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October 14, 2008
L-08-314

10 CFR 50.54(f)

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

SUBJECT:
Davis-Besse Nuclear Power Station
Docket No. 50-346, License No. NPF-3
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. MD7819)

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, 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 this 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 Davis-Besse Nuclear Power Station (DBNPS) was provided by letter dated April 11, 2008 (L-08-132). 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 NRC letter dated September 16, 2008.

In summary, based on the information reviewed to date, it is concluded that the subject systems/functions at DBNPS are capable of performing their intended safety function, and that for DBNPS, 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 identified 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,

Barry S. Allen

Barry S. Allen

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

cc: NRC Region III Administrator
NRC Resident Inspector
NRC Project Manager
Utility Radiological Safety Board

This attachment provides the Davis-Besse Nuclear Power Station (DBNPS) 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 DBNPS three month response dated April 11, 2008.

Scope

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

- High Pressure Injection (HPI) system, including the associated Auxiliary Pressurizer Spray piping related to Backup Boron Precipitation Control (BPC)
- Low Pressure Injection (LPI) system
- Core Flood (CF) system
- Decay Heat Removal (DHR) system
- Containment Spray (CS) system

The portions of the system piping included in the evaluation are the primary piping flow paths required for system operability, including interconnecting piping such as recirculation or flow test piping to the first normally closed isolation valve.

The HPI piping boundary includes the suction piping from the ECCS suction sources (BWST and Containment Emergency Sump) to the associated pumps, and the pump discharge flow path piping to the associated injection nozzles at the Reactor Coolant System (RCS) cold leg. The normal minimum recirculation flow paths are defined to be from each HPI pump discharge piping connection back to the Borated Water Storage Tank (BWST) nozzles. The Backup Boron Precipitation Control piping between the Decay Heat (DH) Loop 2 cooler discharge connection and the auxiliary pressurizer spray connection with the normal pressurizer spray piping (located in containment) is included.

HPI pumps 1 and 2 alternate minimum recirculation piping is included. More specifically, HPI Train 1 alternate minimum recirculation piping is defined as between the tap at the common discharge header in ECCS Room 1 to the connection with the DH pump 1 discharge piping. HPI Train 2 alternate minimum recirculation piping is defined as between the tap at the HPI Train 2 minimum recirculation piping in ECCS Room 2 to the connection with the DH pump 2 discharge piping connection.

The LPI piping boundary includes the suction piping from the ECCS suction sources (BWST and containment emergency sump) to the associated pumps, and the pump discharge flow path to the associated injection nozzles at the reactor pressure vessel. The Boron Precipitation Control system piping from the DH Train 1 cooler outlet to the connection with the DH drop line is included.

The CF evaluation boundary is defined to be from each Core Flood Tank (CFT) outlet to the CFT injection nozzle at the reactor vessel.

The DHR system utilizes portions of the LPI suction, the LPI pumps, and the LPI discharge piping. The piping segment utilized for DHR is the suction piping from the RCS Loop 2 Hot Leg nozzle to the connection with the ECCS suction piping. The nomenclature used at DBNPS (and, therefore, also in this summary of the GL 2008-01 reviews) for the LPI and DHR system components is the "DH" label, including the piping and components that are dedicated to LPI.

The CS evaluation boundary is defined to be from the suction connection of the ECCS common piping header to the pumps, and the discharge piping to the normally closed automatic isolation valves. In the portion of the system downstream of the automatic isolation valves, which is designed to be voided, the potential for water hammer upon the startup of the CS system pump (including the automatic start in response to a Design Basis Accident (DBA)) was evaluated and determined to be acceptable. Therefore, no additional evaluations of this portion of the CS system were necessary.

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 System 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 Planned Actions."

1. Licensing Basis Evaluation

A summary of the DBNPS 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) Technical Requirements Manual (TRM) and TRM Bases (as applicable),
d) Responses to NRC Generic Communications,
e) NRC Commitments, and
f) Operating License.

1a) Updated Final Safety Analysis Report (UFSAR)

The DBNPS UFSAR contains several discussions relevant to managing gas accumulation in ECCS systems:

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 included in UFSAR Appendix 3D "Conformance with the NRC General Design Criteria, Safety Guides, and Information Guides." Information on which GDCs apply to each of the subject systems is provided in Section 2a, "Design Basis Document Review," below.

UFSAR Section 5, "Reactor Coolant System," Subsection 5.5.10.2, "Description," describes the methods available to remove non-condensable gases that might get swept into the reactor coolant system. These include the Reactor Coolant System (RCS) High Point Vent system that provides vents on each of the two hot legs and on the pressurizer to assure that core cooling during natural circulation will not be inhibited. These vent lines are controlled by the operators from the Control Room. UFSAR Section 5.5.16, "Reactor Vessel Head Vent," describes the reactor vessel continuous head vent, which allows any non-condensable gases or steam that may collect in the reactor vessel upper head region to vent to the hot leg high point of Steam Generator 2, where the gases can then be removed via the high point vents discussed above. Therefore, the introduction of non-condensable gases such as those that may be present in the Emergency Core Cooling Systems into a Pressurized Water Reactor (PWR) such as DBNPS has already been addressed.

UFSAR Section 6.3, "Emergency Core Cooling System," contains the remainder of the relevant discussions about non-condensable gases in the ECCS. Subsection 6.3.3.1.4, "Discussion of Non-condensable Gases," describes the sources and quantities of non-condensables in the coolant, the pressurizer, and the makeup sources. It evaluates the effects of non-condensables on the plant following a small break loss-of-coolant accident (LOCA), and shows that there is considerable margin between the expected volume of gas (22.4 ft^3) and the volume that would impede cooling by completely filling the U-bend in the hot leg (125 ft^3). The conclusion of this section is that non-condensables do not significantly affect the condensation heat transfer process or the small break transient.

This same section of the UFSAR describes actions to minimize introduction of non-condensable gases into the primary system, and the operator actions to be taken should non-condensables accumulate. It notes that emergency procedures have been developed to accommodate non-condensable gases, to maintain plant control, and to achieve a stable long term cooling condition. This includes use of the continuous head vent and the hot leg high point vents described above. It notes that a substantial quantity (approximately 1000 ft^3) of gas can be accommodated in the upper region of the reactor vessel; therefore, there is assurance that natural circulation can be maintained if reactor coolant pump operation must be terminated, and core cooling and pressure control can also be maintained.

