AmerenUE
Callaway Plant

PO Box 620
Fulton, MO 65251

October 13, 2008

ULNRC-05551

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

10 CFR 50.54(f)

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
RESPONSE TO NRC GENERIC LETTER 2008-01, "MANAGING GAS ACCUMULATION IN EMERGENCY CORE COOLING, DECAY HEAT REMOVAL, AND CONTAINMENT SPRAY SYSTEMS"
(TAC NO. MD7806)

References:
1. NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008
2. ULNRC-05504, "Three-Month Response to NRC Generic Letter 2008-01, 'Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems,'" dated April 10, 2008
3. NRC Letter from M.C. Thadani to A. C. Heflin re: Callaway Plant, Unit 1, "Generic Letter 2008-01, 'Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems,' Proposed Alternative Course of Action," dated September 18, 2008

NRC Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008 (Reference 1) was issued pursuant to the requirements of 10 CFR Part 50.54(f) to request information from licensees regarding how they protect certain safety systems from the accumulation of air, nitrogen or other gases that could cause the systems to become inoperable.

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The GL requested licensees to evaluate their emergency core cooling, decay heat removal, and containment spray systems in order to determine how their licensing basis, design, testing and corrective actions 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. Specifically, the NRC requested licensees to provide the following information:

1. A description of the results of evaluations that were performed pursuant to the above requested actions. This description should provide sufficient information to demonstrate that [the licensee is] or will be in 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 subject systems;

2. A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that [the licensee] determined were necessary to assure compliance with these regulations, and

3. A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

GL 2008-01 requested that within nine months, licensees submit a response to the requests in the GL. AmerenUE's response for Callaway Plant Unit 1 is hereby provided in Enclosure I.

By letter dated April 10, 2008 (Reference 2) AmerenUE provided a 3-month response to the GL, indicating that not all of the required plant walkdowns and evaluations would be completed by the October 11, 2008 deadline. AmerenUE's April 10, 2008 letter was subsequently acknowledged by the NRC in the NRC's letter to AmerenUE dated September 18, 2008 (Reference 3). The NRC's letter clarified that a 9-month response letter was still expected to be submitted.

As indicated in the letter of Reference 2, AmerenUE remains committed to providing a final response to the GL (subsequent to this 9-month response). However, it should be noted that AmerenUE will provide its final response within 90 days, instead of 60 days as previously stated, following the end of the Refuel 16 outage which began on October 11, 2008.

In summary, based on the evaluations and inspections performed to date, AmerenUE has concluded that the ECCS, RHR, and CS systems are capable of performing their specified safety functions and that the systems are in compliance with their licensing basis with respect to the concerns outlined in GL 2008-01.

This response is submitted in accordance with 10 CFR 50.4. In addition, this letter contains new commitments which are summarized in Enclosure II.

If there are any questions or if additional information is needed, please contact Mr. Scott Maglio at (573) 676-8719 or Mr. Tom Elwood at (573) 676-6479.

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

Sincerely,

Executed on: 10-13-2008

Luke H. Graessle
Manager, Regulatory Affairs

DER/nls

Enclosures: I - Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency fore cooling, Decay Heat Removal, and Containment Spray Systems"

II - List of Commitments

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

Mr. Elmo E. Collins, Jr.
Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
612 E . Lamar Blvd., Suite 400
Arlington, TX 76011-4125

Senior Resident Inspector
Callaway Resident Office
U.S. Nuclear Regulatory Commission
8201 NRC Road
Steedman, MO 65077

Mr. Mohan C. Thadani (2 copies)
Licensing Project Manager, Callaway Plant
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8G14
Washington, DC 20555-2738

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

NRC Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008 was issued to request information from licensees regarding compliance with current licensing and design basis requirements, applicable regulatory requirements, and control measures in place for maintaining compliance for the following systems:

- Emergency Core Cooling System (ECCS),
- Decay Heat Removal (DHR), and
- Containment Spray System (CSS).

The NRC has requested that each addressee evaluate its ECCS, DHR system, and CSS licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

The NRC has requested that each addressee provide the following information:

1. A description of the results of evaluations that were performed pursuant to the above requested actions. This description should provide sufficient information to demonstrate that the licensee is or will be in 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 subject systems;

2. A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that the licensee determined were necessary to assure compliance with these regulations, and

3. A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

This response is structured to address each requested information item in sequence and provides the results of the evaluations performed for Callaway Plant.

A. EVALUATION RESULTS

Licensing Basis Evaluation

The Callaway Plant Unit 1 license basis documents (LBDs) were reviewed with respect to gas accumulation in the Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems. This review included the Technical Specifications (TS), TS Bases, Final Safety Analysis Report (FSAR), responses to NRC generic communications, Regulatory Commitments, and License Conditions. The following provides the evaluation results for each of the systems.

The LBDs provide a clear translation of the regulatory and license requirements into the system design and operational requirements. The level of detail of the Callaway Plant Unit 1 FSAR is consistent with the level of detail prescribed by NEI 98-03 Rev. 1, "Guidelines for Updating Final Safety Analysis Reports," and Regulatory Guide (RG) 1.181, "Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e)."

A) Emergency Core Cooling System (ECCS)

FSAR Section 6.3 provides the governing discussion of the ECCS. The primary function of the ECCS is to provide emergency core cooling in the event of a loss-of-coolant accident (LOCA) resulting from a break in the primary reactor coolant system (RCS) or to provide emergency boration in the event of a steam or feedwater line break accident resulting from a break in the secondary steam system.

The LBDs for the ECCS systems were reviewed as directed by the GL. The documents included the Operating License, TS, TS Bases, the FSAR, and pertinent correspondence and safety evaluation reports (SERs) issued subsequent to Improved Technical Specification (ITS) conversion. An evaluation of correspondence limited to licensing activities potentially applicable to the systems was also conducted.

