FPL Energy
Seabrook Station

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October 14, 2008

SBK-L-08179
Docket No. 50-443

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

Seabrook Station

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," January 11, 2008

2. Letter L-2008-076 to NRC, "Extension Request Regarding the Three Month Response to Generic Letter 2008-01 Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," April 9, 2008

3. Letter SBK-L-08058, "Three-Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," May 9, 2008

4. NRC Letter, "Seabrook Station – RE: Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," Proposed Alternative Course of Action," September 29, 2008.

The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2008-01 (Reference 1) to request that each licensee evaluate the licensing basis, design, testing, and corrective action programs 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:

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"(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."

Attachment 1 to this letter contains the FPL Energy Seabrook, LLC (FPL Energy Seabrook) nine-month response to NRC GL 2008-01.

In summary, FPL Energy Seabrook has concluded that the subject systems/functions at Seabrook Station are in compliance with the TS definition of Operability, i.e., capable of performing their intended safety function and that Seabrook Station is currently in compliance with 10 CFR 50 Appendix B, 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 3, FPL Energy Seabrook will complete its assessments of those inaccessible portions of these systems/functions during the next refueling outage and provide a complete GL 2008-01 submittal based on the final walk downs with completed evaluation results within 90 days of the fall 2009 refueling outage but no later than February 28, 2010.

Commitments made by FPL Energy Seabrook in response to GL 2008-01 are included in Attachment 2.

Should you have any questions regarding this information, please contact Mr. Michael O'Keefe, Licensing Manager, at (603) 773-7745.

Very truly yours,

FPL Energy Seabrook, LLC

Gene St. Pierre
Site Vice President

Attachments

cc: S. J. Collins, NRC Region I Administrator
G. E. Miller, NRC Project Manager, Project Directorate I-2
W. J. Raymond, NRC Resident Inspector

FPL Energy
Seabrook Station

SEABROOK STATION UNIT 1

Facility Operating License NPF-86
Docket No. 50-443

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

The following information is enclosed in support of this response to Generic Letter 2008-01:

Attachment 1 – FPL Energy Seabrook Nine-Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"

Attachment 2 – FPL Energy Seabrook Commitments in Nine-Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"

I, Gene St. Pierre, Site Vice President of FPL Energy Seabrook, LLC hereby affirm that the information and statements contained within this response to Generic Letter 2008-01 are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

Sworn and Subscribed
before me this
14 **day of** October, **2008**

Michael D. O'Keefe
Notary Public

MICHAEL D. O'KEEFE
NOTARY PUBLIC
NEW HAMPSHIRE
MY COMMISSION EXPIRES FEB. 13, 2013

Gene St. Pierre
Gene St. Pierre
Site Vice President

Attachment 1 to SBK-L-08179

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

This Attachment contains Seabrook 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, DHR system, and containment spray system licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified."

The following information is provided in this response:

a) A description of the results of evaluations that were performed pursuant to the requested actions (see Section A of this Attachment),

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 Attachment), 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 Attachment).

The following systems are in the scope of GL 2008-01 for Seabrook Station:

- Safety Injection System (SI), including the centrifugal charging pumps (CCPs) and ECCS flow paths in the Chemical and Volume Control System (CS), and the Residual Heat Removal (RHR) System serving as the Emergency Core Cooling System

- Residual Heat Removal System serving as the Decay Heat Removal System

- Containment Building Spray (CBS) System serving as the Containment Spray System

In-scope piping systems were reviewed and evaluated in their entirety. Accessible piping outside containment was walked down to verify piping geometry. Piping system walk downs for piping inside containment and inside the refueling water storage tank (RWST) were not completed for this response.

A. EVALUATION RESULTS

Licensing Basis Evaluation

The Seabrook licensing basis was reviewed with respect to gas accumulation in the Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems. This review included the Technical Specifications (TS), TS Bases, Updated Final Safety Analysis Report (UFSAR), the Technical Requirements Manual (TRM) and the Safety Evaluation Reports (SER).

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 following changes were determined to be needed to address weaknesses or deficiencies in meeting regulatory requirements or commitments:

a) Discuss how the ECCS suction piping was addressed.