UFSAR Section 6.3.3.2.5, "Provisions to Protect the ECCS," notes that during normal station operation, the ECCS lines will be maintained full by the static head created by the relative elevations of the Borated Water Storage Tank (BWST) (bottom at elevation 585') and the emergency sump valves (elevation 560'-8"). The water level in the BWST when suction switches to the emergency sump is above the BWST discharge line, so water hammer due to line filling will not occur. In the discharge lines, the highest point in the discharge piping is at 593'-3/4", which is well below the normal operating water level in the BWST, thus providing a significant positive head on the system. The UFSAR also notes that some gas may exist in the ECCS piping. It explains that gas or vapor could be trapped at the closed High Pressure Injection (HPI) discharge valves (at the containment vessel) or at the closed Low Pressure Injection (LPI) check valves (at the reactor coolant piping). This amount of voiding would not cause a water hammer. It notes that manual venting capability is provided at the ECCS pump casings and at discharge high points. Finally, a scenario is examined in which the piping downstream of the motor-operated HPI discharge throttle valves is completely voided of liquid. For such a completely voided situation, an analysis has been performed to verify that no unacceptable forces on the lines will occur in the event of an HPI system actuation.

UFSAR Section 6.3.4, "Test and Inspections," explains that the Core Flooding system, the High Pressure Injection system, and the Low Pressure Injection system are tested at the frequencies specified in the Technical Specifications. Each system is tested by itself and it is evaluated so the system's emergency core cooling functional requirements are confirmed to be fulfilled.

In summary of the UFSAR information, the presence of some non-condensable gases in the ECCS systems is explicitly recognized, but the ECCS and the reactor coolant systems are designed to preclude adverse effects from air/gas intrusion or accumulation, due to a combination of effective filling and venting and maintenance of system pressure with the BWST and the installed RCS venting capabilities.

The DBNPS UFSAR discussions are considered to be acceptable, but some additional information should be added. The concept of performance-based periodic verifications on both the suction and the discharge side of the ECCS piping, such as those that have been implemented at DBNPS per the Corrective Action Program, 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. Along with this information about periodic checks that are performed more frequently than the current Technical Specification requirement of once per refueling interval, words similar to other plant UFSARs should be added explaining that the presence of some gas is a normal phenomenon that is expected. By introducing such discussions, the DBNPS UFSAR will more clearly indicate that a filled/full system does not mean that there is no gas present anywhere in the system, and that gas accumulation which does occur is appropriately managed. The above UFSAR changes are entered as a corrective action in the DBNPS Corrective Action Program. Because new licensing basis information will be established upon completion of the NRC's review of GL 2008-01, the schedule for completion of this corrective action will be 120 days following NRC closure of the GL 2008-01 review.

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

The DBNPS Technical Specifications and their Bases contain several items related to managing gas accumulation. Davis-Besse conversion to the improved Technical Specifications (ITS) is currently scheduled to be implemented in December 2008.

Emergency Core Cooling System Technical Specifications, applicable when T_{avg} is greater than or equal to 280°F, include Surveillance Requirement (SR) 4.5.2.b, which confirms system OPERABILITY by verifying "At least once each REFUELING INTERVAL, or prior to operation after ECCS piping has been drained by verifying that the ECCS piping is full of water by venting the ECCS pump casings and discharge piping high points."

The basis for this specification simply states that "the Surveillance Requirements provided to ensure OPERABILITY of each component ensures that, at a minimum, the assumptions used in the safety analyses are met and that subsystem OPERABILITY is maintained." This TS SR on the discharge lines was originally created at the request of the NRC in order to minimize the potential for water hammer (see the Davis-Besse Safety Evaluation Report (SER) Supplement 1, Section 6.3.2).

The above SR is also applicable when T_{avg} is less than 280°F, as enforced by TS 4.5.3. These same SRs are being transferred directly into the improved Technical Specifications.

The surveillance requirement to vent the high points on a once per fuel cycle frequency was approved by the NRC in a license amendment dated July 2, 1980 (License Amendment 25; ADAMS #ML021160263). Prior to the amendment, the frequency was at least once per 31 days.

Other relevant TS requirements are found in Specification 3.3.2, "Safety Features Actuation System Instrumentation," and 3.5.4, "Borated Water Storage Tank," which ensure the BWST low-level instruments that indicate the need to realign from the BWST to the emergency sump remain OPERABLE and place a minimum limit on the normally available water volume in the BWST, respectively. As noted in the UFSAR discussion above, the BWST level serves to maintain the ECCS piping full.

Finally, the basis for Specification 3.1.1.2, "Boron Dilution," explains that when the plant is shut down and in a reduced inventory condition in the RCS, in order to reduce the possibility of vortexing, the flowrate through the decay heat system may be procedurally restricted to prevent introduction of air into the systems due to such vortexing.

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 the Davis Besse Nuclear Power Station, and evaluate adopting the Traveler to either supplement or replace the current TS requirements.

1c) Technical Requirements Manual (TRM) and TRM Bases

The administrative requirements that maintain the functionality of the Reactor Coolant System High Point Vents (see the UFSAR discussion above) are contained in TRM 3.4.11, "Reactor Coolant System Vents." The Bases explain that these high point vents were added to the plant design as a result of NUREG-0737 Item II.B.1, and that operability of the vents ensures the capability of venting steam or non-condensable gas bubbles in the reactor coolant system to restore natural circulation following a small break loss of coolant accident.

No changes to the TRM are proposed.

Appropriate periodic checks of the ECCS piping in addition to those required by the Technical Specifications are being accomplished by activities established through the Corrective Action Program. As discussed in Section 3, "Testing Evaluation," additional locations are being added to the periodic test procedure.

1d) Responses to NRC Generic Communications

The DBNPS responses to Generic Letter 88-17, "Loss of Decay Heat Removal," and Generic Letter 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps," were provided to the NRC and were determined to be acceptable through the NRC inspection process and/or NRC review and approval of the submitted information.

These responses were reviewed, and no necessary changes were identified.

1e) NRC Commitments

A regulatory commitment was made in the three-month response to GL 2008-01. This 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.

As requested by the NRC in a letter dated September 16, 2008, a summary of the results of the evaluations of the remaining in-field piping segment verifications will be submitted to the NRC within 90 days after startup from the next refueling outage.

1f) Operating License

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

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

A summary of the information from the DBNPS 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 Verifications

2a) Design Basis Document Review

Design basis documents, including calculations and engineering evaluations, were reviewed with respect to managing gas accumulation in the systems within the scope of the review.

The 10CFR50 Appendix A General Design Criteria 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 DHR system is designed to satisfy the requirements of GDC 34.
- The emergency core cooling systems consisting of HPI, LPI and CF are designed to meet the requirements of GDC 35, and are inspected and tested to GDC 36 and 37, respectively. These systems meet the core cooling performance criteria specified in 10CFR50.46.
- The Containment Spray system is designed to accomplish the containment heat removal function required by GDC 38, and is inspected and tested in accordance with GDC 39 and 40, respectively.

