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October 14, 2008
L-08-315

10 CFR 50.54(f)

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

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
Nine Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems" (TAC No. MD7862)

The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2008-01, dated January 11, 2008, to request that each licensee evaluate the licensing basis, design, testing, and corrective action programs for the Emergency Core Cooling Systems (ECCS), Decay Heat Removal 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.

The Generic Letter 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 following (summarized) information:

(a) A description of the results of evaluations that were performed pursuant to the requested actions of the GL;

(b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that were 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 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.

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The Generic Letter also stated that if a licensee could not meet the requested nine-month response date, the licensee was to provide a response within three months of the date of the GL describing the alternative course of action that it proposed to take, including the basis for the acceptability of the proposed alternative course of action.

The three-month response for the Perry Nuclear Power Plant (PNPP) was provided by letter dated April 11, 2008 (L-08-133). The NRC staff's review of the three-month response was provided in a letter dated September 16, 2008, which requested that clarifications be provided in the nine-month response to the Generic Letter.

The nine-month response to NRC GL 2008-01 is included as Attachment 1, including the clarifications requested in the letter dated September 16, 2008.

In summary, based on the information reviewed to date, it is concluded that the subject systems/functions at PNPP are capable of performing their intended safety function, and that for PNPP, FirstEnergy Nuclear Operating Company (FENOC) is currently in or will be in compliance with 10 CFR 50 Appendix B, Criteria III, V, XI, XVI and XVII, with respect to the concerns outlined in GL 2008-01. A number of enhancements have been identified by the evaluations and have been entered into the FENOC Corrective Action Program.

The regulatory commitments contained in this submittal are listed in Attachment 2. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager - Fleet Licensing, at (330) 761-6071.

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 14, 2008.

Sincerely,

Mark B. Bezilla

Attachments:
1. PNPP Nine Month Response to NRC Generic Letter 2008-01
2. Regulatory Commitment List

cc: NRC Region III Administrator
NRC Resident Inspector
NRC Project Manager

This attachment provides the Perry Nuclear Power Plant (PNPP) nine-month response requested in Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008. It provides:

- A description of the results of evaluations that were performed pursuant to the requested actions,
- A description of the corrective actions determined necessary to ensure 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, and
- A statement regarding which corrective actions have been completed, the schedule for the corrective actions not yet complete, and the basis for that schedule.

In addition, this attachment responds to the September 16, 2008, NRC request for clarification of information that was previously provided in the PNPP three-month response dated April 11, 2008.

Scope

In the initial PNPP response to GL 2008-01, the following systems were determined to be within the scope of the Generic Letter evaluations:

- High Pressure Core Spray (HPCS) system
- Low Pressure Core Spray (LPCS) system
- Residual Heat Removal (RHR) system (for the following modes of operation: Low Pressure Coolant Injection (LPCI) subsystems A, B, and C, Suppression Pool Cooling, Shutdown Cooling, and Containment Spray)
- Automatic Depressurization System (ADS)

The Automatic Depressurization System (ADS) is included in the above list since it is considered to be part of the Emergency Core Cooling System (ECCS). The piping that supports ADS is isolated from the primary system during normal operation. The flow path relieves reactor steam to the suppression pool during a transient. Two vacuum relief valves are provided on each relief valve discharge line to prevent drawing an excessive amount of water into the line. ADS piping is designed to contain air while the system is in standby and steam when in operation. Since the ADS piping is designed to be voided, the system does not need additional evaluation for managing gas accumulation. Therefore, no further discussion of ADS is necessary or provided in the following sections.

The GL 2008-01 scope for the review of HPCS, LPCS, and the LPCI mode of RHR considered piping from the suction source to the injection valve. An industry evaluation has demonstrated that for the ECCS, gas accumulation in piping between the reactor pressure vessel and the first closed isolation valve will not create a water hammer that could challenge the operability of these systems. Piping inboard of the injection valve, which discharges into the vessel, could void due to flashing during vessel de-pressurization and is designed accordingly. Pressure transients occurring due to voids would be within the piping design.

Similarly, for the Containment Spray function of RHR, the piping from the closed shutoff valves to the spray nozzles is open to the containment atmosphere. This section of piping is normally filled with air and does not need additional evaluation for the management of gas accumulation. The Containment Spray piping, including this segment, is designed to withstand operating loads such as those experienced during actuation of the sprays.

A non-safety related Alternate Decay Heat Removal (ADHR) system is being installed at PNPP to provide additional heat removal capability/flexibility. The connections to ECCS for this new ADHR system have been designed to not create any additional gas voiding issues. Therefore, no further discussion of ADHR is necessary or provided in the following sections.

A. EVALUATION RESULTS

The evaluations performed covered the following four major topics, as requested in the Generic Letter:

1. Licensing Basis Evaluation
2. Design Evaluation (Including Reviews of Initial Fill and Vents)
3. Testing Evaluation (Including Reviews of Periodic Verifications)
4. Corrective Action Program Evaluation

Corrective actions resulting from each of the following evaluations are compiled and summarized in Section B, "Necessary Corrective Actions, Schedule, And Basis," and Section C, "Additional Actions."

1. Licensing Basis Evaluation

A summary of the PNPP Licensing Basis Evaluation information that establishes the foundation for the subsequent Design, Testing and Corrective Action Evaluations is provided below for the following Licensing Basis documents:

a) Updated Final Safety Analysis Report (UFSAR),
b) Technical Specifications (TS) and TS Bases,
c) Operational Requirements Manual (ORM) and ORM Bases (as applicable),
d) Responses to NRC Generic Communications,
e) NRC Commitments, and
f) Operating License.

1a) Updated Final Safety Analysis Report (UFSAR)

The PNPP UFSAR contains several discussions relevant to managing gas accumulation in the subject systems.

The introduction of noncondensable gases such as those that may be present in the Emergency Core Cooling Systems (ECCS) into a Boiling Water Reactor (BWR) such as PNPP has already been addressed through the resolution of Three Mile Island (TMI) Action Plan Item No. II.B.1, "Reactor Coolant System Vents" as discussed in UFSAR Section 1A, "TMI ACTION PLAN REQUIREMENTS FOR APPLICANTS FOR NEW OPERATING LICENSES." This section explains the multiple methods available to remove noncondensable gases that might get swept into the reactor vessel. These methods are either automatically initiated as part of the plant response to a transient or accident, or manually initiated by plant operators in accordance with established procedures.

Discussions about conformance to the General Design Criteria (GDCs) listed in GL 2008-01 (GDC 1, 34, 35, 36, 37, 38, 39, and 40) are addressed in PNPP UFSAR Section 3.1, "Conformance with NRC General Design Criteria," and the other sections that are referenced therein." Information on which GDCs apply to each of the subject systems is provided in the Design Evaluation in Section 2a, below.

UFSAR Section 6.3, "Emergency Core Cooling Systems," contains the remainder of the relevant discussions about noncondensable gases in the ECCS. The concern about possible degradation of pump performance through air ingestion and other adverse hydraulic effects is addressed by describing the design of the large passive toroidal ECCS suction strainer. This large strainer has a very low approach velocity and is located at the bottom of the suppression pool, so vortexing will not be present. Even if air enters the strainer as a result of encroachment when the Safety Relief Valves (SRVs) are activated, the air will be released from the strainer mesh before it can travel to the pump suction plenums, so air entrainment will be minimized.