Historically, Seabrook Station has been monitoring for gas accumulation in ECCS pump suction piping from the refueling water storage tank (RWST) in accordance with the plant technical specifications (TS). The current plant TS require verifying that the ECCS piping is full of water every 31 days. The TS Bases define piping "full of water" as follows:

> "The phrase "full of water" is subjective particularly since most system fluid streams do contain a certain amount of non-condensable gasses. "Full" can be defined in context of the TS Bases, whereby ECCS piping may be considered "full of water" if there is reasonable assurance that the content of the non-condensable gas within the system (including the aggregate amount of non-condensable gasses in all ECCS piping) and/or at a particular point will not be of significance to impair the ECCS system from performing properly by injecting its full capacity into the RCS upon demand. Consideration must be given to water hammer, pump cavitation or pumping of non-condensable gas into the reactor vessel following a safety injection (SI) signal or during shutdown cooling."

The residual heat removal pump (RHR) suction piping from the ECCS recirculation sumps is not included in the scope of the current TS or the TS Bases. The RHR pump suction piping from the RCS is not included in the current scope of the TS or the TS Bases. The TS definition of OPERABLE / OPERABILITY applies to the RHR pump suction piping relative to gas intrusion.

The UFSAR does not discuss requirements for ECCS piping high point venting, gas accumulation or piping systems "full of water." The specific requirements are included the TS and TS Bases. Therefore, no changes to the Seabrook Station UFSAR are required.

For ECCS pump suction piping from the RWST, the current Seabrook Station TS and TS Bases verify that ECCS suction piping is sufficiently full. The RHR pump suction piping from the ECCS recirculation sumps and from the RCS loops will be included in the appropriate monitoring procedure. The RHR pump suction piping from the ECCS recirculation sumps will be added to the TS Bases for TS 3/4.5.2 and 3/4.5.3. Since the specific requirements are included in the TS and TS Bases, no changes are required to the Seabrook Station UFSAR.

TS changes, if required following the Technical Specification Task Force (TSTF) review, will be completed as discussed in A. 3 below. This includes any changes that address the RHR pump suction piping from the RCS loops for decay heat removal.

b) Discuss how the Containment Spray System was addressed.

The current containment building spray (CBS) system TS and TS Bases do not require verifying that the CBS piping is full of water every 31 days.

The TS definition of OPERABLE / OPERABILITY applies to the CBS system piping relative to gas intrusion.

The UFSAR does not discuss requirements for CBS system piping high point venting, gas accumulation or piping systems "full of water."

The CBS system monitoring points will be added to the plant surveillance procedures. Monitoring the CBS system high points and applying the TS definition of Operable is all that is required to support the licensing basis. The TS Bases for TS 3/4.6.2.1 and 3/4.6.2.2 will be revised to define piping sufficiently full as a basis for system operability. TS changes, if required following the TSTF review, will be completed as discussed in A. 3 below.

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

a) Discuss how the ECCS suction piping was addressed.

For ECCS piping, the TS Bases for TS 3/4.5.2 and 3/4.5.3 will be revised to add the RHR pump suction piping from the ECCS recirculation sumps.

b) Discuss how the Containment Spray System piping was addressed.

For Containment Building Spray System piping, the TS Bases for TS 3/4.6.2.1 and 3/4.6.2.2 will be revised to define piping sufficiently full as a basis for system operability.

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

Corrective actions are identified throughout this document as (CA-#). A summary of

the corrective actions, including the schedule for completing the actions and the bases for the schedule, are included in Section C.2.

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. FPL Energy Seabrook 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. FPL Energy Seabrook will evaluate the resolution of TS issues as contained in the TSTF traveler for applicability to the Seabrook design and licensing basis, and submit a license amendment request based on this evaluation within 180 days following NRC publication of the Notice of Availability of the TSTF traveler, as deemed necessary. Any TS Bases changes associated with the TS changes will also be made upon NRC issuance of the license amendment for Seabrook under the TS Bases Control Program. This is a long-term action that will be tracked in the corrective action program. (CA-1)

The TS Bases for TS 3/4.5.2 and 3/4.5.3 will be revised to add the RHR pump suction piping from the ECCS recirculation sumps. The TS Bases for TS 3/4.6.2.1 and 3/4.6.2.2 will be revised to define piping sufficiently full as a basis for system operability. (CA-2)

Design Evaluation

The Seabrook Station design basis was reviewed with respect to gas accumulation in the Emergency Core Cooling, Residual Heat Removal, and Containment Building Spray Systems. This review included 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.**

   Seabrook Station has been monitoring piping high points in the ECCS from the RWST to the RCS for approximately 10 years.