Pertinent FSAR sections reviewed include 5.4.7, 6.2.1, 6.3, 16.1.1, 16.1.2, 16.5.1, 16.5.2, and Appendix 3A. Pertinent TS include LCO 3.5.2, "ECCS - Operating," LCO 3.5.3, "ECCS – Shutdown," LCO 3.5.5, "Seal Injection Flow," and associated Bases. TS LCO 3.5.2 contains Surveillance Requirement (SR) 3.5.2.3, and LCO 3.5.3 contains SR 3.5.3.1 which references SR 3.5.2.3 regarding verification of the piping fullness. The definition of Operability also establishes the minimum expectations for system functional capability which includes the expected degree of fullness of the piping systems. Other LBDs and references supporting these sections were also reviewed. The TS SR requirements are included in the FSAR system description in Section 6.3.2.2, "Equipment and Component Descriptions."

B) Decay Heat Removal System

Callaway uses the term Residual Heat Removal (RHR) system in lieu of decay heat removal system. FSAR Section 6.3.2.1 provides the governing discussion of the RHR function as it relates to the ECCS function. The primary function of the RHR system is to inject large volumes of water at relatively low pressures resulting from large break LOCA's. This function is provided during both the injection and recirculation phases of an accident. The RHR pumps also provide suction to the intermediate head safety injection pumps and high head safety injection pumps (centrifugal charging pumps) to support their operation during events in which RCS pressure remains high such as a small break LOCA and containment sump recirculation is required.

The LBDs for the Residual Heat Removal (EJ) system were reviewed as directed by the GL. The documents included the Operating License, TS, TS Bases, the FSAR, and pertinent correspondence and SERs subsequent to ITS conversion. An evaluation of correspondence limited to licensing activities potentially applicable to the Residual Heat Removal system was also conducted.

Pertinent FSAR sections reviewed include 5.4.7, 6.2.1, 6.3, 16.1.2, 16.5.2, and Appendix 3A. Pertinent TS include LCO 3.5.2, "ECCS - Operating," LCO 3.5.3, "ECCS – Shutdown," and associated Bases. TS LCO 3.5.2 does contain Surveillance Requirement (SR) 3.5.2.3, and LCO 3.5.3 contains SR 3.5.3.1 which references SR 3.5.2.3 regarding verification of the piping fullness. In addition, the definition of Operability establishes the minimum expectations for system functional capability which includes the expected degree of fullness of the piping systems. Other LBDs and references supporting these sections were also reviewed. The TS SR requirements are included in the FSAR system description in Section 6.3.2.2, "Equipment and Component Descriptions."

C) Containment Spray System (CSS)

FSAR Section 6.2.2.1 and 6.5.2 provides the governing discussion of the CSS. The primary function of the CSS is to reduce the containment temperature and pressure following a LOCA or main steam line break (MSLB) accident, by removing thermal energy from the containment atmosphere. This also serves to limit offsite radiation levels by reducing the pressure differential between the containment atmosphere and the external environment, thereby diminishing the driving force for the leakage of fission products from the containment to the environment.

The LBDs for the Containment Spray (EN) system were reviewed as directed by the GL. The documents included the Operating License, TS, TS Bases, the FSAR, and pertinent correspondence and SERs subsequent to ITS conversion. An evaluation of correspondence limited to licensing activities potentially applicable to the Containment Spray system was also conducted.

Pertinent FSAR sections reviewed include 6.1, 6.2.2.1, and Appendix 3A. Pertinent TS include LCO 3.6.6, "Containment Spray and Cooling Systems," and associated Bases. Unlike TS LCO 3.5.2, "ECCS - Operating," LCO 3.6.6 does not contain a Surveillance Requirement (SR) regarding verification of the piping fullness. This is consistent with NUREG 1431, "Standard Technical Specifications – Westinghouse Plants." Despite the absence of the SR, the definition of Operability establishes the minimum expectations for system functional capability which includes the expected degree of fullness of the piping systems. Other LBDs and references supporting these sections were also reviewed.

1. Summarize the results of the review of these documents:

The above documents and regulatory commitments were evaluated for compliance with applicable regulatory requirements. The following changes were determined to be needed to address weaknesses or deficiencies in meeting regulatory requirements or commitments:

<u>A) Emergency Core Cooling System</u>

Required changes: The TS Bases for SR 3.5.2.3 require revision. The current language is subject to interpretation/misinterpretation. The SR Bases will be revised to make clear the applicability to both the suction and discharge sides of the pumps as well as define that the SR's requirement to be "full of water" means sufficiently full to ensure operability of the system, given the considerations outlined in the GL. Similarly, the FSAR description in section 6.3.2.2 will be revised to reflect the same description as the TS Bases.

Enhancements: The description of system reliability included in FSAR section 6.3.2.5 will be revised to include a description of the methods used to verify that the piping is sufficiently full of water to ensure the functional capability of the system.

With respect to the required changes for the Technical Specifications and TS Bases, AmerenUE will monitor the NRC/ NEI Technical Specification Task Force (TSTF) initiatives toward defining the expected content of the Technical Specifications, TS Surveillance Requirements and associated Bases.

B) Decay Heat Removal System

Required changes: The TS Bases for SR 3.5.2.3 requires revision. The current language is subject to interpretation/misinterpretation. The SR Bases will be revised to make clear the applicability to both the suction and discharge sides of the pumps as well as define that the SR's requirement to be "full of water" means sufficiently full to ensure operability of the system given the considerations outlined in the GL. Similarly, the FSAR description in section 6.3.2.2 will be revised to include the same description as the Tech Spec Bases.

Enhancements: The description of system reliability included in FSAR section 6.3.2.5 will be revised to include a description of the methods used to verify that the piping is sufficiently full of water to ensure the functional capability of the system.

With respect to the required changes for the Technical Specifications and TS Bases, AmerenUE will monitor the NRC/ NEI Technical Specification Task Force (TSTF) initiatives toward defining the expected content of the Technical Specifications, TS Surveillance Requirements and associated Bases.