The Condensate Storage Tank (CST) is an additional source of water used for the High Pressure Core Spray (HPCS) system. Section 6.3.2.2.1 explains that preoperational tests visually checked for vortexing when the CST was pumped down to the low level transfer point. It also explains that the HPCS system is maintained full of water by the discharge line fill system. This same section also addresses the preclusion of adverse effects from water hammer due to the supports provided for this Seismic Category I piping.

Similar to HPCS, the Low Pressure Core Spray (LPCS) system, discussed in Section 6.3.2.2.3, is designed so its piping can be maintained full of water by a discharge line fill system. The LPCS system pump is located at an elevation sufficiently below the top of the suppression pool to ensure a flooded pump suction and to meet pump net positive suction head requirements without any credit for containment pressurization. The discharge line is also seismically supported, including consideration of water hammer effects in the dynamic analysis, which precludes adverse effects from water hammer.

Section 6.3.2.2.4 describes the Low Pressure Coolant Injection (LPCI) systems. Again, a discharge line fill system is used to prevent water hammer in the discharge lines, and the system is supported to Seismic Category I standards.

Section 6.3.2.2.5 provides additional details about the ECCS Discharge Line Fill System that was discussed for each of the ECCS systems above. The system "is designed to maintain the pump discharge lines in a filled condition" after "the systems are filled and vented to remove any potentially damaging air or non-condensables." Since the ECCS discharge lines are elevated above the suppression pool, check or stop check valves are provided near the pumps to prevent back flow from emptying the lines into the suppression pool. Past experience has shown that these valves will leak slightly, producing a small back flow that will eventually empty the discharge piping. To ensure that this leakage from the discharge lines is replaced and the lines are always kept filled, a water leg pump is provided for each of the three ECCS divisions. The power supply to these pumps is classified as essential when the main ECCS pumps are deactivated. The fill system, typical for each of the three ECCS divisions, consists of a jockey pump that takes suction from the corresponding ECCS division's pump suction line(s) from the suppression pool and discharges downstream of the check valves on the ECCS pump discharge line. This system works to pressurize the discharge piping so that any water that may leak out of the ECCS discharge lines is replaced with water from the jockey pumps rather than allowing air to intrude into the piping. For each ECCS division, the minimum keep fill pressure and flow requirements have been determined, assuming conservative estimates of leakage.

A discussion of the fill and vent process for the ECCS systems is included in Section 6.3.2.2.5. It describes that "Initial filling of the piping systems is accomplished using the combination of jockey pumps, condensate water supply lines (located a minimum distance from filled system boundary valves), maintenance drains, vents, and test connections that are available, as shown on the Piping and Instrumentation Diagrams (P&IDs). All potentially damaging air is eliminated from the ECCS pump discharge lines when the fill system is placed into service by opening vents at all piping high points until water begins to flow from the vents. A high point venting procedure is repeated, after initial fill of the system, any time the jockey pump is stopped and restarted, and following any indication of low discharge line pressure. Pressure instrumentation provided on the jockey pump's discharge line initiates an alarm in the control room when pressure in the discharge line is less than the hydrostatic head required to maintain the line full. Indication is also provided in the control room as to when the jockey pumps are operating."

Section 6.3.2.2.5 also explicitly notes that "A small amount of dissolved gas may come out of solution during the interval between surveillance tests and accumulate at the high point vent(s) even though the jockey pump system is functioning properly. This is considered to be a normal phenomenon that will not compromise the system integrity."

To summarize the UFSAR information, the presence of some noncondensable gases in the ECCS systems is explicitly recognized, but the ECCS and reactor coolant systems are designed to preclude adverse effects from gas intrusion or accumulation, due to a combination of effective filling and venting and maintenance of system pressures with the keep-fill system.

The PNPP UFSAR discussions are considered to be acceptable, but some additional information should be added. The concept of performance-based periodic verifications on the suction side piping should be acknowledged in the UFSAR. The description of these performance-based periodic checks should note that if voiding is identified, potentially damaging gas is removed, similar to the existing UFSAR discussion for the discharge side fill and vent process. The PNPP UFSAR already acknowledges the concept that a filled system does not mean there is no gas present anywhere in the system (i.e., gas accumulation occurs), but it is managed. Since 1981, the Final Safety Analysis Report (FSAR) has recognized that some degassing may occur in the systems during the interval between surveillance tests, which is considered to be a normal phenomenon. The UFSAR currently notes that the filling and venting process removes potentially damaging air rather than all air, and that the Discharge Line Fill systems then operate to maintain the systems in a filled condition, ready to rapidly respond if called upon. The UFSAR change to require performance-based periodic verifications on the suction piping in addition to the discharge side of the ECCS piping is entered as a corrective action in the PNPP Corrective Action Program. Because new licensing basis information is established upon completion of the NRC's review of the response to GL 2008-01, the schedule for completion of this activity will be 120 days following NRC closure of the GL 2008-01 review. A corrective action has been initiated to track this activity.

1b) <u>Technical Specifications and TS Bases</u>

The PNPP Technical Specifications (TS) and their Bases contain several items related to managing gas accumulation.

The TS Bases for Specification 3.5.1, "ECCS-Operating," note that "To ensure rapid delivery of water to the RPV and to minimize water hammer effects, the

ECCS discharge line 'keep fill' systems are designed to maintain all pump discharge lines filled with water." In order to confirm this, TS Surveillance Requirement (SR) 3.5.1.1 (during Modes 1, 2, and 3) and SR 3.5.2.3 (Modes 4 and 5) has a 31 day frequency to "Verify, for each ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve."

The Bases for this SR provide clarification of this requirement, noting that "the flow path piping has the potential to develop voids and pockets of entrained air" and that "one acceptable method of ensuring the lines are full is to periodically vent at the high points." The periodicity of this check is based on "operating experience, on the procedural controls governing system operation, and on the gradual nature of void buildup in the ECCS piping." Therefore, it is recognized that gas will exist in the piping in small amounts, and that periodic venting is an effective means to ensure the systems will perform properly and to prevent water hammer following an initiation signal.

An additional requirement when the plant is shut down is contained in SR 3.5.2.2, which requires minimum water levels in the suppression pool or the condensate storage tank. The Bases for SR 3.5.2.2 explain that these minimum levels provide adequate net positive suction head (NPSH) for the ECCS pumps, and prevent vortexing, which could introduce air into the piping systems.

Similar controls over suppression pool water levels exist during Modes 1, 2 and 3 in Specification 3.6.2.2, "Suppression Pool Water Level", with the same basis of providing adequate NPSH and preventing vortexing.

Finally, the switchover point at which the suction source for the High Pressure Core Spray system changes from the condensate storage tank to the suppression pool when the plant is operating in Modes 1, 2, or 3 is addressed by the Technical Specifications. Specification 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," requires that the Condensate Storage Tank Level-Low instruments be operable. The Bases note that this switchover ensures that an adequate supply of makeup water is available to the HPCS pump.