   Prior to issuance of NRC Generic Letter 2008-01, Seabrook Station maintained calculations that established gas void allowable values for the emergency core cooling system (ECCS) pump suction piping from the refueling water storage tank (RWST) and for the ECCS pump discharge piping.

   Seabrook maintains engineering evaluations that document the bases for monitoring selected ECCS high points in the ECCS pump discharge piping and in the ECCS pump suction piping from the RWST.

   Residual heat removal (RHR) pump suction piping from the reactor coolant system (RCS) and from the ECCS recirculation sumps, containment building spray (CBS) pump suction and discharge piping were not included in design basis calculations or evaluations.

   Historically, Seabrook Station has used a 5% void fraction for short-term transient operation in the pump suction piping systems for the safety injection pump (SIP) and RHR pump suction piping based on available industry information. The CCP suction piping used both a void fraction and Froude number to establish allowable gas void volumes. The Froude number will be discontinued as a result of this evaluation. This 5% void fraction is continued for use for the CCP, SIP and RHR pump suction piping within the scope of this generic letter.

   The piping systems within the scope of the generic letter had hydraulic transient calculations completed as part of the initial plant design. Engineering evaluations of the transient calculations determined that pump startup with gas pockets in the system would not create higher loads than the analyzed pump trip loads. Based on the hydraulic transient calculations and the further engineering evaluations, a 25 – 50% void fraction is used for pump discharge piping acceptance criteria based on large or small bore pipe.

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

Historically, Seabrook Station has used a 5% void fraction for short-term transient operation in the pump suction piping systems for the SIP and RHR pump suction piping. The CCP suction piping used both a void fraction and Froude number to establish allowable gas void volumes. The Froude number will be discontinued as a result of this evaluation. This 5% void fraction is continued for use for the CCP, SIP and RHR pump suction piping within the scope of this generic letter.

The CBS pump suction piping void fraction is limited nominally to 2% void fraction for continuous pump operation. An evaluation of one inaccessible pipe segment located inside the RWST indicates that the CBS pump may experience a transient void fraction of 3.5%. This evaluation considered the maximum possible void based on the piping geometry. This 3.5% void fraction is less than the 5% maximum void fraction for short-term transients recommended by the PWROG for single stage pumps.

The 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.			

Piping void allowable values were determined for each pump suction gas accumulation point. The allowable values were included with the initial gas accumulation ultrasonic testing (UT) monitoring work order. Accessible, piping high points were monitored using UT methods and met the allowable gas void values.

Seabrook Station procedures that monitor piping high points in the ECCS piping from the RWST to the RCS and monitoring the new RHR and CBS pump suction piping high points provide assurance that the volume of gas in the pump suction piping for the RHR, SI, CS and CBS systems is limited such that pump gas ingestion is within the above PWROG program established interim criteria.

Plant surveillance and trending procedures will be modified to include the new points identified as part of the GL review and the associated gas void allowable values by April 15, 2009. (CA-3 and 4)

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

The Seabrook Station initial design included hydraulic transient calculations for each of the systems within the scope of the generic letter. These calculations and further engineering evaluations, that considered the effect of the restriction orifices, formed the basis for piping void allowable values for the ECCS pump discharge piping systems.

The allowed values permit up to a 50% void in the 4-inch and under safety-injection pump and CCP discharge piping and up to a 25% void in RHR pump discharge piping

New ECCS pump discharge piping monitoring points identified as a result of the system piping slope walk downs will continue to use the existing ECCS pipe discharge allowable values.

The initial design basis of Seabrook Station includes a detailed calculation of the hydraulic transients during filling of the Containment Building Spray pump discharge header. The resultant force imbalances are within the margin of the pipe supports.

Based on a review of the hydraulic transient calculations and the condition that there are no restricting orifices in the Containment Building Spray pump discharge header, the allowed values permit up to a 25% void in the CBS pump discharge piping.

c) RCS Allowable Gas Ingestion

The PWROG qualitatively evaluated the impact of non-condensable gases entering the RCS on the post-accident core cooling functions of the RCS. This evaluation assumed that 5 cubic feet of non-condensable gas at 400 psig was present in the CCP and SIP discharge piping concurrent with 5 cubic feet of non-condensable gas at 100 psig in the RHR pump discharge piping. The

qualitative evaluation concluded that the quantities of gas will not prevent the ECCS from performing its core cooling function.