C) Containment Spray System

Required changes: None

Enhancements: The description of operational testing included in section 6.2.2.1.4 will be revised to include a description of the methods used to verify that the piping is sufficiently full of water to ensure the functional capability of the system.

With respect to the Technical Specifications and TS Bases, AmerenUE will monitor the NRC/ NEI Technical Specification Task Force (TSTF) initiatives toward defining the expected content of the Technical Specifications, TS Surveillance Requirements and associated Bases.

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

As described above, the TS Bases for SR 3.5.2.3 and corresponding text in FSAR section 6.3.2.2 will be revised to remove ambiguous wording and clearly define that the systems must be sufficiently full of water in order to perform their intended safety function. This action will make clear that the presence of negligible volumes of gas are acceptable within the ECCS systems (assuming that negligible quantities have been properly evaluated for their effect on system functional capability).

Until the TS Bases are revised and as-found acceptance criteria for system operability can be applied with respect to gas voiding, all voids will be documented in the corrective action program upon identification. Voids will continue to be promptly vented when possible, promptly evaluated for their effect on operability, and addressed commensurate with their safety significance.

No changes are deemed necessary for the TS and associated Bases for the Containment Spray system.. The basic concept conveyed by the TS definition of OPERABILITY establishes the expectations for limits on gas voiding of the Containment Spray system.

Besides the above prescribed changes (corrective actions), the proposed FSAR enhancements increase the level of detail in the document to help future plant personnel understand the practices employed to monitor for gas accumulation in the ECCS and CS systems. Although this information is inherent in the plant procedures, its placement in the FSAR provides a more holistic presentation of the activities used to ensure the functional capability of the systems. The procedures are already subject to 10 CFR 50, Appendix B requirements, thus making this an enhancement.

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

All of the above proposed changes are on hold pending NRC resolution of allowable mechanisms for making the changes. This allows the changes to be made in accordance with an approved process, made only one time, and helps ensure that the FSAR, TS and TS Bases all contain consistent requirements. These changes were placed on hold following receipt of a communication from the Nuclear Energy Institute (NEI) on August 28, 2008 indicating that the NRC Office of General Council (OGC) had determined that 10 CFR 50.59 could not be used to make the needed TS Bases changes.

TS improvements are being addressed by the Technical Specifications Task Force (TSTF) to provide an approved TSTF Traveler for making changes to individual licensee's TS related to the potential for unacceptable gas accumulation. The development of the TSTF Traveler relies on the results of the evaluations of a large number of licensees to address the various plant designs. AmerenUE is continuing to support the industry and NEI Gas Accumulation Management Team activities regarding the resolution of generic TS changes via the TSTF Traveler process. After NRC approval of the Traveler, AmerenUE will evaluate its applicability to the Callaway Plant Unit 1, and evaluate adopting the Traveler to either supplement or replace the current TS requirements.

Design Evaluation

The Callaway Plant Unit 1 design basis was reviewed with respect to gas accumulation in the Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems. This review included Design Basis Documents, Calculations, Engineering Evaluations, Vendor Technical Manuals, and Pressurized Water Reactor Owner's Group (PWROG) program reports.

1. **Discuss the results of the review of the design basis documents. This discussion should include a description of any plant specific calculations or analyses that were performed to confirm the acceptability of gas accumulation in the piping of the affected systems, including any acceptance criteria if applicable. Note: This should describe the "as found" (pre Generic Letter) condition prior to any corrective or enhancement actions.**

The Callaway Plant Unit 1 design bases do not explicitly address the possibility of gas accumulation in the ECCS, RHR, and CS systems. The system descriptions reflect the implicit design assumption that the systems are sufficiently full of water because no evaluations were performed to quantify the effects of gas accumulation on system performance. All calculations are based on pump performance data and flow delivery from the system that assume the piping to be completely filled. For example, the time delays estimated for delivery of flow for the various ECCS functions are based on pump start times and valve opening times. However, the FSAR safety analyses of record assume that the ECCS pump curves are degraded 7% when determining accident consequences. This 7% can be the result of impeller wear, motor degradation, underfrequency, etc. In addition to the 7% allowance, assumed delays due to pump start and valve actuation are conservative, which also provide margin for the effects of gas accumulation.

In the event that voiding is identified in one of the systems, the void(s) would be vented to remove its presence, if possible, and the presence of the void would be documented in the corrective action program. Any remaining void volume would be promptly evaluated for its impact on operability and the issue resolved commensurate with safety. In effect, until the TS Bases are revised as previously described, the presence of a discovered void will be considered a degraded/nonconforming condition based on the conservatively imposed assumption that the design basis assumes no voiding. Conservatively established acceptance criteria may be considered, however, for the purpose of evaluating operability.

For the centrifugal charging flow path portion of the Chemical and Volume Control (BG) system, acceptance criteria are provided from site calculations ZZ-537 and EJ-39 and Request for Resolution (RFR) 200803669. For the Safety Injection (EM) system, acceptance criteria are defined in RFR 200803669 and calculations ZZ-537 and R-4152-00-1 and its Addenda. For the RHR (EJ) system, acceptance criteria are defined in calculation R-4152-00-1 and its Addenda. The calculations utilized computer modeling of the systems to calculate the impulse pressures associated with gas voids in the system.

The plant does not currently have any specific design basis voiding acceptance criteria for pump suction piping affecting the RHR (EJ) and the CS (EN) system. The guidance in NUREG / CR-2792, "An Assessment of Residual Heat Removal and Containment Spray Pump Performance Under Air and Debris Ingesting Conditions," would be consulted if air was identified on the suction side of the CS pumps. As discussed below, Callaway will adopt the interim acceptance criteria developed by the PWROG for pump suction voiding.

2. Discuss new applicable gas volume acceptance criteria for each piping segment in each system where gas can accumulate where no acceptance criteria previously existed, and summarize the Corrective Actions and schedule for completion of any Corrective Actions.

