHR System piping sections that are located inside the bio-shield wall during the current refueling outage (2RE13) October 2008.

STP will complete the piping slope surveys and evaluations associated with the accessible piping for all systems on both units by January 30, 2009.

STP will perform the remaining piping slope surveys of inaccessible piping in the STP Unit 1 containment 1RE15, currently scheduled to begin in October 2009.

STP will perform the remaining piping slope surveys of inaccessible piping inside containment for STP Unit 2 during 2RE14, currently scheduled to begin in March of 2010.

This schedule is based on the commitments in the STP 3-month letter, reference 3, and the next scheduled outages for each unit following October 11, 2008.

STP will make a beneficial change to the "Design Checklist" in the design change process. This is a checklist that prompts the developer of the design change package to answer, and possibly take additional action on, numerous questions associated with the STP design and licensing bases. This checklist addresses considerations related to gas accumulation issues such as hydraulic design, water hammer and pipe/pipe support analysis. The design checklist will be revised to include an item that will require engineers to explicitly consider potential gas accumulation and/or impact of design modifications on system venting capability. This revision will be issued no later than October 11, 2009.

The beneficial revisions to the procedures identified in section 9 will be tracked in the condition report resulting from the Generic Letter evaluation and are planned to be issued no later than October 11, 2009.

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

Testing Evaluation

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

STP has a surveillance procedure that vents the ECCS (SI) piping on a monthly frequency as required by TS 3/4.5.2. This surveillance is designed to ensure that the ECCS piping is full of water by venting "the ECCS pump casings and accessible discharge piping high points". The Containment Spray System (CSS) is not included in the periodic testing because it is not defined as part of the ECCS.

The SI periodic venting procedures specify vent points at the pump casings, suction and discharge lines. No vent valves on the SI discharge line inside the RCB are included in this surveillance because the TS only requires accessible vent locations be utilized. STP vents at the pump suction even though this is not required by TS. Venting at the specified locations ensures that the SI system piping is sufficiently full of water. An evaluation was performed to verify that systems were not preconditioned by other surveillance tests prior to performing the periodic venting procedures. There is no evidence of preconditioning and no likely source of preconditioning for this surveillance. Based on surveillance performance history, all of the subsystems are maintained sufficiently full.

2. **Identify procedure revisions, or new procedures resulting from the periodic venting or gas accumulation surveillance procedure review that need to be developed, and summarize the Corrective Actions, and schedule for completion of the Corrective Actions.**

The review identified several beneficial changes to 0PSP03-SI-0014, "ECCS Valve Checklist". The revision to this procedure will be tracked as a Corrective Action resulting from the Generic Letter evaluation and is planned to be issued no later than October 11, 2009.

3. **Discuss how procedures adequately address the manual operation of the RHR in its decay heat removal mode of operation. Include how the procedures assure that the RHR 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).**

Operation of the system is in accordance with procedure 0POP02-RH-0001, "Residual Heat Removal System Operation", which establishes the appropriate limits and precautions for system operation. This procedure also provides direction for the startup and shutdown of the RHR system including filling and venting the system following maintenance. There are two methods described in the procedure for filling and venting the RHR system: dynamic venting (flow sweeps) and vacuum fill.

The dynamic venting is in the forward direction that transports any accumulated gas to the reactor coolant loop. This was a procedure change resulting from the evaluation of the operating history of surveillance runs of the RHR Pumps in a recirculation mode that would sweep the gas into the pump flow instruments causing a low flow trip. The vacuum fill method has been effective in removing air following system maintenance.

Each train can be filled and vented independently. Operators have indication in the control room to allow diagnosis of abnormal system operation. Abnormal operating procedures exist to allow the operators to respond to the abnormal condition and return the system to its normal mode of operation.

The RHR uses a heat exchanger bypass loop arrangement to control the RHR heat removal rate while maintaining design flow through the system. The RCS cooldown rate is controlled by manually regulating the reactor coolant flow through the tube side of each residual heat exchanger. A bypass line around the residual heat exchanger contains a flow control valve that automatically maintains a constant return flow to the RCS. Instrumentation is provided to monitor system pressure, temperature, and flow in all three trains. A pump motor current indication system is provided on each RHR pump motor. During reduced RCS inventory the pump motor current indication system warns the operators of the approach to inadequate pump suction conditions. Also, multiple narrow range level indicators are utilized to monitor actual water levels in the Reactor Coolant loops during reduced inventory operation.