Trending procedures will be revised to monitor gas accumulation on an aggregate basis to determine if further corrective action is necessary. (CA-4)

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

Design basis calculations were revised to determine piping void allowable values for CBS pump suction and discharge piping and RHR pump suction piping from the RCS and ECCS recirculation sumps. Gas void allowable values are now available for all piping systems within the scope of the GL.

Engineering evaluations that form inputs to the gas void surveillance procedures require further updating to include the additional scope of monitoring points, the basis for their selection and gas void allowable values for each point.

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

System piping and instrumentation diagrams (P&IDs) and isometric drawings were reviewed to identify piping system high points and local high points due to closed valves or check valves. Eighteen new system high points were identified as a result of this process. For fourteen of the new system high points, gas void allowable values were developed and an initial UT measurement completed. Initial UT monitoring of the fourteen accessible piping high points determined that the piping systems were sufficiently full to meet the established allowable values.

Two of remaining four new high points are in the RHR pump suction drop legs from the RCS and are located inside containment and inside the bioshield. These two points are not accessible at power. Gas voids at these points are unlikely due to pressurizing the system piping to RCS pressure, approximately 362 psig, at the beginning of cool down. Another new system high point is located inside the RWST. This piping is the spray additive tank to RWST mixing chamber and is located inside the RWST. The potential maximum void size within the tank internal piping does not challenge operability of the RHR, SI, or CBS pumps located downstream. The last high point identified during the drawing review is in the CS system. This point was further evaluated as acceptable due to the small size of the maximum potential trapped volume.

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

Based on the GL review, new vent valves are not required to achieve the gas void allowable values at the identified piping high point locations. System piping was

sufficiently full, as verified by a UT of the system piping, based on current system fill and vent and dynamic vent procedures with no identified accumulator leakage into lower pressure systems. System vent enhancements that will simplify the gas removal process or reduce system out of service time should gas be found at a piping system high point will be considered on a case-by-case basis.

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

System piping walk downs were completed for the RHR, CS, SI and CBS system piping located outside containment within the scope of the generic letter. System piping isometric drawings were identified for the piping systems within the scope of the generic letter. Each horizontal piping run on the isometric drawing was identified with a reference location number. Measurements were made from a reference horizontal point to determine direction and amount of pipe slope from the reference point for each identified horizontal piping run. Measurements were made to the pipe wall by either removing insulation or by pushing a measuring probe through the insulation. This information was then used to determine a maximum void size at a horizontal position that sloped away from the piping geometry high point. The maximum void size was compared to void size allowable values for the pipe segment and if greater than the void size allowable values for the pipe segment was selected for UT monitoring. Further screening eliminated several points. This screening process did not consider the effects of gas compression due to RWST head pressure or pump operating pressures. Further consideration of the local pressure conditions may reduce the number of monitored high points due to the piping slope measurements.

This process yielded thirteen high points, in addition to the 18 high points discussed above, for initial monitoring. The thirteen high points identified from the piping walk downs were UT monitored for the presence of gas. At the thirteen high points, the piping was sufficiently full to meet the established gas void allowable values. A gas void was found at one piping high point located in the CBS pump suction from the ECCS recirculation sump B. The void size was within the allowed values for CBS pump operation. The gas void is documented in a condition report.

7. **Identify new vent valve locations, modifications to existing vent valves, or utilization of existing vent valves that resulted from the confirmatory walk downs, and summarize the Corrective Actions, and the schedule for completion of the Corrective Actions, i.e., the walk downs that have been completed, and the walk downs not yet complete (refer to Reference 3, Three-Month Response to NRC Generic Letter 2008-01).**

New vent valves are not required to achieve acceptable gas void volumes at the identified piping walk down high points. System piping was sufficiently full based on current system fill and vent and dynamic vent procedures and no identified

accumulator leakage into lower pressure systems. System vent enhancements that will simplify the gas removal process or reduce system out of service time, should gas be found at a piping system high point, will be considered on a case-by-case basis.