To summarize the Technical Specification information, controls exist to perform periodic gas accumulation checks on the discharge piping to ensure the systems will perform properly if called upon to respond to an accident or transient. For the suction side of the pump, controls exist to verify suction source water levels will provide adequate NPSH and prevent vortexing, to preclude air entrainment after the onset of an event. However, for the suction piping only, no specific controls exist in the TS to require periodic gas accumulation checks. Periodic checks of the suction piping have been addressed through the Corrective Action Program (CAP).

Technical Specification (TS) improvements are being addressed by the Technical Specification Task Force (TSTF) to provide an approved TSTF Traveler for making changes to individual licensee's TS related to managing 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. FirstEnergy Nuclear Operating Company (FENOC) is continuing to support the industry Gas Accumulation Management Team activities regarding the resolution of generic TS changes via the TSTF Traveler process. After NRC approval of the Traveler, FENOC will evaluate its applicability to PNPP, and evaluate adopting the Traveler to either supplement or replace the current TS requirements.

1c) <u>Operational Requirements Manual (ORM) and ORM Bases</u>

Relevant requirements contained within the ORM relate to the ECCS keep-fill provisions. ORM Control 6.2.17, "ECCS Keep-Fill Instrumentation," requires that the ECCS discharge line keep-fill pressure alarm instrumentation associated with a required ECCS system shall be operable, and provide actions to take if this is not maintained.

No changes to the PNPP ORM are considered to be required.

Appropriate periodic checks of the discharge side piping are being accomplished per Technical Specification requirements, and select suction side piping is being periodically checked by activities established through the Corrective Action Program; once in place, the UFSAR change described above will reflect the licensing basis need for the performance-based periodic suction side verifications.

1d) <u>Responses to NRC Generic Communications</u>

Generic Letter 2008-01 lists two generic communications that requested licensee responses on the docket. Generic Letter 88-17, "Loss of Decay Heat Removal," was addressed to Pressurized Boiling Water Reactors; therefore, no docketed response to this generic communication was submitted. The PNPP response to Generic Letter 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps," was submitted to the NRC on January 5, 1998. It described the methodology used in the calculations, and identified that the various PNPP ECCS systems had a range of NPSH from 25.6 feet to 27.4 feet versus a required 4 feet of NPSH, with no credit for containment overpressure. This analysis was performed as part of a design modification that installed a new large capacity passive strainer as part of the resolution to Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors." The NRC closed the GL 97-04 review for PNPP in a letter dated June 5, 1998 (TAC NO. MA0027).

1e) NRC Commitments

A regulatory commitment was made in the three-month response to GL 2008-01. The commitment states that "Any piping segments that are determined to need in-field verification, but have not received it prior to the nine-month GL 2008-01 response, will be in-field verified no later than restart from the next refueling outage." This commitment is still in effect.

In response to a request from the NRC in a letter dated September 16, 2008, a summary of the results of the evaluations of the in-field piping segment verifications for the piping that was not accessible during the nine-month GL 2008-01 evaluation period will be submitted to the NRC within 90 days after startup from the next refueling outage.

In addition, as discussed in more detail in the Design Evaluation section 2g, "System In-Field Verification," below, evaluations of the in-field verifications performed to date at PNPP, which are intended to confirm the conclusions of the completed design/drawing evaluations, have not been completed. The laser scanning results for the accessible piping segments were not received back from the vendor in sufficient time to complete a quality review and incorporate the evaluations in this nine-month response letter. As a result, the in-field verifications that have been completed as of October 14, 2008, will be evaluated, and a summary of the evaluation results will be submitted to the NRC by December 19, 2008.

1f) Operating License

The PNPP operating license, including license conditions, was reviewed and no issues were identified.

2. Design Evaluation (Including Reviews of Initial Fill and Vents)

A summary of the information from the PNPP Design Evaluation is provided below for the following topics:

a) Design Basis Document Review
b) Acceptance Criteria Review
c) Drawing Review
d) Fill and Vent Review
e) Gas Intrusion Review
f) Ongoing Industry Programs
g) System In-Field Verification

2a) Design Basis Document Review

Design Basis Documents for the HPCS, LPCS and RHR systems (including the Containment Spray mode) were reviewed, including design inputs, calculations, operating procedures, engineering change packages, engineering evaluations, and vendor technical manuals, with respect to managing gas accumulation. As part of the Design Basis Document Review, a detailed design review of each system was performed, to establish each system's design requirements and to identify the design, procedural, and testing changes that have already been completed at PNPP to better manage gas accumulation issues. The reviews of the calculations also determined the ability to move gas through the piping using the concept of Froude numbers or with qualitative analysis for smaller potential void areas. Froude numbers correlate with the ability of gas voids to transport in piping systems - a dimensionless number, the Froude number is the ratio of liquid inertial force to bubble buoyancy force.

Each of the 10CFR50 Appendix A General Design Criterion listed in Generic Letter 2008-01, along with 10 CFR 50.46, were examined to identify the in-scope systems that apply to each.

- A detailed quality assurance program is established and implemented to satisfy the requirements of GDC 1.
- The RHR (Shutdown Cooling Mode) system is designed to satisfy the requirements of GDC 34.
- The emergency core cooling systems consisting of HPCS, ADS, LPCS and LPCI are designed to meet the requirements of GDC 35, and are inspected and tested to GDC 36 and 37, respectively. These systems are designed to meet the core cooling performance criteria specified in 10CFR50.46.
- The Containment Spray or Suppression Pool Cooling modes of RHR are designed to accomplish the containment heat removal function required by GDC 38, and are inspected and tested in accordance with GDC 39 and 40, respectively.

A previous gas accumulation problem that has subsequently been resolved occurred at PNPP during a Loss of Offsite Power event on August 14, 2003, during the electrical switchover from offsite to onsite power. This event was briefly discussed in GL 2008-01. In that event, when power was briefly lost and the Division 1 water leg pump briefly stopped running, the resultant pressure reduction in the piping allowed air that had accumulated over time in the Feedwater Leakage Control system to expand until it reached the water leg pump. Air binding of the water leg pump resulted, so the pump was not able to supply adequate keep-fill pressure. This air had been allowed to remain in the system due to inadequate venting operations. Periodic venting requirements for the associated systems now ensure this piping is filled and air pockets are purged from the respective ECCS discharge headers. The Division 1 Feedwater Leakage Control system piping was rerouted to preclude air entrapment during Refueling Outage 11 in the spring of 2007, and a vent valve is being added to the Division 2 Feedwater Leakage Control system during Refueling Outage 12 in the spring of 2009. A discussion of system keep-fill design was provided in Section 1a (above) in the UFSAR review discussions.