Many plants in the industry utilize 'keep-fill" systems. However, none of the DBNPS systems within the scope of this review utilize an active pumping mechanism in order to keep the piping sufficiently full of water. The BWST maintains the systems filled by providing a standing head of water above the level of the system injection piping which is maintained water-filled. Portions of the CS spray nozzle headers are above the level of the BWST but this piping is designed to be voided.

Two portions of the in-scope piping segments are designed to be voided. For these sections, the GL concept of filling, venting, and ensuring the piping remains sufficiently full of water is not applicable. This applies to the following segments:

- CS: The Containment Spray system discharge lines downstream of the containment spray automatic isolation valves to the containment spray header are designed to be voided until the CS pumps start on an emergency signal. The potential for water hammer upon the startup of the CS system pump was considered and would not adversely affect system operation.
- A section of interconnected piping in the Auxiliary Pressurizer Spray/Boron Precipitation Control piping between the auxiliary spray stop and throttle valves is purposely voided, to provide a thermal expansion volume. Engineering analysis determined the voiding in the piping between DH2735 and DH2736 is acceptable.

System realignments during Design Basis actuations and during realignment to support decay heat removal were examined to ensure that the piping would remain full during such evolutions. The review of calculations and component realignments during such evolutions determined existing conditions are acceptable. The suction transfer from the BWST to the emergency containment sump involves a manual operator action that is credited in the Design Basis analysis. As part of the evaluation, the associated BWST level setpoints and procedural controls over this realignment were reviewed and determined to remain acceptable. The containment emergency sump suction valves open as the BWST suction valves close so that the pump suction remains flooded during the transfer.

An important parameter to ensure gas is not introduced into system piping is the vortex correlation used to establish minimum water level setpoints or manual actions credited in the design basis LOCA. The evaluation concluded that unacceptable vortex formation does not occur during the maximum flow scenarios during design basis actuations when aligned to either of the suction sources, the BWST or the containment emergency sump. The calculations evaluated and found acceptable the minimum water level setpoints that are established for the manual transfer actions that are credited in the design basis LOCA event. Adequate level is maintained in the BWST prior to transfer to the sump to eliminate the potential for adverse gas intrusion (void fraction maintained less than 2%) due to vortex formation.

The design of the containment emergency sump strainer prevents vortex formation because it complies with the specifications for vortex suppression contained in Regulatory Guide 1.82, Revision 2, Appendix A, Table A-6. The Regulatory Guide guidance was based on NUREG/CR-2761, "Results of Vortex Suppressor Tests, Single Outlet Sump Tests and Miscellaneous Sensitivity Tests." The fluid velocity at the emergency sump strainer surface is extremely low, on the order of 0.02 feet per second (11,000 gpm through 1226 ft^2 of surface). Gas entrainment at this velocity is not expected.

Vortex formation during decay heat removal operation was also examined. The decay heat removal suction from the reactor during shutdown conditions is adequately protected by precautions, limits and other guidance in the operational procedures. As an enhancement, a corrective action has been initiated to develop a design calculation to address vortex formation and NPSH for the Decay Heat Pumps during suction from the reactor when shutdown.

As illustrated by industry operating experience (OE), one method of introducing gas into piping is from interconnecting tanks or systems that operate at a higher pressure than the injection system itself. The CS system discharge piping has an interface with the station air system, which is used during shutdown testing to supply station air to the CS discharge piping during the air testing of the CS System spray nozzles. A corrective action has been created to revise the associated testing procedures to provide guidance regarding re-venting the CS Train discharge piping following completion of the CS nozzle air testing. For the DH/LPI and HPI systems, boundary check valves from the RCS and the Core Flood Tank (CFT) are periodically leak tested per the Inservice Testing Program (IST). The leakage test procedures require seat leakage to be evaluated for potential gas void concerns using the FENOC Corrective Action Program. A pre-determined acceptance criterion is not currently specified, so an enhancement action has been created to develop such an acceptable voiding value for the discharge piping. As discussed in Section 2e, “Gas Intrusion,” and Section 3, “Testing Evaluation,” due to the DH/LPI system interface with the CF, which results in the possibility of gas intrusion, DBNPS is adding additional checks into site procedures to periodically monitor for potential leakage past the DH/LPI boundary check valves.

The mission time for pump operation is considered in the acceptance criteria discussions in Section 2b, below. For the purposes of the gas intrusion reviews, the mission time was considered to be 30 days, as set by the duration of the post-DBA mission time in UFSAR Appendix 3D for the Ultimate Heat Sink (UHS). This is applied to the subject systems other than Core Flood.

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

- HPI & LPI: The delivery of gas into the reactor vessel will not impede flow of liquid into the vessel. The Davis-Besse reactor vessel head has a vent that routes gas to the steam generator, where RCS high point vents are available to vent this gas to the containment. Entry of entrained gas into the core is no different than the entry of nitrogen from the Core Flood Tanks. The gas would have to pass through the vessel downcomer and lower head structures, giving time for dispersal. Consequently, the mechanical agitation of the fuel would not be significant. Delivery of non-condensable gas in lieu of liquid to the reactor vessel would be acceptable as long as the overall delay is less than the delivery delay time already assumed in the accident analyses. However, delays greater than the assumed value may be tolerable depending on the specific conditions. For example, a previous situation-specific analysis determined that LPI injection for Train 2 will operate within analyzed limits (injection time delay due to the voiding is acceptable) for any gas void 65 ft^3 or smaller. A large gas bubble may be compressed once exposed to the pressure necessary for injection in a small break LOCA scenario. This is particularly significant for the High Pressure Injection System, which is the primary system that would be used to mitigate a small break LOCA. The Low Pressure Injection System is the primary mitigating system for large break LOCAs, during which the overall system pressure does not change significantly from normal LPI system pressure. The safety analyses are relatively insensitive to minor flow reductions such as could occur as the lines purge small residual gas bubbles out of the system.

- CS: This system does not interact with the fuel. The system already contains sections of empty pipe. The Containment Spray system piping was not previously included within the DBNPS periodic monitoring procedure (see Sections 2e and 3, below). However, Containment Spray piping will be added to the periodic monitoring activities through a corrective action that has been created to ensure locations that are considered to be vulnerable to air entrapment in the piping on the suction and discharge side of the systems within the scope of GL 2008-01 remain full of water.

Existing DBNPS evaluations of void size acceptability were reviewed. As discussed in Section 1, "Licensing Basis Evaluation," UFSAR Section 6.3.3.2.5 contains summaries of previous acceptable void analyses. In addition, several evaluations have been completed as past operability evaluations. These previous analyses have not identified a void that would have precluded the ECCS systems from accomplishing their design functions. From these reviews the following bounding conditions were established:

- For HPI: The critical gas void size for the HPI train 1 piping upstream of the HPI injection valves is 1.3 ft^3. For voids larger than the critical void volume, the gas minimizes water hammer by decelerating or cushioning the water column. For voids smaller than the critical void volume, the maximum acceleration or water hammer is not achieved. This critical void size was shown to not preclude accomplishment of the design function.
- For DH/LPI: Gas voids >17 ft^3 in the DH/LPI Train 2 discharge piping can be considered large enough to minimize water hammer.
- For DH/LPI: LPI injection for Train 2 will operate within analyzed limits (injection time delay due to the voiding is acceptable) for any gas void 65 ft^3 or smaller.