Walk downs and evaluations for piping systems located inside containment were not completed. The walk downs for piping systems located inside containment will be completed during the fall 2009 refueling outage as stated in our three month response, SBK-L-08058, Three-Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems", dated May 9, 2008. (CA-7)

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

Fill and vent procedures and dynamic vent procedures are available and in-use for each of the systems within the scope of the generic letter. For the systems that are currently monitored, the system piping is confirmed to be full using UT methods. This practice will be extended to the additional piping systems and piping system high points that were identified from the GL review. (CA-5)

The fill and vent procedures were reviewed to determine if the sequence of steps was effective and whether or not adequate acceptance criteria were provided. In each case, the sequence of steps was found to be effective. Minor procedure enhancements were identified and are tracked as part of the station corrective action program.

Instrument lines were found to require no special consideration since the lines are designed to be down sloping to the sensing device. Procedures are available if instrument-sensing lines require further venting.

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. (Routine periodic surveillance testing is addressed in the "Testing Evaluation" section of this Attachment.)**

System fill and vent procedures and dynamic vent procedures were adequate to ensure ECCS and CBS system piping is sufficiently full to ensure operability of the systems. Nonetheless, a procedure change was implemented to enhance the filling and venting of two locations in the RHR pump suction from the ECCS recirculation sumps. However, the system piping was found sufficiently full prior to implementation of the procedure change.

System fill and vent procedures for the RHR pump suction piping from the RCS, RHR pump suction piping from the ECCS recirculation sumps, CBS pump suction piping from the RWST, CBS pump suction piping from the ECCS recirculation

sumps, and CBS pump discharge piping will be revised to require verification that the piping is full using UT methods and the newly established gas void allowable values. (CA-5)

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

Pump suction piping for the RHR, CS, SI and CBS pumps is most likely to retain air if the system piping is not adequately filled and vented. In systems capable of flowing following the fill and vent process, the pump flow and dynamic venting procedures or UT verification ensure that the system piping is sufficiently filled. System flow sweeps for the RHR, SI and CS systems occur when the RHR loop is placed into service for decay heat removal, for ECCS check valve flow testing as part of the in-service test program, or using dynamic vent procedures. The CBS system piping, including the pump suction and pump discharge piping, is swept of air using the pump recirculation path to the RWST. This path develops sufficient velocities to sweep air from the system piping and return any air to the top of the RWST.

Systems that do not flow, such as the spray additive tank (SAT) to RWST piping and CBS and RHR pump suction piping from the ECCS recirculation sumps, benefit from use of detailed fill and vent procedures and available vent valve locations. These systems are filled by gravity from the RWST.

SI and RHR pump discharge piping has the potential for gas intrusion due to system boundary check valve leakage. Accumulator levels are trended to ensure early detection of accumulator out-leakage. The existing ECCS high point UT monitoring and trending program would also detect gas accumulation if it occurs. RCS intersystem leakage, another potential gas source, contains hydrogen dissolved in the coolant at 25-35 cc/kg. This concentration derives by operating the volume control tank (VCT) hydrogen pressure at 18-25 psig. The VCT operating pressure is less than the RWST head pressure in the piping systems. Thus, hydrogen gas is not a credible gas source for the RHR and SI pump discharge piping.

The CCPs normally operate by taking suction from the VCT that includes the hydrogen dissolved in the pumped fluid. Many examples of industry experience involve hydrogen coming out of solution at various locations that interface with the charging pump suction piping. After approximately 10 years of monitoring CCP suction piping within the ECCS flow path at Seabrook Station, including the piping cross connect from the RHR pumps to the SI pump suction and to the CCP suction, no gas accumulation of hydrogen has been detected. This is partially due to a favorable piping geometry of the cross connect piping from the SIP and RHR pumps. These piping runs rise from a lower elevation up to the CCP pump suction header piping vice from a higher elevation down to the CCP pump suction header piping. This later configuration, not present in the Seabrook piping geometry, creates an unfavorable stagnant flow, gas accumulation site. The CCPs also benefit from a favorably high elevation difference from the VCT to the CCPs. This elevation difference maintains gases in solution in the centrifugal charging pump recirculation

piping system.

Vortexing has been evaluated for the CCP suction from the VCT, the ECCS and CBS pump suctions from the RWST, the RHR and CBS pump suction from the ECCS recirculation sumps, and the RHR pump suction from the RCS hot legs.

Vortexing in the VCT to the CCP is prevented by automatically swapping the CCP suction from the VCT to the RWST on a low-low level signal in the volume control tank.