A) <u>Pump Suction Piping</u>

The interim allowable gas accumulation in the pump suction piping is based on limiting the gas entrainment to the pump after a pump start. A PWROG program established interim pump gas ingestion limits to be employed by the member utilities. The interim criteria address pump mechanical integrity only and are as follows:

	Single-Stage	***Multi-Stage*** Stiff Shaft	***Multi-Stage*** Flexible Shaft
Steady-State	2%	2%	2%
Transient*	5% for 20 sec.	20% for 20 sec.	10% for 5 sec.
$Q_{B.E.P.}$ Range	70%-120%	70%-140%	70%-120%
Pump Type (transient data)	WDF	CA	RLIJ, JHF
* The transient criteria are based on pump test data and vendor supplied information.			

Callaway Plant Unit 1 procedures provide assurance that the volume of gas in the pump suction piping for the ECCS, RHR, and CS systems is limited such that pump gas ingestion is within the above PWROG program established interim criteria.

B) Pump discharge piping susceptible to pressure pulsation after a pump start.

ECCS and RHR Systems:

A joint Owner's Group program evaluated pump discharge piping gas accumulation. Gas accumulation in the piping downstream of the pump to the first closed isolation valve or the RCS pressure boundary isolation valves will result in amplified pressure pulsations after a pump start. The subsequent pressure pulsation may cause relief valves in the subject systems to lift, or result in unacceptable pipe loads, i.e., axial forces that are greater than the design rating of the axial restraint(s). The joint Owner's Group program establishes a method to determine the limit for discharge line gas accumulation to be utilized by the member utilities.

The method uses plant specific information for piping restraints and relief valve set points in the subject systems to determine the acceptable gas volume accumulation such that relief valve lifting in the subject systems does not occur and pipe loading is within acceptable limits.

AmerenUE has evaluated this methodology and may use it, if necessary, to establish the applicable limits for gas accumulation in the discharge piping of the ECCS, RHR and CS systems. Callaway Plant Unit 1 procedures provide assurance that any gas in the discharge piping of these systems is limited to within the acceptance criteria determined by the plant-specific application of the joint Owner's Group program method.

Containment Spray System:

FSAR section 6.2.2.1.2.2, "Component Description," states that the containment spray header and nozzles are designed to withstand the impulse of a water hammer at the commencement of flow. Thus, this postulated condition has been previously evaluated.

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

Emergency Core Cooling and Residual Heat Removal systems

A PWROG methodology has been developed to assess when a significant gas-water pressure pulsation could occur during switchover to hot leg injection. The methodology concludes that if the upstream valve has an opening time of approximately 10 seconds and the downstream path to the Reactor Coolant System (RCS) is only restricted by check valve(s), no significant pressure pulsation would occur, i.e., none of the relief valves in the subject systems would lift, or none of the piping restraints would be damaged.

The Callaway Plant Unit 1 RHR flow path for switchover to hot leg injection has an upstream isolation valve that has an opening time of approximately 10 seconds. The downstream path to the RCS is only restricted by check valves. Therefore, consistent with the PWROG program methodology, no significant pressure pulsation will occur i.e., none of the relief valves in the subject systems would lift and none of the piping restraints would be damaged.

The Callaway Plant Unit 1 Safety Injection flow path for switchover to hot leg injection has an upstream isolation valve that has an opening time of approximately 7 to 8 seconds. The downstream path to the RCS is only restricted by check valves. Although this is not strictly consistent with the PWROG program assumptions, engineering judgment based on the methodology approach and assumptions used in the PWROG methodology concludes that no significant pressure pulsation is expected to occur, i.e., none of the relief valves in the subject systems would lift and none of the piping restraints would be damaged as a result of placing this flow path in service.

Containment Spray

FSAR section 6.2.2.1.2.2, "Component Description," indicates that the containment spray header and nozzles are designed to withstand the impulse of a water hammer event at the commencement of flow. Given system operational characteristics following actuation, no other pressure transient mechanisms are credible.

D) RCS Allowable Gas Ingestion

The PWROG qualitatively evaluated the impact of non-condensable gases entering the reactor coolant system (RCS) on the ability of the post-accident core cooling functions of the ECCS. This evaluation assumed that 5 cubic feet of non-condensable gas at 400 psig was present in the centrifugal charging and safety injection discharge piping concurrent with 5 cubic feet of non-condensable gas at 100 psig in the RHR discharge piping. The qualitative evaluation concluded that these quantities of gas will not prevent the ECCS from performing its core cooling function.

The PWROG assessment justified that gas voids passing through the core do not pose an additional safety concern mainly because of the unlikely path for air to get into the core and high void conditions already present in the core during a loss of coolant accident (LOCA).

The PWROG assessments of the loss of feedwater (LOFW) and anticipated transient without SCRAM (ATWS) events 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 (SBO) 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 the 10 CFR 50, Appendix R fire safe shutdown analysis.

Callaway Plant Unit 1 procedures provide assurance that the gas accumulation in any sections of the RHR system cold leg and hot leg piping is verified to be less than 5 cubic feet of non-condensable gas at 100 psig at any location. Callaway Plant Unit 1 procedures also provide assurance that the gas accumulation in any sections of the centrifugal charging cold leg injection and safety injection system cold leg and hot leg piping is verified to be less than 5 cubic feet of non-condensable gas at 400 psig at any location. These procedures ensure the validity of the PWROG assessments for Callaway Plant Unit 1.

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

No changes were identified as being needed to the design basis documents. AmerenUE will follow industry initiatives regarding void migration and the effects of void ingestion on pumps. Depending on the results of those initiatives, AmerenUE may make future changes to its design basis documentation.

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

The drawing evaluation results are presented by system.

BG – Centrifugal Charging portion of the Chemical and Volume Control System

The detailed drawing review focused on applicable portions of Process and Instrumentation Diagram (P&ID) M-22BG03, and Isometric Drawing M-23BG02. The specific pipe lines applicable to ECCS are (1) Common CCP A/B Suction Header, (2) CCP "A" Individual Suction Header, (3) CCP "B" Individual Suction Header, and (4) the 4" section of the common suction header. [Ref. 6, Action 2.2.1.3]

The review of the plant drawings did not show a location where a system high point did not have a vent located at it.