System realignments during design basis actuations were examined to ensure that the piping would remain sufficiently full during such realignments. There are two types of system realignments that occur during a Loss of Offsite Power (LOOP)/Loss of Coolant Accident (LOCA) Design Basis Accident (DBA) event, or a LOOP transient. These are:

1. A suction source switchover for HPCS that occurs when the pump is aligned to the Condensate Storage Tank (CST) and a Design Basis LOOP/LOCA event occurs that lowers the CST inventory to a low level setpoint when switchover from the CST to the suppression pool is initiated.
2. An electrical source switchover from offsite to onsite power sources during a LOOP or a LOOP/LOCA event. This temporarily interrupts the normal power supplies to the Divisional (all 3 Divisions) water leg (keep-fill system) pumps. In this case, water leg pump discharge pressure is lost and system discharge piping standby pressure decreases until the emergency diesel generators start in approximately 10 seconds (13 seconds for Division 3) to supply emergency power to the water leg pumps as well as other Class 1E loads on the three Divisional buses.

With respect to the first realignment issue, the automatic switchover to the suppression pool water source from the CST will ensure a continuous water supply for operation of the HPCS system. HPCS pump suction is also automatically transferred to the suppression pool if the suppression pool water level exceeds a prescribed value. These switchover setpoints are controlled by the Technical Specifications. To maintain constant suction source availability, the CST suction isolation valve does not receive its signal to close until the Suppression Pool suction isolation valve is fully open. The switchover of the HPCS suction source from the CST has been evaluated for potential vortexing. The current evaluation provides sufficient level allowance to prevent vortex formation from occurring at the CST; therefore, no air would be drawn down to the pump by the suction flow.

The second realignment issue focuses on the temporary loss of makeup flow into the piping during realignment from offsite power to the onsite power sources. If the RHR pump is in standby, and the keep-fill pumps are operating, the loss of power will lead to a brief interruption in keep-fill flow. Since the ECCS discharge lines are elevated above the suppression pool water level, check or stop check valves are provided near the pumps to prevent back flow from emptying the lines into the suppression pool. Past experience has shown that these valves may leak, producing a small drain back. Several scenarios were examined involving different systems and different operational alignments. Some combinations were determined acceptable, with resultant void sizes less than 1.0 cubic foot, which is an acceptance criteria that is being established as a result of the Acceptance Criteria Review discussed in Section 2b, below. Other combinations could result in larger voids, and procedural changes were determined to be appropriate to ensure a fill and vent of the system is performed before manual starts of the associated pumps would be permitted.

The potential for gas intrusion due to a debris laden suction strainer was examined. This potential previously led to the installation of a large strainer as described in UFSAR Section 6.3. This strainer has a design surface area of nearly 5330 square feet. If the strainer is laden with debris from a postulated Design Basis Accident, the theoretical approach velocities would be less than 0.02 feet per second, which would essentially preclude air bubbles from being drawn into the strainer. The strainer's design features (surface area and low profile) greatly minimizes air bubble transport from the SRV spargers to the strainer surfaces. Any air bubbles reaching the inside of the strainer divisional segments see limited velocities, which allow the air bubbles to rise, where they can exit through the strainer surface perforations.

As concluded in the first system realignment discussion above and in the suction strainer discussions above, vortexing and gas intrusion in the condensate storage tank and in the suppression pool at the ECCS strainer is not a concern.

Note that for a Boiling Water Reactor such as PNPP, there are issues related to suction strainers that the industry is currently considering under Generic Safety Issue (GSI) 193, "BWR ECCS Suction Concerns." As noted in the SECY-08-0108 discussion for GSI-193 in the NRC's Generic Issue Management Control System, the NRC decided not to include that generic issue within the scope of GL 2008-01. Resolution of these issues will continue to be pursued through the various owner's groups and industry leadership organizations and will not be addressed further herein.

Industry GL reviews examined potential effects of a void on the safety analyses for the core and the containment pressures and temperatures.

- ECCS: A conservative evaluation was provided for the entire United States BWR fleet, which determined a limiting LOCA Peak Clad Temperature (PCT) heatup rate of 12°F/second. Using this heatup rate and a maximum 4-second delay in ECCS actuation due to a void, the assessment determined a maximum 48 °F of PCT impact.

A similar assessment on a Loss of Feedwater event and an Anticipated Transient Without Scram (ATWS) event concluded that a delay of 5 seconds in ECCS flow would affect the analysis results insignificantly and have no impact on meeting the acceptance criteria. The evaluation of station blackout events indicates that a delay of 10 seconds would not impact the ability of the water makeup system to maintain the vessel water level above the top of active fuel. Similarly, it is concluded that a delay of 10 seconds would have an insignificant impact on meeting the acceptance criteria in Appendix R fire safe shutdown analysis.

- Containment Spray or Suppression Pool Cooling modes of RHR: These functions do not interact with the fuel. The Containment Spray system already contains sections of purposely voided pipe. Both functions are part of RHR and are within the piping boundaries of the monthly Technical Specification surveillance requirement to verify the piping is full, so voids that would result in an appreciable delay time are not expected, especially when compared to the 10 minute actuation time for containment sprays and 30 minute manual initiation time for suppression pool cooling.

One factor that can input into acceptance criteria considerations as discussed in Section 2b, below, is the pump operation mission time. For gas intrusion review purposes, the mission time was considered to be 30 days, consistent with the duration discussed in the UFSAR for certain aspects of the Design Basis Accident LOCA.

The FENOC design control program ensures that design changes are reviewed by appropriate organizations for impact on the design and licensing basis. The design interface review checklists have a specific line item to evaluate potential gas intrusion/introduction into systems, such as the ECCS, from system interconnections.

2b) <u>Acceptance Criteria Review</u>

For suction piping, the allowable amount of gas is largely determined by the impact of the gas on pump operation. Based on several industry studies, the PNPP ECCS pumps are not highly susceptible to damage given a nominal void fraction at the pump intake. Two types of acceptance criteria have been adopted at PNPP for void fractions at the pump suction:

- A continuous (long-term) void fraction of 2 percent or less, and

- A transient (short-term) void fraction of no greater than 10 percent during any 5 second period, applied to voids with a fixed amount of gas rather than a continuous gas void flowing through the pump.

These conservative criteria are applied in support of system operability until further data supports a change. The actual gas volume that would result in exceeding the 10 percent void fraction in 5 seconds criterion at the pump suction will depend on pump suction line diameter, flow rate, and pressure.

However, if a void would not transport to the pump suction, the void fraction that could result from such a void does not need to be calculated. The transportability of a void can be determined by calculations using the concept of Froude number analysis. The transportability of voids in specific sections of pipe was examined as part of the drawing reviews discussed in Section 2c, below. This methodology can be applied to determine if a void in the suction piping would be capable of being transported through the piping and down more than 20 feet to the pump suction.

For discharge piping, the allowable amount of gas is largely determined by factors such as induced hydraulic loads on piping, supports and components and associated effects of system performance, commonly referred to as water hammer. Therefore the above void fraction acceptance criteria are not applied to discharge piping.

As discussed in Section 2a above, an acceptance criteria of 1.0 cubic foot of gas has been determined for discharge piping, based on analyses of the PNPP LPCI and LPCS systems. These analyses determined that the systems would not lift relief valves during a hydraulic transient, using an industry-developed pressure pulsation methodology. A corrective action is tracking the addition of this acceptance criteria into appropriate design documentation.