The design control program was reviewed to ensure that Design Interface Review Checklists (DIRCs) have an explicit line item to determine if the design change introduces or increases the potential for gas accumulation. These checklists and the overall Design Control Program were found to properly address the gas accumulation/intrusion issue.

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

Identified voids will be addressed through the Corrective Action Program. As detailed below, specific acceptance criteria have been developed for certain portions of the subject piping systems, based on pump vendor input and industry information. In these piping sections, if voids are discovered during the periodic ultrasonic test (UT) verifications that are being performed (see Section 3, Testing Evaluation), the established acceptance criteria can be applied. In other piping segments for which specific acceptance criteria have not been developed, any identified void would be evaluated to determine appropriate actions.

For suction piping, in order to limit gas entrainment to the pump after a pump start, void fraction acceptance criteria were established for the in-scope system suction piping. These void fraction acceptance criteria are based on FENOC-reviewed technical documents and industry standards associated with void fractions. These consist of the following limits:

- A steady state ingestion limit of 2% continuous.
- A transient ingestion limit of 5% for 5 seconds.

However, if a void would not transport to the pump suction, the void fraction that could result from such a discovered void does not need to be calculated. The transportability of a void can be determined by calculations using Froude number analysis. The transportability of voids in specific sections of pipe was examined in Section 2c, "Drawing Review," below.

For discharge piping, void fractions are not relevant. The primary concern created by a void is water hammer. As stated above, a discovered void in discharge piping would be evaluated on a situation-specific basis unless a previous analysis for critical void size (described in Section 2a) can be applied.

Other generic acceptable conditions have been established based on review of industry standards and water hammer guidance.

1) Small bore piping, smaller than 1" diameter, such as vents, drains, instruments, pressure points and sample lines, do not represent a significant water hammer concern.
2) The deadlegs or localized high points created by a relief valve do not represent significant water hammer concerns.
3) Valve Bonnets. Gas accumulation in valve bonnets does not represent a significant water hammer concern.
4) Water hammer is not required to be evaluated downstream of the system flow control device if:
   - The piping discharges to an open, vented portion of the system (such as the BWST) and the downstream piping size is the same internal diameter or larger, or
   - If pump operation is established prior to the flow control device operation and the flow control device does not rapidly actuate (i.e., not a solenoid operated or spring actuated valve).

For the reasons stated above in Section 2a, no separate acceptance criteria are necessary to address either:

1) the short delays that might occur in system actuations due to the minor voiding that could exist in the subject piping, or
2) the mechanical agitation of fuel due to gas.

2c) Drawing Review

System piping and instrumentation diagrams (P&IDs) and isometric drawings for the systems within the scope of the Generic Letter were reviewed to identify system vents and high points, and the potential for the need to add new vent valve locations, modify existing vent valves, or change utilization of existing vent valves.

In preparation for the drawing review, it was noted that there is no specific design guidance on the placement of vent valves. However, the subsequent drawing review identified no adverse drawing or vent valve discrepancies, no modifications to or changes in utilization of existing vent valves, and no new required vent locations. The drawing review did identify three locations where maintenance and plant operations would be enhanced by the installation of new vent valves, although these are not required because the piping in these areas can be dynamically flushed to eliminate accumulated gas. The incorporation of dynamic flushing into site procedures has been identified as a corrective action, to sweep gas from nominally horizontal piping.

The above conclusions were reached as a result of an extensive drawing review. As part of the review, transportability of gas in suction and discharge piping was assessed based on Froude Numbers (the Froude Number (Fr) correlates 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).

Based on the Fr evaluations of the piping, it was determined that in the nominally horizontal piping, the flow rates that are generated during static venting are not sufficient to remove all gas from horizontal piping, which resulted in the recommended corrective action identified above for dynamic flushing at higher system flow rates in association with system fill and vent evolutions (see Section 2d, "Fill and Vent Review," below). Areas were also identified for examination during the in-field verifications discussed in Section 2g, "System In-Field Verifications."

Another item reviewed was the acceptability of gas accumulation within the bonnets of system valves. This gas accumulation was considered to be acceptable, although it was noted that post-fill and vent operation of these valves could release gas into the bulk piping as the valve disc moves into the bonnet and displaces the gas. System walkdowns determined the piping is currently filled. Therefore, as an enhancement to the procedures, a corrective action has been identified to open these valves during the system fill and vent evolution.

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 concepts.

- Venting activities are controlled by approved operating procedures.
- 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 flushing methods are effective where used (adequate flowrates/fluid velocities).
- Vacuum fill operations are considered for piping sections which are difficult to fill and vent following maintenance.
- Venting of instrument lines, including the backfilling of level and flow transmitters, is included in venting procedures.

At DBNPS, venting activities are controlled by procedures; however, procedure revisions are appropriate to address both identified deficiencies and enhancements. The following items are captured within the Corrective Action Program (CAP). Three deficiencies were identified in which some venting locations were not included in the fill and vent section of the operating procedures. Venting procedures and practices utilize effective sequencing, but do not specify venting durations or acceptance criteria such as attaining a solid stream of water. DBNPS currently does not utilize dynamic venting. However, site procedures are to be revised to reflect this practice. Vacuum-assisted fill operations were determined to not be necessary for any location. At DBNPS, the Instrument and Control (I&C) Maintenance procedures (calibrations) do not contain fill and vent instructions for instrument lines; however, based on a review of I&C technician qualifications and training, and Davis-Besse operating experience, it was determined that procedure changes were not necessary.

2e) Gas Intrusion Review

Areas of potential gas intrusion into each system and each piping segment with potential for gas accumulation during the operating cycle were considered. Gas intrusion prevention, monitoring, evaluation, and operability determination criteria were considered for each system segment found to be vulnerable to gas intrusion and accumulation.

As discussed in Section 3, "Testing Evaluation," a site Periodic Procedure DB-SP-04212, "Venting of ECCS Piping – SOER 97-1," was developed as a result of evaluations performed for Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report (SOER) 97-01. This procedure requires periodic venting in both suction and discharge piping in addition to the venting required by TS surveillance requirement venting procedure DB-SP-03212, "Venting of ECCS Piping." The TS surveillance requirement essentially requires a one-time post-maintenance vent. Performance of the additional venting per the periodic procedure provides a means of identifying gas intrusion in the HPI and LPI/DH systems. Gas voiding concerns are required to be addressed through the Corrective Action Program.