EJ – Residual Heat Removal System

A review of plant P&ID and isometric drawings was completed for the RHR (EJ) system. Drawings M-22EJ01, M-23EJ01, M-23EJ02, M-23EJ03, and M-23EJ04 were reviewed to determine system high point and system vents. [Ref. 6, Action 2.2.2.3]

The review of the plant isometrics did not show a location where a system high point did not have a vent located at it.

EM – Safety Injection System

A review of plant P&ID and isometric drawings was completed for the Safety Injection System (EM) system. Drawings M-22EM01, M-22EM02, M-23EM01, M-23EM02, M-23EM03, M-23EM04, and M-23EM05 were reviewed to determine system high point and system vents. [Ref. 6, Action 2.2.3.3]

The review of the plant isometrics did not show a location where a system high point did not have a vent located at it.

EN – Containment Spray System

A review of plant P&ID and isometric drawings was completed for the CS (EN) system. Drawings M-22EN01, M-23EN01, and M-23EN02 were reviewed to determine system high point and system vents. [Ref. 6, Action 2.2.4.3]

As a result of the review of the attached drawings of the CSS, additional vent valves were identified as being needed between ENV0002 and ENHV0001 on the "A" train and between ENV0008 and ENHV0007 on the "B" train.

EP – Accumulators

The Accumulator Safety Injection (EP) System drawings reviewed include P&ID M-22EP01 and Isometric Drawings M-23EP01 and M-23EP02. [Ref. 6, Action 2.2.5.3]

No new vents were identified as being needed as a result of this review.

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

As a result of the review of the drawings of the CSS, additional venting capability was identified as being needed between ENV0002 and ENHV0001 on the "A" train and between ENV0008 and ENHV0007 on the "B" train. The drawing review prompted a walkdown and ultrasonic (UT) evaluation of the piping. Ultrasonic data was taken on the piping between valves ENV0002 and ENHV0001 and valves ENV0008 and ENHV0007. Voiding was identified between ENV0002 and ENHV0001 ("A" train). The "B" train was found to be water solid. This finding was documented in the Corrective Action Program. The corrective action document was reviewed by Operations, and the Operability Determination supported that the system was Operable. Request for Resolution (RFR) 200805681 was generated to develop Modification Package 08-0016 FCN 01 to implement the plant design change. The design change installs a bypass line to allow the pipe segments described above to be properly filled and vented. Jobs 08004424 and 08004426 have been initiated to perform the field work of installing the bypass lines and vent valves on these two sections of pipe. These jobs have been marked as Corrective Action and are currently scheduled to be worked during RF16 which began on October 11, 2008. This constitutes the first available opportunity to add these vent valves. [Ref. 6, Action 2.2.4.3]

6. Discuss the results (including the scope and acceptance criteria used) of the system confirmation walkdowns that have been completed to ensure that they are sufficiently full of water.

The walkdown evaluation results are presented by system. The acceptance criteria for the walkdowns include: 1) verification that vents are in the proper location along horizontal (nominal) runs of pipe, 2) verification that vents are in the proper location along circumference of the pipe, 3) verification that piping is sloped in the proper direction, and 4) verification that horizontal (nominal) runs of pipe do not contain local highpoints.

BG – Centrifugal Charging portion of the Chemical and Volume Control System

The portion of the Chemical and Volume Control system (CVCS) within the scope of the Callaway ECCS consists of the Centrifugal Charging Pumps (CCPs), the common and individual suction piping headers to the CCPs, and the CCP discharge piping which includes connections to the Boron Injection Header (BIH) and the Reactor Coolant System (RCS) cold legs (CLs). All portions of these lines are outside containment, uninsulated, and radiologically and physically accessible.

The detailed walkdown consisted of a visual inspection performed by the System Engineer and a laser transit survey to verify line slope and identify high and low sections of the piping. The visual inspection performed by the System Engineer verified that the CVCS portion of the ECCS is configured as shown on P&ID M-22BG03 and Isometric Drawing M-23BG02, and that the vents are located in the proper location. The laser transit survey identified multiple high and low points in the system piping. The high points were either ultrasonically examined or located in a "self-venting" location due to the piping configuration. With the exception of one location, all identified high points did not contain any voids.

The one location identified above is not able to be vented since it is sloped upward away from the vertical line leading to vent BGV0371. This line was examined ultrasonically and a small void (0.0045 cu. ft.) was found. Engineering ultrasonically examined this location (per Job 08003873) on 5/27/08 and found the presence of a small void. This location was re-examined on 6/16/08, 6/19/08 and 6/23/08, and no voids were identified. The small void was swept into the 8" header and vented through the Residual Heat Removal (RHR) "piggy-back" line during the performance of OSP-SA-00003 venting surveillance. In the corrective action document that documents the cause evaluation and operability determination for this void, it was determined that the venting surveillance removed the void and that no additional corrective actions are required.

EJ – Residual Heat Removal System

The scope of the RHR (EJ) system piping walkdown was from the refueling water storage tank (RWST) through the RHR pumps to the check valves in the safety injection accumulator cold leg lines, from the containment sump to the RWST supply tee, from the discharge of the RHR heat exchanger to the BG (centrifugal charging pumps) and EM (safety injection pumps) systems, and from the RHR injection headers through the hot leg injection check valves.

A walkdown of Auxiliary Building piping was completed to verify that the vents noted on the plant drawings were installed in the plant at an acceptable location on the pipe. There were no discrepancies noted between the field walkdown and the plant isometrics. The CVCS letdown line off of the discharge of the RHR heat exchangers was not a part of this evaluation. This piping is not used as a flow path during accident conditions. There were no locations identified in the EJ system where valves were closed in a vertical pipe run creating a potential adverse gas accumulation high point. There were no inaccessible areas of the EJ system due to buried piping or embedded piping.