Vortexing in the RWST is prevented by automatically swapping the suction of the RHR and CBS pumps to the ECCS recirculation sumps on a low-low level in the RWST and completing the manual switchover of the CCP's and SIP's in a timely manner as described in the UFSAR and operating procedures.

Vortexing from the ECCS recirculation sumps to the RHR and CBS pumps is prevented as demonstrated by testing the containment sump strainers at scaled flow rates at the minimum expected containment sump level to ensure that no vortexes form.

Vortexing from the RCS hot legs to the RHR pump suction is prevented by procedural guidance that limits the pump flow rate based on the water level in the RCS loop piping.

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 Seabrook Station relative to gas accumulation. The activities will be monitored and tracked in the corrective program to determine if additional changes to the Seabrook Station 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. (CA-8)

- Pump Acceptance Criteria

  Long-term industry tasks were identified that will provide additional tools to address GL-2008-01 with respect to pump gas void ingestion tolerance limits. (CA-8)

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

See Section C.2. below.

Testing Evaluation

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

Gas accumulation surveillances are conducted using UT methods and are trended. For systems and high points that are currently monitored, several allowable values require revision. (See Design Evaluation Item 1.) New piping high points resulting from the GL review will be included in the surveillance procedure. The identified piping high points due to pipe slopes will be included in the surveillance procedure or an additional review will be completed to exclude them from the surveillance program. Exclusion could be based on the condition that regardless of the pipe slope, sufficient gas could not accumulate to challenge acceptance values for the high point piping location or could be based on the local pressure at the point.

The ECCS system surveillance procedure will be revised to include any new piping high points or revised allowable values. (CA-3)

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

Existing procedures will be modified to include the new piping system high points in the RHR pump suction piping from the ECCS recirculation sumps and from the RCS hot legs. Existing procedures will be modified to include the new piping system high points for the CBS system. (CA-3)

The system trending procedure for the ECCS system will be modified to trend the gas accumulation surveillance results at the new identified ECCS, RHR and CBS system piping high points. Trending procedures will be revised to monitor gas accumulation on an aggregate basis to determine if further corrective action is necessary. (CA-4)

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

During normal operation, the RHR system is pressurized at approximately 45 psig from the RWST static pressure. Once the RCS pressure is decreased to approximately 362 psig, the RHR system is then pressurized from the reactor coolant system. Since the RHR pump suction and discharge both tie in to the RCS, the entire RHR system is therefore pressurized to the RCS pressure. Any postulated pre-existing void in the system will then be compressed based on the ratio of the above pressures. Once the RHR pump is turned on the void volume would no longer challenge pump operation.

New piping system high points for the RHR pump suction piping from the RCS will be included in the periodic surveillance program and will be trended as part of the system trending procedure as described above. (CA-3 and CA-4).

Vortexing from the RCS hot legs to the RHR pump suction is prevented by procedural guidance that limits the pump flow rate based on the water level in the RCS loop piping. Reactor level instrumentation and RHR flow instrumentation provide the input used by the operators to ensure that the appropriate level and flow are maintained.

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 results of the procedure reviews, the systems are not subject to inadvertent draining when current procedures are followed.

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.**

Surveillance testing of ECCS, RHR, and CBS system piping high points is conducted using UT methods. Gas voids that meet the allowable value are documented in the plant procedure data sheets and are then trended by the system engineer. Gas voids that do not meet the allowable value are documented in the plant procedure data sheets and are entered in the corrective action program. Void sizing is performed at the time of detection. UT methods characterize the size of the piping void by measuring the distance from the top of the pipe to the water interface along the pipe outside diameter. This measurement is compared to the allowable value included in the procedure, which is also stated as distance from the top of the pipe. If necessary, the length of the gas void is determined using similar methods. If the allowable values are not met and further evaluation within the corrective action program determines that the value is unacceptable, plant operators take appropriate action to bring the system into compliance with the allowable values. This includes venting or using system flow to sweep the gas to an acceptable location. This current practice will be extended to new points identified as a result of the generic letter reviews.

Gas accumulation is currently trended for the ECCS systems within the scope of the current technical specifications. New monitoring points will be trended by revised or new system trending procedures. (CA-4)

6. **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 5 above.

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

   See Section C. 2. Below.