As also mentioned in Section 2a, the BWR industry performed a conservative assessment of the LOCA Peak Clad Temperature (PCT) heatup rate for the entire U.S. BWR fleet. This informational assessment determined that PCT would increase 12 °F per second of ECCS injection delay. Using this heatup rate, even with a maximum four second delay in injection time due to voiding, only 48°F of PCT impact could be seen. Per Technical Specification requirements, PNPP performs periodic (currently monthly) venting to remove voids in ECCS discharge piping between the pump and the injection valves. A void that would result in a four second delay would be much larger than the 1.0 cubic foot acceptance criteria discussed above for the discharge piping. This bounding industry report provides confirmation that voids smaller than the postulated void would not result in significant impacts on ECCS PCT analyses.

2c) Drawing Review

Isometric drawings and flow diagrams for the systems within the scope of Generic Letter 2008-01 were reviewed for horizontal pipe runs and vent locations on high points. Simplified one-line diagrams were developed and used to identify potential high points where gas accumulation may occur.

Acceptance criteria for pipe slope and test flows were established to screen out sections of piping that are not vulnerable to potential air entrapment.

High points and inverted U areas that may trap air in the systems within scope were identified. After screening, locations considered potentially vulnerable to air entrapment were evaluated as part of the procedure review to determine whether adequate venting was being performed. Potentially vulnerable sections of piping were then designated for follow-up verification during the review of system in-field verification results as referenced in Section 2g below.

The drawing review did not identify any new vent valve locations beyond those previously identified following the August, 14, 2003, PNPP LOOP event.

2d) Fill and Vent Review

The following fill and vent discussions address initial fill and vents following system outages or maintenance that involves or may involve introduction of gas into the system as an expected part of the evolution. Such voids, intentionally introduced as part of a maintenance activity, are not quantified or tracked, because the amount of gas released will vary depending on the amount that was introduced during the work on the system. Periodic checks that ensure the piping remains full after such initial fill and vents are discussed in Section 3, "Testing Evaluation."

Procedure reviews were performed for each of the systems within the scope of the GL review. The reviews examined site procedures for filling and venting for the following aspects:

- venting activities are controlled by an approved operating procedure
- procedures exist to vent locations where gas may accumulate using existing vent valves
- venting procedures and practices utilize effective sequencing of steps, adequate venting durations, and acceptance criteria for the completion of venting
- dynamic venting methods are effective, where used (adequate flow rates/fluid velocities)
- vacuum fill operations are considered for piping sections which are difficult to fill and vent following maintenance

- fill and vent procedures default to fleet guidance documents , if the maintenance work scope or boundaries change from those assumed in the procedure
- incorporate verification techniques to validate that systems are sufficiently full of water following fill and vent, based on quantification of a remaining gas void against the established acceptance criteria. Unvented gas that remains after an initial system fill and vent is quantified, trended and justified.
- venting of instrument lines, including the backfilling of level and flow transmitters, is included in venting procedures

The above reviews concluded that the existing procedures were adequate; however, a number of enhancements were identified, and have been entered into the Corrective Action Program.

2e) <u>Gas Intrusion Review</u>

Areas of potential gas intrusion into each system and each piping segment vulnerable to subsequent gas accumulation were assessed.

The Emergency Core Cooling System (ECCS) has no interconnections with accumulators containing gas or air. Therefore, the ECCS is not subject to this source of gas coming out of solution.

The potential for leakage from the Reactor Coolant System (RCS) into the ECCS was evaluated. High pressure sources of in-leakage into the ECCS are from the RCS into the Low Pressure Coolant Injection (LPCI) upstream injection headers or from the Feedwater System into the RHR return piping. Each of these potential in-leakage sources has an isolation check valve downstream of the normally closed isolation valve.

The potential of dissolved gas coming out of solution due to a pressure reduction was evaluated. Based on the significant pressure drop, the RHR heat exchanger flow control valves have the greatest potential for creating downstream voids. Other pressure reductions due to flow obstructions, such as flow orifices or other valves, are considered to be small and should not present a significant source of air. Since voids would only be created when the RHR system is being operated for heat removal, air voids would be transported to the reactor pressure vessel or suppression pool, depending upon the RHR mode of operation, and would not impact the operability of the RHR heat exchangers.

The LPCS, HPCS, and RHR minimum flow lines were evaluated. Froude numbers were calculated for each line, and in each instance, the number was significantly greater than 1.0. With a Froude number significantly greater than 1.0, trapped air can be readily purged from the minimum flow piping.

Certain connected piping high points have small elevation differences relative to the suppression pool level. The head available for venting these lines is limited by the small elevation difference between the suppression pool and the vent line. Vent valves are being installed at these locations during the next refueling outage, which is scheduled to begin in February 2009. This activity is identified as a Necessary Corrective Action in Table 1 of this letter.

Maintenance activities that breach piping or components in the system could potentially introduce quantities of air in the system. Following such activities, fill and vent instructions are performed to ensure the system will be sufficiently filled with water. Additionally, the ECCS keepfill pumps have low pressure alarms to alert the operator to potential problems with the system.

Failure of suction source level instruments leading to gas intrusion was evaluated. The design basis source of suction for the ECCS pumps is the suppression pool. HPCS can also take its suction from the Condensate Storage Tank (CST). Since each of these suction sources are provided with redundant, safety-related level instrumentation, a low level condition that results in vortexing and gas intrusion is considered improbable.

The ECCS test headers, except for the HPCS test return to the CST, have test return lines that discharge back to the suppression pool. The keepfill system pressure associated with each ECCS pump and its discharge piping is maintained well above atmospheric pressure. Therefore, air intrusion from the containment atmosphere would not occur through the closed test return isolation valve.

Air operated valve designs were reviewed for potential to leak air into the system. The ECCS does not have air operated valves that could cause potential air leakage into the system.

As discussed previously, the ECCS keepfill pumps have low pressure alarms to alert the operator to potential problems. The alarm response instructions provide guidance for performing fill and vent operations in accordance with system operating instructions. LOOP event procedures direct entry into off-normal instructions that require several venting sequences for RHR system restoration.

2f) Ongoing Industry Programs

Ongoing industry programs may impact the conclusions reached during the PNPP design evaluation relative to managing gas accumulation. These activities are being monitored to determine if additional changes to the PNPP design may be required or desired to provide additional margin or reduce vulnerability to gas intrusion.

2g) System In-Field Verification

In response to GL 2008-01, in-field verifications were performed on each of the systems within the scope of the GL review. No previous in-field verifications, including those performed following the August 2003 LOOP event, were credited for the GL response.

No analytical assessments were performed to refine the scope or level of detail of the verifications. In-field verification of system piping performed to date consisted solely of laser scanning. The subject piping was initially scanned with insulation in place. After the initial scan, limited sections of piping had their insulation removed for additional scanning. These subsequent scans were completed for pipe slope comparative purposes. Final results from the system in-field verifications performed in response to the GL, including the insulated/un-insulated slope comparisons, are not yet complete.