To identify areas of potential improvement in gas intrusion management, the GL 2008-01 review identified piping sections susceptible to gas intrusion. Corrective actions have been initiated to track resultant changes to the site periodic monitoring procedure to include performance of periodic UT inspections to monitor for gas accumulation and provide a method of quantifying and tracking voids. Venting requirements are also to be added for the suction piping of the Containment Spray system. The revision to DB-SP-04212 will also include sampling of void gases when practical to aid in identification of the source of the void.

Additional actions are being put in effect to perform periodic UT inspections of appropriate locations in the piping systems using the work management process. Corrective actions are included in the Corrective Action Program to accomplish these inspections.

To determine the appropriate locations and frequencies for additional monitoring, gas intrusion susceptibility was examined. This involved many considerations. Provisions to preclude the formation of gas entraining vortices were addressed in Section 2a, "Design Basis Document Review," above. Section 3, "Testing Evaluation," addresses the potential for gas intrusion due to inadvertent draining, system realignments, and incorrect maintenance and testing procedures.

Provisions to prevent leakage from high pressure sources that could result in nitrogen coming out of solution were examined. The core flood tank pressure is maintained by a nitrogen cover gas at approximately 600 psig during normal plant operation. The core flood lines are connected to the LPI/DH injection piping, but are isolated from the lower pressure portions of the system by a back leakage check valve in each system. As noted in Section 2a, above, these valves are leak rate tested during refueling outages. In the refueling outage completed in early 2008 (RFO15), these valves had zero back leakage. Should the tests identify leakage, the procedure requires that the leakage be evaluated for potential gas void concerns by entering the discovery into the Corrective Action Program. Also, in the past, back leakage through the check valves has been identified by elevated suction pressure, which was appropriately entered into the corrective action program for disposition. As noted above and in Section 3, additional points in the suction and discharge piping are being added into the periodic monitoring program to look for gas intrusion from such sources. A corrective action has also been created to document periodic monitoring of the Core Flood Tank levels for unexplained level decreases, which would indicate potential back leakage.

In a similar manner, back leakage from the Reactor Coolant System could occur into LPI/DH or HPI. For LPI/DH, the path from the RCS has an additional check valve, which also had zero leakage during RFO15. For HPI, there are dual check valves in the path from the RCS, which are leak rate tested and had zero leakage during RFO15. The above discussions about LPI/DH back leakage management also apply to HPI.

Dissolved gas can be stripped out of solution due to pressure reductions. Over extended periods of system operation, these stripped gases can accumulate. Since HPI, LPI, Containment Spray, and Core Flood systems are normally in standby, stripping of gas is expected to be insignificant. Shutdown operation of DHR is continuous, however, so it was examined. The normal flowrates (approximately 3000 GPM) were determined to be sufficient to flush any potential air accumulation through the piping (based on an approximate Froude number >1.1). DHR operation during shutdown operation was evaluated for potentially offgassing into stagnant vertical piping connections. The DHR system's vertically upward sections were evaluated and determined not to be a significant source of gas accumulation.

The system static pressure in HPI and LPI is provided by the BWST head. The BWST is open to atmosphere; therefore, the BWST water source is expected to have an air concentration based on atmospheric pressure. The HPI and LPI systems are not expected to encounter sub-atmospheric pressure conditions during normal operation; thus, no significant HPI or LPI system offgas would be expected during normal plant operation. Also, because the subject system piping does not operate at a pressure less than atmospheric pressure, leakage through vent valves does not present a condition for air in-leakage during normal system operation.

Air in-leakage through system pathways that allow drainback to the system has been an issue at some plants. At DBNPS, however, no system pathways that allow for drainback were identified.

Failure of level instruments to indicate the correct level for tanks used as a pump suction source can result in gas intrusion. The review determined the BWST tank level transmitters are not susceptible to a common mode reference leg failure because the reference legs are independent. Therefore, the underlying event of a common mode instrument failure has been addressed at DBNPS.

Air-operated valve designs were reviewed for potential to introduce air into the system. The style of air operated diaphragm valve that has introduced air at another plant is not installed at DBNPS.

2f) <u>Ongoing Industry Programs</u>

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

2g) <u>System In-Field Verifications</u>

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 were credited for the GL response. The system in-field verifications performed in response to the GL determined that existing vents are in the proper location along horizontal runs of pipe. Existing vents are in the proper location along the circumference of the pipe. Piping expected to be essentially horizontal was verified to be so, with several localized high spots identified and verified to be sufficiently full of water via UT inspections where appropriate. No analytical assessments were performed to refine the scope or level of detail of the verifications. Insulation was removed where required to complete the in-field verifications. All in-field measurements were performed on bare piping surfaces. Two potential locations for new vent valves were identified and documented within the Corrective Action Program. Subsequent UT void inspections of these locations concluded the piping was water solid. Three voids were identified via UT inspections during the in-field verifications, including a void in the Auxiliary Pressurizer Spray piping, a void just below the High Pressure Injection Pump 1 Suction Relief Valve and a void in a dead leg portion of a tee off of the High Pressure Injection piping downstream of HP2A. Each was determined to not adversely affect the associated system's ability to perform its intended function.

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. No piping segments that are inaccessible due to being buried were identified.

3. Testing Evaluation (Including Reviews of Periodic Verifications)

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

The DBNPS TS surveillance requirement states that each ECCS subsystem will be demonstrated operable "At least once each REFUELING INTERVAL, or prior to operation after ECCS piping has been drained by verifying that the ECCS piping is full of water by venting the ECCS pump casings and discharge piping high points." The TS are currently being converted to the improved Technical Specifications (ITS). The ITS requirement is to "Verify ECCS piping is full of water by venting the ECCS pump casings and discharge piping high points every 24 months AND prior to declaring ECCS Operable after draining ECCS piping." Surveillance Test Procedure DB-SP-03212, "Venting of ECCS Piping," directs those TS surveillance activities. Review of DB-SP-03212 identified the need to clarify venting instructions for a single existing vent location. This item has been entered into the Corrective Action Program. Based on License Amendment 25 dated July 2, 1980, this surveillance frequency was changed from monthly to once per refueling interval. Therefore, this procedure does not provide the periodic verification checks utilized for management of gas accumulation. That task is provided by a separate DBNPS procedure.

Periodic Procedure DB-SP-04212, "Venting of ECCS Piping – SOER 97-1," was developed as a result of evaluations performed for Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report (SOER) 97-01 and directs periodic venting that is performed in addition to the vents required by TS surveillance requirement procedure DB-SP-03212. The Gas Intrusion Review section of the GL evaluation identified piping sections susceptible to gas intrusion. Changes to Periodic Procedure DB-SP-04212 to include performance of periodic UT inspections in additional locations of the suction and discharge piping in the ECCS and CS systems to monitor for gas accumulation are tracked within the Corrective Action Program. This will provide a method of quantifying and tracking voids. The revision to DB-SP-04212 will identify that when a void is discovered, void gas sampling should be performed as practical, to aid in identifying the source of the void.