Corrective Actions Evaluation

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

   Seabrook Station's Corrective Action Program is used to document identified gas intrusion/accumulation issues as potentially nonconforming conditions. Existing processes require a condition report to be initiated, and the shift manager notified, if the accumulated gas volume allowable values specified in the procedures are exceeded. As part of Seabrook Station's Corrective Action Program, condition reports related to plant equipment are evaluated for potential impact on operability and reportability. Prompt Operability Determinations are made and any necessary follow-up actions are tracked in the corrective action program to completion to resolve any identified non-conformances or performance enhancements in a timely manner. Management oversight is provided to assure that proper priority to achieve such timely resolution is assigned. In addition, the Nuclear Oversight department monitors the station's performance and identifies any performance deficiencies for correction.

   Results of surveillances within the existing gas monitoring program are trended in accordance with plant procedures.

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

   See Section C.2. Below.

Conclusion

Based upon the above, FPL Energy Seabrook has concluded that Seabrook Station is in conformance with its commitments to 10 CFR 50, Appendix B, Criterion III, V, XI, XVI, and XVII, as described in FPL Quality Assurance Topical Report (QATR) – FPL-1, Rev. 2. or any identified deviations that have not yet been corrected are entered into the Seabrook Station Corrective Action Program for tracking and final resolution, as described in Sections B and C of this Enclosure.

B. DESCRIPTION OF NECESSARY CORRECTIVE ACTIONS

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

See Section C.2. Below.

C. CORRECTIVE ACTION SCHEDULE

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

Calculations were completed to document the allowable values for the piping systems within the scope of the generic letter.

Newly identified piping system high points were monitored using UT methods to determine that the piping system high points were sufficiently full of water. All monitored high points were sufficiently full of water. A gas void was found at one piping high point located in the CBS pump suction from the ECCS recirculation sump B. The void size was within the allowed values for CBS pump operation. No further action was taken. The gas void is documented in a condition report. Since there is no source for gas intrusion, no further monitoring of this point will be completed until the scheduled corrective actions are completed.

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

1. 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. FPL Energy Seabrook 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. FPL Energy Seabrook will evaluate the resolution of TS issues as contained in the TSTF traveler for applicability to the Seabrook design and licensing basis, and submit a license amendment request based on this evaluation within 180 days following NRC publication of the Notice of Availability of the TSTF traveler, as deemed necessary. Any TS Bases changes associated with the TS changes will also be made upon NRC issuance of the license amendment for Seabrook under

the TS BASES control Program. This long-term action is being tracked in the Seabrook Station corrective action program (Condition Report 08-13813).

2. Revise the TS Bases for TS 3/4.5.2 and 3/4.5.3 to add the RHR pump suction piping from the ECCS recirculation sumps. Revise the TS Bases for TS 3/4.6.2.1 and 3/4.6.2.2 to define piping sufficiently full. The TS Bases revisions will be completed by April 15, 2009.

3. Revise the gas accumulation surveillance procedure to a) revise acceptance values for existing monitoring points, b) add new monitoring points for the ECCS, c) add new monitoring points for the RHR pump suction piping from the RCS and from the ECCS recirculation sumps, d) add new monitoring points for the CS, SI and CBS systems, e) add acceptance values for all new monitoring points. f) add a requirement for gas sampling when necessary. The procedure revision will be completed by April 15, 2009.

4. Revise the ECCS system trending procedure to include all new monitoring points in the ECCS, CBS and the RHR system. Trending procedures will be revised to monitor gas accumulation on an aggregate basis to determine if further corrective action is necessary. The procedure revision will be completed by April 15, 2009.

5. Revise system fill and vent procedures for the RHR pump suction piping from the RCS, RHR pump suction piping from the ECCS recirculation sumps, CBS pump suction piping from the RWST, CBS pump suction piping from the ECCS recirculation sumps, and CBS pump discharge piping to require verification that the piping is full using UT methods and include newly established gas void acceptance values. The procedure revision will be completed by April 15, 2009.

6. Revise engineering evaluations that form inputs to the gas void surveillance procedures to include the selected monitoring points, the basis for their selection, and allowable values for each point. The engineering evaluation revisions will be completed by April 15, 2009.

7. Complete the walk downs of piping systems inside containment during refueling outage OR13 on a schedule as stated in the three-month response to GL 2008-01. Complete the GL 2008-01 supplemental submittal based on the final walk downs with completed evaluation results within 90 days of the fall 2009 refueling outage but no later than February 28, 2010.