As a result, the in-field verifications that have been completed as of October 14, 2008 will be evaluated, and a summary of the evaluation results will be submitted to the NRC by December 19, 2008.

As committed to in the three-month response to the Generic Letter, portions of piping within the containment and the annulus that were inaccessible during the nine month GL evaluation period due to adherence to "As Low As Reasonably Achievable" (ALARA) principles will be in-field verified no later than the conclusion of the next refueling outage. The HPCS suction piping connection and test return line to the CST are inaccessible due to being buried. Pipe slope measurements can not be obtained.

3. Testing Evaluation (Including Reviews of Periodic Verifications)

A summary of the PNPP Testing Evaluation is provided below, addressing the procedure review of gas accumulation periodic tests/verification checks.

Technical Specification compliance is addressed through specific surveillance instructions (SVIs) for the Residual Heat Removal (RHR), Low Pressure Core Spray (LPCS), and High Pressure Core Spray (HPCS) systems. Acceptance criteria in the ECCS venting SVIs use general nomenclature such as, "If excessive air was vented, generate a condition report to evaluate past operability and surveillance frequency." A definition of "excessive air" is not provided and left to the test performer to determine whether excessive air is vented. The procedures also do not provide a mechanism to record the quantity of air vented from the system. Acceptance criteria shall be developed and incorporated into the respective ECCS surveillance instructions with a method for recording and tracking results.

Additionally, during normal system operation, the LPCS water leg pump has a ten gpm flow rate for pump minimum flow requirements through the recirculation line. This flow rate creates a fluid velocity of approximately one foot per second, which is marginal for sweeping air out of the horizontal suction piping near the flow element. Since the flow rate in the line is less than desired to ensure removal of air, an alternate means of verifying that the line is sufficiently filled with water is required. A corrective action was generated to perform an ultrasonic test (UT) examination that will verify whether or not an air void is present in this section of the water leg pump suction piping.

4. **Corrective Action Program Evaluation**

The FENOC Corrective Action Program documents the discovery of adverse conditions including those associated with gas intrusion and accumulation. The process is used to identify the cause of the event and the actions necessary to correct and if possible prevent recurrence in a timely manner. Condition Reports (CRs) have been written to determine the cause and condition of previously identified gas accumulation events at PNPP. The process has precluded repeat occurrences.

Conclusion of the Above Evaluations

In summary, the subject systems/functions are capable of performing their intended safety function, and for PNPP, FENOC is currently in or will be in compliance with 10 CFR 50 Appendix B, Criteria III, V, XI, XVI and XVII, with respect to the concerns outlined in GL 2008-01. A number of enhancements have also been identified by the evaluations and have been entered into the FENOC Corrective Action Program.

B. NECESSARY CORRECTIVE ACTIONS, SCHEDULE, AND BASIS

The following corrective actions have been completed:

- Reviewed High Pressure Core Spray isometric drawings for adequacy of venting (procedures and design) for both SOI-E22A system fill and vents and SVI-E22-

T1183 periodic venting (monthly Technical Surveillance SR to assure "the piping is filled with water from the pump discharge valve to the injection valve"). Most areas were either determined to be acceptably vented by current procedures or were of no concern. One area required revision to the SVI to ensure proper system fill. Two other areas required revision of procedures to provide for ultrasonic testing (UT) to ensure the line is sufficiently full until vent valves are installed.

For those volumes determined to be potential air traps, but still acceptable with respect to SR 3.5.1.1, SR 3.5.2.3, and general acceptable operating practices, it is assumed that the entire identified "potential air trap volume" may be air filled without impacting the system's ability to meet its Design and Licensing Basis Functions.

- Revised surveillance procedure (SVI-E22-T1183, Revision 6) to periodically vent the affected test return piping segment using valves 1E22F0521 and 1E22F0522 or 1E22F0523 and 1E22F0524 to minimize initial entrapped air volume.
- Revised surveillance procedure (SVI-E22-T1183, Revision 6) to include UT confirmation, ensuring air is not detected in piping segment between 1E22F0015 and 1E22F0016 and downstream of 1E22F0016. Procedure revision also includes UT fill confirmation for the 1" "camel back" section of piping downstream of the HPCS water leg pump (1E22C0003). This later section is part of the recirculation piping.
- Reviewed Low Pressure Core Spray isometric drawings for adequacy of venting (procedures and design) for both SOI-E21 system fill and vents and SVI-E21-T1181 periodic venting (monthly Technical Surveillance to assure "the piping is filled with water from the pump discharge valve to the injection valve"). Items of interest requiring further evaluation were identified. The areas noted were evaluated for venting concerns. Most areas were either being acceptably vented by current procedures or were of no concern. One area of concern was resolved by Revision 18 to SOI-E21. That revision became effective on April 6, 2005.
- Review of RHR A piping isometric drawings for adequacy of venting identified a number of items that required further evaluation. All areas identified were evaluated for venting concerns. Most areas were either being acceptably vented by current procedures or were of no concerns. One area of concern required a revision to SVI-E12-T2001. The changes were implemented in Revision 19 and became effective on 4/25/2005. Another area of concern required a means of venting the 12" RHR A containment spray piping below valve 1E12F0037A. This vent valve was installed in 1R11 with the implementation of ECP 05-0124-000.
- Review of RHR B piping isometric drawings identified a number of items that needed further evaluation. All of the areas identified were evaluated for venting concerns. Most areas were either being acceptably vented by current

procedures or were of no concern. One area required a revision to SVI-E12-T2002. The changes were implemented in Revision 18 and became effective on 4/25/2008. Another area of concern required a revision to SVI-E12-T1182A/B/C. These SVIs were all modified on 4/25/2005, all Revision 4, which incorporated the respective changes. Another identified area of concern resulted in a means of venting the 12" RHR B containment spray piping below valve 1E12F0037B. The required vent valve was installed during the implementation of ECP 05-0124-001. This ECP was implementation in 1R11.

- The RHR C areas noted were evaluated for venting concerns. Most areas were either being acceptably vented by current procedures or were of no concern. Review of Residual Heat Removal C piping isometric drawings for adequacy of venting (procedures and design) for both SOI-E12 system fill and vents and SVI-E12-T1182C periodic venting (Technical Specification SR 3.5.1.1 and SR 3.5.2.3 to assure "the piping is filled with water from the pump discharge valve to the injection valve") identified the following items of interest that require further evaluation (listed by isometric Drawing number). Some items involve pipe volumes that are not within the scope of SR 3.5.1.1 and/or SR 3.5.2.3 and are described as such. All other items involve pipe volumes that are within the scope of SR 3.5.1.1 and/or SR 3.5.2.3.

  For those items which are determined to be a "potential trapped air volume" and determined to be acceptable with respect to SR 3.5.1.1, SR 3.5.2.3, and general acceptable operating practices, it is assumed that the entire identified "potential trapped air volume" may be air filled without impacting the system's ability to meet its Design and Licensing Basis Functions.

A 2004 Condition Report investigation identified the need to install additional vent valves. Plans to install additional vent valves resulted from the investigation, and the modifications were planned for the spring 2009 refueling outage. The following list identifies the vent valve installations scheduled for the 2009 refueling outage.