The EJ portion of the suction piping from the RWST to the RHR pump does not have vents on the piping. The RHR pumps do have casing vents which provide a means to vent the pump. These casing vents along with the vents located in the RWST piping, the RWST tank itself, and the guidance given in procedure OTN-EJ-00002 and its addenda, provide an adequate means to fill and vent the EJ suction piping.

There were no new locations identified as needing vent valves, as a result of walkdowns completed to date.

The RHR system piping located in the Auxiliary Building will be surveyed/laser scanned by the completion of refuel outage RF16 which began on October 11, 2008. The RHR system piping located inside containment will be walked-down and surveyed/laser scanned during RF16. Job 08005266 will track and capture the results of the level check of the RHR system piping. After review of the survey/laser scan data, plant personnel will evaluate additional actions needed to address any localized high spots. Nonconforming conditions will be entered into the corrective action program and such conditions will be evaluated for their effect on operability. As provided in Reference 5, the results of the walkdowns for this system will be provided within 90 days of the completion of the refuel outage.

EM – Safety Injection System

The scope of the Safety injection (EM) system piping walkdown was from the refueling water storage tank (RWST) through the SI pumps to the throttle valves in the SI accumulator cold leg lines, the "piggyback" lines from the centrifugal charging pumps (BG system)' the pump discharge crossover line to the SI throttle valves to the RCS hot leg lines, and the SI pump suction crossover line. The SI pump recirculation lines were not a part of this scope as the piping is flushed to the RWST during quarterly pump surveillances.

The walkdown of the piping located in the Auxiliary Building was completed to verify the vents noted on the plant drawings were installed in the plant at an acceptable location on the pipe. There were no discrepancies noted between the field walkdown and the plant isometrics. All of the vents were located on the top of the pipe or top of the pump casing. There were no locations identified where valves were closed in a vertical pipe run creating a potential gas accumulation high point. The EM system does not have a heat exchanger. The safety injection pumps (PEM01A/B) have multiple casing vents which are opened on a monthly basis during the monthly ECCS venting surveillance. There were no inaccessible areas of the EM system due to buried piping or embedded piping.

Plant engineering personnel performed multiple level checks on the piping within the scope of this evaluation. After review of the data, multiple localized high spots were identified and checked for gas voiding via ultrasonic test (UT) equipment and evaluated for acceptability. This data is attached to Reference 6.

The walkdown did not identify the need for any additional vent valve locations. A void was identified in the piggyback piping line segment EM-023-HCB. Initially the void was larger than allowed by current acceptance criteria discussed under RFR 200803669. Vent valve EMV0179 was used to vent the gas to acceptable levels. A corrective action document addresses the causes and corrective actions for the void identified in line EM-023. The evaluation indicated that the void was not the result of a design or configuration management issue.

Job 08005239 will complete a level check of the remainder of the EM system piping in the Auxiliary Building and piping in the Containment Building which is a part of the scope of this evaluation. This piping could not be accessed due to operability, safety and radiological considerations prior to the refuel outage which began on October 11, 2008. As provided in Reference 5, the results of the walkdowns for this system will be provided within 90 days of the completion of the refuel outage.

EN – Containment Spray System

The scope of the Containment Spray (EN) system piping walkdown was from the refueling water storage tank (RWST) to the containment isolation valve on the discharge side of the containment spray pump. Walkdowns of the piping from the containment sump to the RWST supply tee will be conducted during refuel outage RF16 which began on October 11, 2008. As provided in Reference 5, the results of the walkdowns for this system will be provided within 90 days of the completion of the refuel outage. The results of the walkdowns conducted during the refuel outage will be tracked for completion and documented in Action 5.4 of Reference 6.

There were no discrepancies identified between the as-built field conditions and plant drawings. There were no additional high points identified that have not already been addressed by past corrective action. There are no closed valves in vertical pipe runs that are in the accident flow path of the CSS. The CSS does not have a heat exchanger. Pump casing vents were added to allow for proper venting of the pump in response to a previous voiding issue documented in the corrective action program. There have been no voiding issues involving the CS pumps subsequent to the installation of the pump casing vents.

As mentioned previously, drawing reviews indicated the need for additional venting capability between ENV0002 and ENHV0001 on the "A" train and between ENV0008 and ENHV0007 on the "B" train. As discussed in the response to item 5 above, the need for additional vent capability was substantiated. Refer to item 5 above for details.

EP – Accumulators

The scope of the Accumulator Safety Injection (EP) System portion of the Callaway ECCS to be walked down consists of the discharge piping from each Safety Injection Accumulator (SI ACC) to the corresponding connections to each RCS Cold Leg. All portions of these lines are inside containment, uninsulated up to the upstream RCS check valves (EM8956A-D), and will not be radiologically and physically accessible until after the start of the refueling outage (RF-16) which began on October 11, 2008. As provided in Reference 5, the results of the walkdowns for this system will be provided within 90 days of the completion of the refuel outage. The results of the walkdowns conducted during the refuel outage will be tracked for completion and documented in Action 5.5 of Reference 6.