Review of other periodic surveillance/testing procedures resulted in no deficiencies identified. Procedure enhancements to ensure gas is not introduced during the conduct of the testing have been captured within the Corrective Action Program. Many of these surveillance/periodic testing procedures rely upon operations personnel to return systems to service after testing is complete. In the past, the system return to service was completed by performing the fill and vent section of the system operating procedure. The Design Review section of the GL evaluation identified that static fill and vent can not ensure voids are removed because of the lack of a designed pipe slope upward toward vent valves. As such, dynamic flushing is required. Resolution of this issue is tracked within the Corrective Action Program.

4. Corrective Action Program Evaluation

The FENOC Corrective Action Program is effectively utilized in concert with the periodic verification checks performed at DBNPS, to address management of gas accumulation.

A historical review of Corrective Action Program documents (Condition Reports (CRs)) identified events in which gas voids were identified in ECCS systems. These events were classified in accordance with the FENOC Corrective Action Program, causes were determined as necessary, and corrective actions were implemented. Several CRs address INPO SER 2-05 Gas Intrusion in Safety Systems, and SOER 97-1 Potential Loss Of HPI and Charging Capability From Gas Intrusion. Based on the review, it was concluded that the Corrective Action Program is appropriately employed to address gas voiding issues in the ECCS and Containment Spray system. In addition, the surveillance and periodic testing procedures DB-SP-03212 and DB-SP-04212 require that a CR be generated if gas voiding concerns are identified. As part of the FENOC Corrective Action Program, condition reports related to plant equipment are evaluated for potential impact on OPERABILITY. The Corrective Action Program provides the trending mechanism for documented gas voids to determine if increased or alternate monitoring is necessary. Therefore, the conclusion of the Corrective Action Program Evaluation is that issues involving gas intrusion/accumulation are properly prioritized and evaluated under the Corrective Action Program.

Prior to the issuance of Generic Letter 2008-01, a corrective action program Condition Report had identified the need to properly re-vent the DH pump discharge piping following completion of on-line maintenance activities that would require draining DH Pump 1(2). The DH operating procedure has since been revised to include additional guidance on fill and vent following a drain, which provides for effective venting. However, installation of vent valves on both DH pump minimum recirculating lines was identified as an enhancement for plant operations and maintenance.

Conclusion of the Above Evaluations

In summary, the subject systems/functions at DBNPS are capable of performing their intended safety function, and for DBNPS, 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

Necessary actions to achieve full compliance with the regulations are listed in Table 1, along with the scheduled completion date for each item. The basis for the proposed schedule is as follows.

The subject systems have recently been tested or examined with respect to gas management; the results were acceptable and support continued operability of the systems during the period of corrective action implementation. During the refueling outage in the spring of 2008 (RFO15), several activities provided positive means of filling the systems and ensuring they will remain sufficiently full, as described below. The recent GL 2008-01 in-field verifications also support the conclusion that the schedules proposed below for outstanding corrective actions are acceptable.

For HPI, during RFO15 pump and valve testing program activities, flow rates high enough to provide reasonable assurance that the affected injection piping is sufficiently full of water were achieved. Then, at the end of the outage, the TS required venting of the HPI pumps and discharge piping high points was completed. Subsequent to this, potential back leakage from the RCS is a low probability, because three of the four HPI injection flow paths had redundant pressure isolation check valves that were tested during the outage and shown to have zero back leakage. The fourth injection pathway is the line through which normal RCS makeup injection passes. Therefore, reverse leakage is not applicable or a concern. Furthermore, the pressure in the HPI discharge piping outboard of these valves is monitored by a pressure switch, which provides an alarm at approximately 375 psig, thus providing an indication of potential back leakage from the RCS.

For the LPI and DH common piping, the routine shutdown cooling flow rates to the RCS during RFO15 were high enough to provide reasonable assurance that the affected injection piping is sufficiently full of water. Then, at the end of the outage, the TS required venting of the LPI pumps and discharge piping high points was completed. Subsequent to this, potential back leakage from the RCS is a low probability, because the LPI/DH injection flow paths had redundant pressure isolation check valves that were tested and shown to have zero back leakage, and the piping that connects to each of the Core Flood tanks has a pressure isolation check valve that also measured zero back leakage. Finally, the Decay Heat Drop Line recirculated high enough flow rates to ensure that this piping is full of water.

For Core Flood system piping, RFO15 check valve testing utilized flow rates high enough to provide reasonable assurance that the affected injection piping is sufficiently full of water. Subsequent to this, potential back leakage from the RCS is a low probability, because each of the CF injection flow paths has a pressure isolation check valve that measured zero back leakage. There are no pumps associated with this system.

TABLE 1

	Description	Completion dates
Actions Identified During the Section 2d Fill and Vent Review		
1.	DB designs do not incorporate a pipe slope to ensure proper fill and vent by static methods. The current processes and procedures also do not incorporate dynamic flushing. Revise processes and procedures as appropriate to incorporate dynamic flushing.	04/11/09
2.	Revise DB-OP-06012, "Decay Heat and Low Pressure Injection System Operating Procedure," to incorporate the following items: a. Require the DH/LPI Pump to be operated recirculating the BWST after any drain of the DH/LPI Pump or DH Cooler. This needs to include the cycling of the DH cooler bypass valves DH13A or DH13B to dynamically flush the associated piping. b. Add a conditional step to open DH830 (Train 2) or DH 831 (Train 1) to fill the cross-connect piping if the piping was drained up to the associated valve. c. Add a procedure section for draining and filling and venting the DH Test line. d. Add to the Train 1 fill and vent sections to open DH30 and vent at DH51. e. Add to the Train 1 fill and vent sections to open DH33 and vent at MU276 unless DH is on purification. f. Add to the Train 2 drain sections to close DH178 as a boundary valve and then re-open in the restoration sections. g. Add to the Train 2 fill and vent sections to vent at DH175.	11/21/08