8. Follow the PWROG industry programs for gas transport in pump suction piping and pump acceptance criteria and evaluate the results for inclusion in Seabrook Station programs and procedures. This long-term action is being tracked in the Seabrook Station corrective action program (Condition Report 08-13814) and will complete on a schedule established by the industry.

The 180 days following a Notice of Availability of a CLIIP is sufficient time to review the completed CLIIP, apply the human resources to prepare the document submittals and obtain appropriate internal approvals. (CA-1)

The document update schedule, April 15, 2009, is based on available human resources to prepare the document revisions, complete the independent and discipline reviews, prepare the 10CFR 50.59 screening documentation and reviews, complete management reviews and enter the documents into the plant record system. Furthermore, the UT monitoring for the new system high points did not identify any significant gas accumulation and the system evaluations did not identify any credible sources of gas intrusion that would not be otherwise detected by the existing surveillance procedure. (CA- 2, 3, 4, 5 and 6)

The walk downs for the piping systems inside containment are performed on a schedule commensurate with the three-month response to GL 2008-01, included in our letter SBK-L-08058, dated May 9, 2007. (CA-7)

CONCLUSION

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

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

As committed in Reference 3, FPL Energy Seabrook will complete its evaluation of the inaccessible portions of these systems and provide a complete GL 2008-01 submittal based on the final walk downs with the completed evaluation results within 90 days of the fall 2009 refueling outage but no later than February 28, 2010.

Attachment 2 to SBK-L- 08179

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

Commitments

FPL Energy Seabrook makes the following commitments in response to Generic Letter 2008-01:

1. FPL Energy Seabrook 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, FPLE Seabrook Station will evaluate its applicability to Seabrook Station, and evaluate adopting the Traveler to either supplement or replace the current TS requirements. FPL Energy Seabrook will evaluate the resolution of TS issues as contained in the TSTF traveler for applicability to the Seabrook design and licensing basis, and submit a license amendment request based on this evaluation within 180 days following NRC publication of the Notice of Availability of the TSTF traveler, as deemed necessary. Any TS Bases changes associated with the TS changes will also be made upon NRC issuance of the license amendment for Seabrook under the TS BASES control Program. This long term action is being tracked in the Seabrook Station corrective action program (Condition Report 08-13813).

2. Revise the TS Bases for TS 3/45.2 and 3/4.5.3 to add the RHR pump suction piping from the ECCS recirculation sumps. Revise the TS Bases for TS 3/4.6.2.1 and 3/4.6.2.2 to define piping sufficiently full. The TS Bases revision will be completed by April 15, 2009.

3. Revise the gas accumulation surveillance procedure to a) revise acceptance values for existing monitoring points, b) add new monitoring points for the ECCS, c) add new monitoring points for the RHR pump suction piping from the RCS and from the ECCS recirculation sumps, d) add new monitoring points for the CS, SI and CBS systems, e) add acceptance values for all new monitoring points, f) add a requirement for gas sampling when necessary. The procedure revision will be completed by April 15, 2009.

4. Revise the ECCS system trending procedure to include all new monitoring points in the ECCS, CBS and the RHR system. Trending procedures will be revised to monitor gas accumulation on an aggregate basis to determine if further corrective action is necessary. The procedure revision will be completed by April 15, 2009.

5. Revise system fill and vent procedures for the RHR pump suction piping from the RCS, RHR pump suction piping from the ECCS recirculation sumps, CBS pump suction piping from the RWST, CBS pump suction piping from the ECCS recirculation sumps, and CBS pump discharge piping to require verification that the piping is full using UT methods and include newly established gas void acceptance values. The procedure revision will be completed by April 15, 2009.

6. Revise engineering evaluations that form inputs to the gas void surveillance procedures to include the selected monitoring points, the basis for their selection, and allowable values for each point. The engineering evaluation revisions will be completed by April 15, 2009.

7. Complete the walk downs of piping systems inside containment during refueling outage OR13 on a schedule as stated in the three-month response to GL 2008. Complete the GL 2008-01 supplemental submittal based on the final walk downs with completed evaluation results within 90 days of the fall 2009 refueling outage but no later than February 28, 2010.

8. Follow the PWROG industry programs for gas transport in pump suction piping and pump acceptance criteria and evaluate the results for inclusion in Seabrook Station programs and procedures. This long-term action is being tracked in the Seabrook Station corrective action program (Condition Report 08-13814) and will complete on a schedule established by the industry.