- Feedwater Leakage Control System Division 2 upstream of the high/low pressure isolation valve.
- HPCS Suction Piping Vent Valves (Quantity 2)
- RCIC Suction Piping Vent Valves (Quantity 2)
- RCIC Suction Branch Piping Vent Valve
- RHR Venting 16-Inch Cross-Tie Piping to LPCS
- RHR Venting of 18-Inch Piping Downstream of Shutdown Cooling Suction Valves (Quantity 2)
- HPCS Waterleg Discharge Piping Vent Valve

Necessary actions to achieve full compliance with the regulations are listed in Table 1, below. The schedule for each item is identified therein. The following information provides the basis for that schedule.

Actions associated with Generic Letter 2008-01 at PNPP are being addressed within the FENOC corrective action and work management programs. Prioritization/scheduling of these actions within the corrective action program are acceptable since these actions are not required to maintain system operability. Actions that involve periodic venting or ultrasonic testing are already being implemented. Additional conditions adverse to quality are not expected to be identified by the implementation of the remaining actions. While some of the remaining actions are identified as required to meet the industry or NRC expectations, they are considered to be enhancements to the existing PNPP program.

TABLE 1		
	Description	Current Schedule
Findings Identified During the Section 2a Design Basis Document Review		
1.	The 24" RHR C suction header exits the piping penetration (approximately 15 feet in length) from the Suppression Pool at elevation 578'-7" and is routed horizontally for approximately 7 feet before reaching the normally closed Suppression Pool isolation valve 1E12F0105. The piping in this segment is nearly completely vented by the vent holes in the Suppression Pool side piping from the ECCS suction strainer. The bonnet of this 300 lb. 24" motor operated gate valve is quite large (approximately 5.2 cubic feet) and is not vented. Air could become trapped in the bonnet following valve maintenance sequences that involve removal of the bonnet. An insignificant quantity (about 10 grams of air) may be absorbed into the suction header. Gas trapped in the bonnet will likely stay in the bonnet. The small quantity of gas transported to the pump would be over an extended period of time. Downstream of this valve is a short 2'-6" run of piping. The line then drops approximately 7 feet to elevation 571'-6¾" where it enters a 24" tee branch and follows horizontal pipe sections (9'-10", 8-6", and 9-6") prior to entering the RHR C pump suction flange. The piping at the opposite end of the 24" tee run is cross connected to the RHR B Shutdown Cooling suction path through the normally closed 1E12F0067 MO isolation gate valve. Significant air accumulation in the short 24" x 18" riser (approximately 6 feet) at the outlet of this isolation valve as well as the isolation valve bonnet can be readily vented by opening this valve during fill and vent operations in SOI-E12.	01/15/09

	Revise SVI-E12-T1182C to perform quarterly UT inspection on 18" piping immediately below valve 1E12F0067 to confirm piping is sufficiently water filled.	
Findings Identified During the Section 2b Acceptance Criteria Review		
2.	IMI-E02-0042 provides instructions for filling and venting the Suppression Pool level instrument lines and instruments. The HPCS level transmitters addressed by this procedure are associated with the functionality of HPCS. The procedure requires the venting of air from the Suppression Pool E22 transmitters, instrument lines, or the system but does not specify any acceptance criteria for quantities of air vented or water drained from the system or venting/draining time requirements. This could be considered as a possible issue for GL2008-01 with respect to having specific criteria for the venting actions. Establish acceptance criteria to implement the criteria into IMI-E02-0042. This Corrective Action was created to formally establish acceptance criteria for IMI-E02-0042 in terms of venting times or quantities of water drained from the system.	04/30/09
3.	ECCS injection lines inboard of the closed isolation valve are normally only vented during a system fill and vent. Since the systems are filled under ambient conditions, degassing may occur following startup and heatup associated with normal operation. This Action was created to obtain a UT examination of the ECCS injection lines to confirm that several months (6 or greater) after a fill and vent of the system that the lines remain sufficiently filled during normal plant operation. Notifications were created to perform the requested UT examinations. Document results of UT inspections on ECCS injection line high points between injection isolation valves and RPV. Notification 600497896 RHR A injection line UT inspection Notification 600497897 RHR B injection line UT inspection Notification 600497898 RHR C injection line UT inspection Notification 600497899 LPCS injection line UT inspection Notification 600497901 HPCS injection line UT inspection	12/15/08
Findings Identified During the Section 2d Fill and Vent Review		
4.	IMI-E6-3 is a general procedure for the calibration and maintenance of system pressure instrumentation. It currently does not specify any acceptance criteria for quantities of air vented or water drained from the system to vent air or venting/draining time requirements. The acceptance criteria shall be established and implement the acceptance criteria into IMI-E6-3. This Corrective Action was created so that specific acceptance criteria for venting actions would be developed and to formally establish these	04/30/09

	acceptance criteria in terms of venting times or quantities of air drained from the system.	
5.	Incorporate post-maintenance verification techniques to validate that systems are sufficiently full of water following fill and vent, based on quantification of a remaining gas void. Unvented gas that remains after an initial system fill and vent is quantified and justified.	4/30/09
Findings Identified During the Section 2e Gas Intrusion Review		
6.	ECPs 05-0123-001 and 05-0123-002 will implement vent valves on high points downstream of isolation valves 1E12F0006A/B respectively. Limited head from the Suppression Pool is available at these locations. Therefore special precautions will need to be in place when venting the suction piping through the added installed vent valves. Venting sequences at these locations, following ECP implementation for installing vent valves, will need to ensure that any air that may be trapped at the vent high point is adequately vented. To accomplish this a minimum volume of water to be drained through the vent shall be specified. Compute the required venting time, and implement the venting requirement into the applicable procedures. This Corrective Action was written to determine appropriate precautions (computation of volume associated with the vent column) that will ensure sufficient water is vented to allow any trapped air in the vent high point to be purged during the venting operations.	04/30/09
Findings Identified During the Section 3 Testing Evaluation		
7.	Acceptance Criterion in the ECCS venting SVIs use general nomenclature such as, "If excessive air was vented, generate a Condition report to evaluate past operability and surveillance frequency". A definition of "excessive air" is not provided and it is left to the test performer to determine whether excessive air is vented. The procedures also do not provide a method to record the quantity of air vented from the system. Quantitative acceptance criteria needs to be specified. Develop the acceptance criteria and implement the acceptance criteria and method for recording and trending results into the respective ECCS SVIs. This Action was written to develop acceptance criteria for the ECCS venting SVI procedures ((E12-T1182A/B/C, E21-T1181 and E22-T1183).	04/30/09
8.	As part of the evaluations associated with Generic Letter 2008-01, a review of the Perry SVIs associated with venting ECCS flow lines was performed. It was determine that adequate measures are not in place to quantify and track any air accumulation released during the venting process. The Perry SVI venting procedures for ECCS do not adequately contain provisions for quantifying and trending air vented from the system high	11/03/08