	h. Add to the Train 2 fill and vent sections to vent the DH Auxiliary Spray line by opening DH200 and DH201 and venting at DH202/202A.	
3.	Revise DB-OP-06011, "High Pressure Injection System," to incorporate the following items: a. Add the venting of BW30 (Train 1) and HP65 (Train 2) after the suction isolation valve is opened during the fill and vent sections. b. Add instructions to vent HP72 at > 3GPM until no gasses are seen. Also add the note that states it takes ~ 2 minutes to ensure any gases are vented. c. Add the venting of MU805 to the Train 2 fill and vent section.	11/21/08
4.	Revise DB-SP-03212, "Venting of ECCS System," to 1) Add instructions to vent HP72 at > 3GPM. 2) Add a note that states it takes ~ 2 minutes to ensure any gases are vented via HP72 piping	11/21/08
5.	Revise DB-OP-06013, "Containment Spray System," to completely vent by closing CS19, opening CS1531, CS33, and throttling open CS17. The pipe should then be vented at CS24.	11/21/08
Actions Identified During the Section 2e Gas Intrusion Review		
6.	DB-SP-04212, "Venting of ECCS System – SOER 97-01," accomplishes periodic venting to assess for gas intrusion or system anomalies. Quantification of any gas accumulation is difficult to accomplish by venting. Review the protocol and incorporate changes to DB-SP-04212 to include: 1) Utilizing ultrasonic testing to assess the piping conditions and quantify any gas accumulation. 2) Formal venting as contingent based on UT analysis or if periodic venting is desired, less frequent based on the accomplishment of UTs. 3) Ensure gas is sampled where practical 4) Verify system has not been preconditioned	04/11/09
7.	Track development of procedural guidance as necessary for chemistry sampling and analysis methods.	11/26/08
8.	Implement periodic monitoring for potential back leakage from the Core Flood Tank(s) into the DH/LPI piping upstream of the DH76/DH77 discharge check valves. 1. CFT 1 and 2 levels should be monitored for any unexplained level decreases (e.g., 0.05 feet/week). 2. Periodic UT void monitoring should be performed in the DH Train 1 and 2 discharge high point.	12/11/08
9.	To ensure that the piping on the suction and the discharge side of the systems evaluated in Generic Letter 2008-01 remain sufficiently full of water, locations considered to be vulnerable to gas entrapment will receive Ultrasonic Tests (UT) on an appropriate periodic basis.	04/11/09

10.	To ensure that the piping on the suction of the Containment Spray systems remain sufficiently full of water: 1. Revise DB-SP-03212, "Venting of ECCS Piping;" and DB-SP-04212, "Venting of ECCS Piping-SOER 97-1," to perform venting at CS34 Containment Spray (CS) Pump 1 Suction Vent Valve. 2. Revise DB-SP-03212 Venting of ECCS Piping; and DB-SP-04212 Venting of ECCS Piping-SOER 97-1 to perform suction piping venting at DH154 upstream of CS Pump 2 suction.	04/11/09
Actions Identified During the Section 2g System In-Field Verifications		
11.	CR 08-44773 documents a void discovered in the Pressurizer Auxiliary Spray piping. The voiding was evaluated and concluded to not adversely impact the ability of the DH system to perform its design functions. Add venting guidance to appropriate procedures.	11/21/08

C. ADDITIONAL PLANNED ACTIONS

The procedure and monitoring changes listed in Table 2 below have been recommended to improve management of gas accumulation at DBNPS. 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
Actions Identified During the Section 1 Licensing Basis Evaluation	
1.	Track UFSAR changes to incorporate additional information describing performance-based periodic checks, and to more clearly reflect the concept that gas accumulation occurs, but is managed.
Actions Identified During the Section 2a Design Basis Document Review	
2.	Track development of a design calculation to address vortexing and NPSH for Decay Heat pumps during suction from the reactor.
3.	Review the MPR evaluation of DH and HPI system acceptable void volume for: 1) Impact on the Design Engineering Review documented in GL 2008-01 AIR ACCUMULATION IN ECCS, DHR and CS SYSTEMS

	2) Applicability for developing high pressure (RCS/CFT) to low pressure HPI or DH/LPI allowable leakage limits. Currently the acceptance criteria for ECCS boundary valve leak tests are based on the allowable RCS leakage. Any leakage during these seat leak test require a CR to be generated for engineering evaluation for gas accumulation but there is no calculated limit available to support the gas accumulation evaluation.
Actions Identified During the Section 2e Gas Intrusion Review	
4.	Track enhancements identified, including procedure revisions and UT monitoring. The enhancements are summarized below: A. Quarterly Monitoring Enhancement Actions 1. Quarterly UT monitoring in the SFP Purification piping high point immediately upstream of DH28/DH29 (i.e., away from the ECCS piping) in MPR 2 horizontal run, approx 574' 6" elev. (e.g., accessible location in the approx. 8 ft run). 2. Quarterly UT Void inspection is recommended on the HPI Pump 1 alternate minimum recirculation line horizontal piping high point in ECCS Room 1. 3. Quarterly UT Void inspection is recommended on the DH Pump 1 discharge sample piping horizontal piping in Room 105 (approx. elev. 553' 3"). 4. Quarterly UT inspection in the DH Train 1 Recirculation test piping, in the vertical piping directly below DH66, prior to performing the Quarterly flow testing (i.e., opening of DH66) 5. Quarterly UT Void inspection is recommended on the DH Pump 2 discharge sample piping horizontal piping high point in Room 113 (approx. elev. 553' 3"). 6. Quarterly UT void inspections of the Pressurizer Aux. spray piping horizontal piping (e.g., high point) in MPR 4. 7. Quarterly UT inspection in the test piping, in the vertical piping directly below DH65, prior to performing the DH Pump 2 Quarterly flow testing (i.e., opening of DH65) B. Procedure Enhancements 1. Revise DB-OP-06012 Decay Heat Operating Procedure to provide guidance to require performing a sample piping (S 033 1) purge following any draining and refilling of the ECCS 24" common suction piping. 2. Revise DB-OP-06021 SFP Operating procedure should include guidance regarding filling and venting of the affected BWST recirculation piping. 3. Revise DB-OP-06011 R21 to ensure MU805 is vented as part of the HPI Train 2 restoration actions. 4. Revise DB-OP-06021 SFP Operating Procedure to require performance of a UT Void inspection in the SFP Purification piping high point immediately upstream of DH28/DH29 (i.e., away from the ECCS piping) in MPR 2 horizontal run, approx 574' 6" elev. (e.g., accessible location in the approx. 8 ft run), prior to placing the SFP Purification system in operation on the DHR system. 5. Revise DB-OP-06021 SFP Operating Procedure to provide guidance regarding the filling and venting of the referenced piping upstream of DH28/DH29 SFP Purification piping. 6. Revise DB-OP-06021 SFP Operating Procedure to require performance of a