7. **Identify new vent valve locations, modifications to existing vent valves, or utilization of existing vent valves, that resulted from the confirmatory walkdowns, and summarize the Corrective Actions, and the schedule for completion of the Corrective Actions.**

As a result of the review of the drawings of the CSS, additional venting capability was identified as being needed between ENV0002 and ENHV0001 on the "A" train and between ENV0008 and ENHV0007 on the "B" train. System walkdowns were performed which confirmed the configuration. Ultrasonic data was taken on the piping between valves ENV0002 and ENHV0001 and valves ENV0008 and ENHV0007. Voiding was identified between ENV0002 and ENHV0001 ("A" train). The "B" train was shown to be solid. This finding was entered into the Corrective Action Program. The corrective action document was reviewed by Operations, and the Operability Determination supported that the system was Operable. An Engineering Request for Resolution (RFR) 200805681 has been generated to develop Modification Package 08-0016 and its associated Field Change Notices (FCNs) to implement the needed changes in the plant. Jobs 08004424 and 08004426 have been initiated to perform the field work of installing a bypass line to facilitate filling and adding vent valves on these two sections of pipe. These jobs have been marked as Corrective Action and are currently scheduled to be worked during RF16 which began on October 11, 2008. This constitutes the first available opportunity to add these vent valves. [Ref. 6, Action 2.2.4.3]

For the remaining portions of the ECCS, RHR and CS systems that are currently not accessible due to operability, safety, or radiological conditions, these areas will be walked down during RF 16 which began on October 11, 2008. As provided in Reference 5, the results of the walkdowns for this system will be provided within 90 days of the completion of the refuel outage.

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

The operation and procedure review results are documented in the "Testing Evaluation" section of this response. Hardware modifications identified as being needed are addressed in item 7 above. In summary, the plant design is appropriate to support system fill and vent activities, and the plant configuration was verified to match the design documentation. These items support that Callaway Plant Unit 1 has effectively implemented its 10 CFR 50 Appendix B programs.

9. Identify procedure revisions or new procedures resulting from the fill and vent activities and procedure reviews that need to be developed, and summarize the Corrective Actions, and schedule for completion of the Corrective Actions. (Note that routine periodic surveillance testing is addressed in the "Testing Evaluation" section of this template.)

The operation and procedure review results are documented in Item 2 of the "Testing Evaluation" section of this response.

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

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

Another high-pressure source is leakage past the first check valves from any of the RCS cold leg and hot leg injection lines. This source, like the accumulators, can result in gas-entrained water leaking past check valves and depressurizing, thereby allowing hydrogen or other entrained gases to come out of solution. Pressure indication and temperature monitoring of this piping provides indication of the leakage. The periodic RCS leak rate evaluation (RCS inventory balance) allows timely indication of increasing trends in leakage. That trend identification would be reported in the corrective action program which allows for a determination of operability, evaluation of cause, and issue resolution.

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

Due to the adverse impact of gases coming out of solution from migration of higher-pressure fluids to lower pressures, the safety injection test header is typically maintained in the isolated position. This action prohibits a potentially continuous and unmonitored build up of gases in the discharge piping. With the test header isolated, any leakage past the check valves will cause the pressure to increase and will be identified via the safety injection discharge header pressure indicators.

Leakage from the RCS can be detected by observing an increase in safety injection accumulator level, an increase in safety injection pump discharge header pressure and/or an increase in residual heat removal suction header pressure.

The containment emergency recirculation sump screens were replaced with new strainer assemblies in Refueling Outage 15 to increase the surface area. The piping from the sumps to the RHR and containment spray system pumps is sloped downward towards the pumps. Thus if any gas were to come out of solution, it would migrate back out to the sump itself. The modified sump strainers installed in Refueling Outage 15 have been analyzed to show that a vortex will not form in the sump to entrain air through the strainers. This is true even with maximum debris loading on the strainers, which can increase local velocity. Flow through the sump strainers is laminar flow so velocity is too low to create a vortex. Without a vortex, air entrainment through the sump strainers is not possible.

Steam voids may form in the fluid from the sump as it passes through the strainers if it is at saturation pressure (i.e., the water in the sump is in equilibrium with the water vapor in the containment atmosphere). However, the calculation for the strainers shows that these steam voids will collapse before they exit the sump through the discharge pipe. By the time the fluid from the sump reaches the pump inlets, it will be sub-cooled because of the static head from the sump to the pump. The NPSH calculations for flow from the sumps take no credit for the containment pressure. Therefore, the available NPSH is calculated relative to the water saturation pressure.

Failure of level instruments to indicate the correct level for tanks and sumps used as a pump suction source has resulted in gas intrusion based on industry operating experience. The tanks used for the ECCS systems as well as the Containment Spray System are the Refueling Water Storage Tank (RWST), Volume Control Tank (VCT), and the Containment Recirculation Sump(s).

The RWST is the primary source of water for all the pumps during the injection phase of an accident. The RWST is a safety-related storage tank containing borated water. The RWST has four separate safety-related level transmitters each with an independent reference leg. This configuration uses a 2/4 style logic to prevent inadvertent actuations. The RWST setpoint levels conservatively account for maximum instrument uncertainty. Thus, a common failure mode of the RWST instrumentation such as air ingestion, vortexing, or cavitation of the ECCS, RHR, and CS pumps, is not credible.

The Volume Control Tank (VCT) is the normal suction source for the Normal and Centrifugal Charging Pumps during non-accident conditions. Upon receipt of a Safety Injection Signal (SIS) or a Low-Low level in the VCT, the suction valves off of the RWST open and the VCT outlet valves are closed. The VCT has three level instruments provided for the tank. Two of these instruments are safety-related and fed off separate safety-related power supplies; while the third instrument is non-safety. One of the safety-related instruments shares a common reference leg with the non-safety instrument. The other safety-related instrument has an independent reference leg. The combination of design redundancy and conservative setpoint selection prevents gas intrusion from the VCT into the suction of the centrifugal charging pumps.

Each containment emergency recirculation sump has a single level instrument powered from a separate safety-related power supply. Design calculations verify that sufficient water can be transferred from the RWST to the containment during accident scenarios prior to the automatic transfer of the RHR pump suctions from the RWST to the sumps, thus to ensure that the sumps are full and that there is sufficient NPSH available for the pumps. Due to the sumps being physically adjacent to each other, even though they have a single instrument, the other sump's indication will be representative of both sumps. For the sumps, there is no instrument failure mode that could have an adverse effect on the ECCS and CSS function.