	points. Some common methods to determine gas quantity in systems are to measure the volume of gas released through vent valves or to determine the gas volume by UT. The Perry procedures provide a method for venting air from system high points, however, instructions are not provided for quantifying any gas that is released. The procedures do specify that a Condition Report shall be written if excessive gas is released, but "excessive gas" is a term that is not defined. The purpose of this Corrective Action is to determine the procedure modifications that need to be implemented by Operations to provide instructions for adequately quantifying the amount of gas released during the venting process. Instructions shall also be developed for implementation by Operations that will ensure the amount of gas vented during the performance of the ECCS venting SVIs is adequately captured for trending purposes.	
9.	The minimum flow requirement through the recirculation line for the LPCS water leg pump is about 10 gpm. This flow rate creates a fluid velocity of approximately 1 fps which is marginal for sweeping air out of the horizontal suction piping near the flow element. Since the flow rate in the line is less than desired to ensure removal of air, an alternate means of verifying that the line is sufficient filled with water is required. Revise SVI-E21-T1181 to add a quarterly UT inspection on horizontal piping between flow element 1E21N0656 and elbow to confirm piping is sufficiently water filled.	01/15/09
10.	As part of the licensing basis, licensees have committed to certain quality assurance provisions that are identified in both their Technical Specifications and quality assurance programs. Licensees have committed to use the guidance of Regulatory Guide (RG) 1.33, "Quality Assurance Requirements (Operation)", Revision 2, issued February 1978. RG 1.33 endorses American National Standards Institute (ANSI) N18.7-1976. Section 5.3.4.4 of ANSI N18.7 states that procedures for monitoring performance of plant systems shall be required to ensure that engineered safety features and emergency equipment are in a state of readiness to maintain the plant in a safe condition if needed. This Action was created to revise each of the ECCS SVI venting procedures (E12-T1182A/B/C, E21-T1181 and E22-T1183) to document and trend (monitor) results from the venting operations obtained during the performance of the venting surveillances.	01/15/09

C. ADDITIONAL ACTIONS

The procedure changes listed in Table 2 below have been recommended to improve management of gas accumulation at PNPP. Because current practices have been determined to be effective at preventing equipment damage caused by voids, and these actions are not required for compliance with existing regulatory requirements, the additional proposed actions are considered enhancements. The schedule for completion is based on resource and plant availability, and the actions are managed in accordance with the FENOC Corrective Action Program or other appropriate action tracking mechanism.

TABLE 2	
	Description
Findings Identified During the Section 1 Licensing Basis Evaluation	
1	The PNPP UFSAR discussions are considered to be acceptable, but some additional information should be added. The concept of performance-based periodic verifications on the suction side piping should be acknowledged in the UFSAR. The description of these performance-based periodic checks should note that if voiding is identified, potentially damaging air/gas is removed, similar to the existing UFSAR discussion for the discharge side fill and vent process. The PNPP UFSAR already acknowledges the concept that a filled/full system does not mean there is no gas present anywhere in the system (i.e., gas accumulation occurs), but it is managed. Since 1981, the FSAR has recognized that some degassing may occur in the systems during the interval between surveillance tests, which is considered to be a normal phenomenon. The UFSAR also currently notes that the filling and venting process removes potentially damaging air rather than all air, and that the Discharge Line Fill Systems then operate to maintain the systems in a filled condition, ready to rapidly respond if called upon. The UFSAR change to require performance-based periodic verifications on the suction piping in addition to the discharge side of the ECCS piping is entered as a corrective action in the PNPP Corrective Action Program. Because new licensing basis information is established upon completion of the NRC's review of GL 2008 01, the schedule for completion of this action will be 120 days following NRC closure of the GL 2008-01 review.
Findings Identified During the Section 2a Design Basis Document Review	
2.	When an ECCS is operating, with return flow to the Suppression Pool, the system is vulnerable to drain back of system inventory into the Suppression Pool should pump operation be interrupted A water hammer will not occur following a LOOP event for either the RHR A or B pumps when operating in the Suppression Pool Cooling Mode because the operating pump will trip on loss of AC power and will not automatically re-start without manual actions. This prevents an RHR pump from starting with potential voids in the Containment Spray/Upper Pool Cooling risers. However, operating procedures for a LOOP event require entering ONI-R10 for returning the system to operability. The Flowchart for ONI-R10 subsequently directs the operators to enter ONI-SPI-A3 or ONI-SPI-B3 respectively for Divisional ECCS Bus Restoration. These procedures require

	several venting sequences for RHR System restoration. These venting sequences do not currently include the 1E12F0400A/B vent valves located at the Containment Spray/Upper Pool Cooling riser high points where the potential voiding is expected to occur. Corrective Action 08-45175-014 has been created to address this potential venting issue. This Action was generated to implement mitigating actions in SOI-E12, ONI-SPI-A3 and ONI-SPI-B3 to ensure that a RHR pump is not manually re-started if the pump stops while in the Suppression Pool cooling mode, prior to performing a high point fill and vent through 1E12F0400A/B. This precaution would minimize the potential for the above conditions to result in a RHR water hammer during a LOOP scenario or pump failure. Precaution would also apply to failure of a water leg pump during normal plant operation.
Findings Identified During the Section 2b Acceptance Criteria Review	
3.	Add a PRECAUTION or step to section 7.13.3 in SOI-E12 to warn against opening the injection line high point vent in Modes 1, 2 and 3. Opening these vent valves in Mode 1, 2 and 3 may void the piping.
4.	Develop a calculation to formally document the void acceptance criteria for the ECCS systems. The Discharge Piping calculation will focus on the Fauske pulsation methodology, and will discuss the GE Hitachi Nuclear Energy criteria for delay time due to voids. The suction side will address the continuous, long-term void fraction of 2 percent or less, and a transient, short-term void fraction of no greater than a 10 percent void fraction during any 5 second period).

Regulatory Commitment List

The following list identifies the new regulatory commitments committed to by FirstEnergy Nuclear Operating Company (FENOC) for the Perry Nuclear Power Plant in this document. Any other actions discussed in the submittal represent intended or planned actions by FENOC. They are described only as information and are not regulatory commitments. Please notify Mr. Thomas A. Lentz, Manager - Fleet Licensing, at (330) 761-6071 of any questions regarding this document or associated regulatory commitments.

Regulatory Commitments

1. A summary of the results of the evaluations of the in-field piping segment verifications for the piping that was not accessible during the nine-month GL 2008-01 evaluation period will be submitted to the NRC within 90 days after startup from the next refueling outage
2. The in-field verifications that have been completed as of October 14, 2008 will be evaluated, and a summary of the evaluation results will be submitted to the NRC by December 19, 2008
3. Technical Specification (TS) improvements are being addressed by the Technical Specification Task Force (TSTF) to provide an approved TSTF Traveler for making changes to individual licensee's TS related to managing 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. FirstEnergy Nuclear Operating Company (FENOC) is continuing to support the industry Gas Accumulation Management Team activities regarding the resolution of generic TS changes via the TSTF Traveler process. After NRC approval of the Traveler, FENOC will evaluate its applicability to PNPP, and evaluate adopting the Traveler to either supplement or replace the current TS requirements