	UT Void inspection in the SFP Cooling piping high point prior to placing the SFP Cooling system in operation on the DHR system. Monitor upstream of DH31/DH30 (i.e., away from the ECCS piping) in MPR 4 near the elbow in the pipe chase as the piping turns horizontal. (e.g:, accessible location)). 7. Revise DB-OP-06021 SFP Operating Procedure to provide guidance regarding the filling and venting of the referenced piping upstream of DH31/DH30. 8. Revise DB-OP-6012 DH Operating Procedure to require monitoring of the piping upstream of DH33/DH32 Purification Demineralizer piping (i.e., away from the ECCS piping, toward the MU system) prior to placing the purification piping into service on DHR (e.g., Train 1 piping – monitor horizontal piping in MU Pump Room or by MU276 in Room 211; Train 2 piping monitor immediately upstream of DH32, in the DH Cooler Room 113). 9. Revise DB-OP-6006 MU Operating Procedure to require monitoring of the piping initial barrier MU274 (i.e., away from the MU system, toward the DHR system) prior to placing the purification piping into service on DHR (e.g., Room 211 near MU276 or MUP Room). 10. Revise DB-OP-6012 DH Operating Procedure to include guidance regarding the filling and venting of the referenced piping upstream of DH33/DH32 Purification Demineralizer piping. 11. Revise DB-OP-6012 DH Operating Procedure to monitor the piping upstream of DH35/DH34 (i.e., away from the ECCS piping, toward the NaOH system) prior to placing the NaOH piping into service on DHR. 12. Revise DB-OP-06012 DH Operating Procedure should provide guidance regarding filling and venting of the DH Recirculation Flow Test Header. (See Attachment 1 Item 27) 13. Revise DB-OP-06012 DH Operating Procedure to provide guidance regarding filling and venting of the DH Recirculation Flow Test Header. 14. Revise DB-OP-06013 to provide CS Train 1 and 2 recirculation Test Header filling and venting guidance. 15. Revise DB-SP-03304 Rev. 5 Ctmt Spray System Nozzle Check Train 1 (Lower Header) and DB SP 03305 Rev. 5 Ctmt Spray System Nozzle Check Train 2 (Upper Header) to provide guidance regarding re-venting the CS Train discharge piping following completion of the CS nozzle air testing. 16. Revise DB-OP-06006 MU Operating Procedure to include filling and venting guidance for the Alternate RCS MU Injection Line C. Monitoring enhancements following plant startup from a plant shutdown to Mode 5 1. Revise DB-SP-04212 Venting of ECCS Piping SOER 97 1 to include the performance of UT void inspections at appropriate DHR suction and discharge piping (e.g., high point) locations following startup from plant shutdown. (see section 2.4.2.1.3) 2. Revise DB-SP-03337 CS Pump 1 Quarterly, DB-SP-03338 CS Pump 2 Quarterly, DB-SP-03218 HPI Train 1 Pump and Valve Test, DB-SP-03219 HPI Train 2 Pump and Valve Test, DB-SP-03136 DH Train 1 Pump and Valve Test, and DB-SP-03137 DH Train 2 Pump and Valve Test to provide guidance to vent the associated Pump at the conclusion of the initial Quarterly IST Pump testing following startup from a refueling outage. (see section 2.4.2.1.3)

	3. Revise DB-OP-06012 DH Operating Procedure to recirculate the trains to the BWST following startup from a plant shutdown requiring DHR operation, and then each DH Pump should be vented at the conclusion of the dynamic sweeping activity. (see section 2.4.2.1.3) D. Miscellaneous Enhancement Actions: 1. Evaluate need for installation of a new check valve in the MU Pump 1 suction piping from the BWST in order to prevent reverse flow from the MU system into the suction piping from the BWST/HPI pump suction piping. (See Attachment 1 Item 5) 2. Evaluate need for installation of a new check valve in the MU Pump 2 suction piping from the BWST in order to prevent reverse flow from the MU system into the suction piping from the BWST/HPI pump suction piping. (See Attachment 1 Item 9)
Actions Identified During the Section 2g System In-Field Verification Review	
5.	Decay Heat Train 1 4"-GCB-2 piping at DH166 is lower than the piping high point by approximately 1.3 inches. UT void inspections verified the piping was water solid. Develop an engineering change package to install an additional vent valve.
6.	A localized high point in the Pressurizer Auxiliary Spray piping was identified during the Drawing Review. UT void inspections verified that the piping was water solid. Evaluate CR to determine whether an additional vent valve is required.
7.	Complete the following Containment and Annulus piping in-field verifications during 16RFO. A. HPI Train 1 discharge injection piping (P50) from the shield building wall up to the RCS nozzle. B. HPI Train 1 discharge injection piping (P22) from the shield building wall up to the RCS nozzle. C. HPI Train 2 discharge injection piping (P20) from the shield building wall up to the RCS nozzle. D. HPI Train 2 discharge injection piping (P19) from the shield building wall up to the RCS nozzle. E. LPI Train 1 discharge injection piping (P 28) from the shield building wall up to the RCS nozzle. F. LPI Train 2 discharge injection piping (P 28) from the shield building wall up to the RCS nozzle. G. CFT 1 and discharge piping from the CFT to the RCS nozzle. H. CFT 2 and discharge piping from the CFT to the RCS nozzle. I. DH Removal suction form RCS Loop 2 Hot Leg (P29) from the shield building wall up to the RCS nozzle.
8.	Track a review of the piping in-field verification results by design engineering. Based on the review, any additional follow-up items as appropriate will be initiated.
Actions Identified During the Section 3 Testing Evaluation	
9.	Evaluate and track potential enhancements identified during review of the following testing/surveillance procedures. 1. DB-PF-03011, ECCS Train 1 System Leakage

	2. DB-PF-03012, ECCS Train 2 System Leakage 3. DB-PF-03068, Generic Check Valve Forward Flow 4. DB-PF-03069, Generic Check Valve Reverse Flow 5. DB-PF-04167, Generic MOV D/P 6. DB-SP-03302, CF28/CF29 Leakage 7. DB-SP-03337, CS Pump 1 Quarterly/Valve Testing 8. DB-SP-03338, CS Pump 2 Quarterly/Valve Testing 9. DB-SP-03136, DH Pump 1 Quarterly/Valve Testing 10. DB-SP-03137, DH Pump 2 Quarterly/Valve Testing 11. DB-PF-03236, DH Pump 1 Baseline Test 12. DB-PF-03237, DH Pump 2 Baseline Test
Action Identified During the Section 4 Corrective Action Program Evaluation	
10.	Develop design change for installation of vent valves on both DH pump minimum recirculating lines to allow proper re-vent the DH pump discharge piping following completion of on-line maintenance activities that would require draining DH Pump 1(2).

Regulatory Commitment List

The following list identifies the new Regulatory Commitments committed to by FirstEnergy Nuclear Operating Company (FENOC) for the Davis-Besse Nuclear Power Station 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 remaining in-field piping segment verifications will be submitted to the NRC within 90 days after startup from the next refueling outage.
2. 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. 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 the Davis-Besse Nuclear Power Station, and evaluate adopting the Traveler to either supplement or replace the current TS requirements.