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.**

Based on the procedure review performed on the ECCS systems (see Design Evaluation Section 8), fill and vent following maintenance activities will not result in gas intrusion that would impact operability or result in gas accumulations being found during this surveillance. During any restoration from maintenance, the applicable IST would be used to demonstrate operability of the train and implicitly verify that the piping is sufficiently full. Compliance with STP's maintenance procedures will preclude the potential for gas intrusion from maintenance activities. A review of maintenance procedures for the SI and CS systems did not reveal any possible gas intrusion sources.

STPNOC identified no credible way for the pump testing procedures for the SI and CS systems to cause gas intrusion. The performance of these procedures is likely to clear any gas accumulation in the ECCS piping upstream of the discharge MOVs by sweeping it into the RWST. The inservice testing surveillances for the various pumps in the SI system have a requirement that the system be aligned in accordance with the initial fill and vent procedure which ensures that the system is full of water.

Suction source changes for the SI and CS pumps are not a credible source of gas intrusion. The suction source for the SI and CS pumps will be the RWST for all operations except for an accident that is severe enough to swap the suction to the containment sump. There are numerous barriers to prevent opening of the recirculation MOV before the containment sumps are full of water. Air in-leakage past the recirculation MOV is not credible as a source of gas intrusion because the containment sumps are at a higher elevation than the pump suction (resulting in any leakage past these valves being water leakage into the containment sumps).

There are no other activities that have been identified which may cause gas intrusion in these areas. The most likely source of gas accumulation in these areas would be a failure to perform required steps in the system fill and vent procedures.

5. **Describe how gas voids are documented, dispositioned, and trended, if found in any of the subject systems.**

If gas voids are found during the periodic venting surveillance, the procedure requires that the Shift Supervisor be notified and a condition report would be written in accordance with the Corrective Action Program. Based on surveillance performance history, interviews and CAP reviews, there is no indication that STP has identified voiding issues during performance of the venting surveillance. With no historical evidence of voiding, there is no data to quantify and trend.

The surveillance procedure, 0PSP03-SI-0014, "ECCS Valve Checklist", will be revised to explicitly require the documentation in Corrective Action program of any gas voids found during the surveillance. This will provide additional assurance that gas voids are being treated with an appropriate response.

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

The review identified several beneficial changes to 0PSP03-SI-0014, "ECCS Valve Checklist". The revision to this procedure will be tracked as a Corrective Action resulting from the Generic Letter evaluation and is planned to be issued no later than October 11, 2009.

<u>Corrective Actions Evaluation</u>

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

All personnel at the South Texas Project are trained on their responsibilities under the Corrective Action program. The Corrective Action program has been effectively applied to conditions involving gas accumulation. This is evident in the actions taken by the station during 2004 and 2005 when gas accumulation problems were identified in the RHR system. In 2004 a letdown relief valve lifted during RHR operation due to an inadequate vacuum fill of the RHR HX which led to a bubble in the upper part of the tubes. Revising the vacuum fill procedure, 0PGP02-RH-0001, corrected this problem. In 2005 the RHR pump was secured after indications of air entrainment. The cause of this problem was determined to be sequencing issue during flow sweeps. Again, the procedure was revised to correct this problem.

If gas voids are found during periodic venting, the procedure requires that the Shift Supervisor be notified and a condition report would be written in accordance with the Corrective Action program. Based on surveillance performance history, interviews and Corrective Action program reviews, there is no indication that STP has identified voiding issues during performance of the venting surveillance.

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

No changes to STP's corrective action program are being made as a result of GL 2008-01 evaluations.

B. DESCRIPTION OF NECESSARY CORRECTIVE ACTIONS

There are no corrective actions identified that were determined to be necessary to assure compliance with the applicable regulations.

C. CORRECTIVE ACTION SCHEDULE

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

   N/A

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

   N/A

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

Regulatory Commitments

The following table identifies actions committed to by STP Nuclear Operating Company in this letter. Any other statements in this letter are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Mr. Wayne Harrison, Licensing Manager, South Texas Project Nuclear Generating Station, (361) 972-7298.

Regulatory Commitment	Due Date	CR Number
STPNOC will complete the piping slope survey and evaluation of accessible piping by January 30, 2009	January 30, 2009	08-796-26
STPNOC will complete the slope survey of inaccessible piping in Unit 1 during the fall outage of 2009 and provide a report 90 days after completion of the outage.	90 days after completion of Unit 1 fall 2009 outage.	08-796-27
STPNOC will complete the walkdown and slope survey of inaccessible piping in Unit 2 during the spring outage of 2010 and provide a report 90 days after completion of the outage.	90 days after completion of Unit 2 spring 2010 outage.	08-796-28