Industry Operating Experience (OE) from the Wolf Creek Generating Station identified a concern for potential voiding in the RHR system during plant heat up following the transition from the shutdown cooling lineup to the RHR injection lineup. An assessment of this OE was documented in the corrective action program, and it was determined that this concern was previously addressed at Callaway. The corrective actions included a revision to procedure OTG-ZZ-00006, "Plant Cooldown Hot Standby to Cold Shutdown." The most recent review also determined the need to add a caution note to procedure OTG-ZZ-00001, "Plant Heatup Cold Shutdown to Hot Standby," to further ensure that the RHR trains are taken out of service before the reactor coolant system reaches a temperature greater than 240°F. This represents an example of the application of Callaway's Operating Experience evaluation program.

Lastly, Callaway Plant does not utilize air operated valves in the ECCS, RHR, and CS systems that have a design such that air could be directly introduced into the process fluid. The only method for air inleakage through system valves would be through the packing or through the packing leak off lines. Given the pressurized nature of the systems during both standby and operation, these methods of gas inleakage are not credible.

11. Ongoing Industry Programs

Ongoing industry programs are planned in the following areas which may impact the conclusions reached during the Design Evaluation of Callaway Plant Unit 1 relative to gas accumulation. The activities will be monitored to determine if additional changes to the design may be required or desired to provide additional margin.

- Gas Transport in Pump Suction Piping

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

- Pump Acceptance Criteria

  Long-term industry tasks coordinated by the PWROG were identified that will provide additional tools to address GL 2008-01 with respect to pump gas void ingestion tolerance limits.

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

As a result of the review of the drawings of the CSS, additional fill and vent valves were identified as being needed between ENV0002 and ENHV0001 on the "A" train and between ENV0008 and ENHV0007 on the "B" train. This finding was entered into the Corrective Action Program. The corrective action document was reviewed by Operations, and the Operability Determination supported that the system was Operable. Request for Resolution (RFR) 200805681 has been generated to develop Modification Package 08-0016 and its associated Field Change Notices to implement the needed changes in the plant. Jobs 08004424 and 08004426 have been initiated to perform the field work of installing a bypass line to facilitate filling and adding vent valves on these two sections of pipe. These jobs have been marked as Corrective Action and are currently scheduled to be worked during RF16 which began on October 11, 2008. This constitutes the first available opportunity to add these vent valves. [Ref. 6, Action 2.2.4.3]

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

Testing Evaluation

This section of the response discusses the operating practices, surveillances, testing, and maintenance restoration practices that ensure the ECCS, RHR, and CS systems are capable of performing their intended safety function.

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

The results are presented by system:

BG – Centrifugal Charging portion of the Chemical and Volume Control System

The centrifugal charging pumps (CCPs), including the common and individual suction headers, and the individual discharge headers are filled and vented per procedure OTN-BG-00001, "Chemical And Volume Control System." Additional filling and venting guidance is contained in ODP-ZZ-00310, "WPA and Caution Tagging," Attachment 5, "Fill and Vent Guide." Note: WPA is Workman's Protection Assurance and is the basic "tag out" procedure utilized at Callaway for isolating systems and/or components to support safe work practices.

The WPA process requires an evaluation and, if necessary, instructions for fill and vent if select portions of the system were drained. If the fill and vent procedure for the entire system is not able to be followed or is not desired to be used, then the process requires a preparer (RO), reviewer (RO-peer) and approver (SRO) for restoration instructions following draining evolutions. As part of the instructions, dynamic fill and vent and expanded use of UT will be considered when appropriate. Finally, when significant portions of these systems are drained, Systems Engineering concurrence with the restoration plan should be obtained.

EJ – Residual Heat Removal

Portions of the EJ system in the Auxiliary Building are filled and vented using procedure OTN-EJ-00002 and its addenda. This procedure provides instructions to vent multiple portions of the EJ system. OTN-EJ-00002 addenda 1 through 4 contain steps which instruct the user to notify Instrumentation and Control maintenance personnel to vent any instrument lines that may have been affected by the system draining. OTN-EJ-00002 addenda 5 and 6 are used to dynamically vent the RHR system. OTN-EJ-00002 addenda 3 and 4 use a vacuum fill for the RHR heat exchanger.

For filling and venting not covered by OTN-EJ-00002 or if the entire procedure is not desired to be used, ODP-ZZ-00310 provides guidance for developing specific fill and vent instructions. ODP-ZZ-00310 provides instructions for Workman's Protection Assurance (WPA) and Caution tagging. It provides direction for the filling and venting of various systems (EJ being one of them) when the normal fill and vent procedure is not entirely used or is not desired to be used. The combination of OTN-EJ-00002, its addenda, and ODP-ZZ-00310 provide adequate means to fill and vent the EJ system following maintenance activities requiring the draining of the EJ system.

The EJ portion of the suction piping from the RWST to the RHR pump does not have vents on the piping. The RHR pumps do have casing vents which provide a means to vent the pump. These casing vents along with the vents located in the RWST piping, the RWST tank itself, and guidance given in OTN-EJ-00002 and its addenda provide an adequate means to fill and vent the EJ suction piping from the RWST.

Procedure OSP-SA-00003 is used to satisfy TS Surveillance Requirement 3.5.2.3 (SR 3.5.2.3) for periodic verification of piping fullness. This procedure provides specific instructions on opening the vent valves, the timing of any gas vented, and comparing any gas vented to the acceptance criteria stated in the procedure.

EM – Safety Injection

Portions of the EM system in the Auxiliary Building are filled and vented using procedure OTN-EM-00001. This procedure provides instructions to vent multiple portions of the EM system. OTN-EM-00001 contains steps which instruct the user to notify Instrumentation and Control maintenance personnel to vent any instrument lines which may have been affected by the system draining. The EM system does not use dynamic venting or vacuum fill in support of system restoration from draining.

The filling and venting instructions for portions of the EM system not covered in OTN-EM-00001 are developed using ODP-ZZ-00310. This procedure provides instructions for Workman's Protection Assurance (WPA) and Caution tagging. ODP-ZZ-00310 provides direction for the filling and venting of various systems (EM being one of them) when the normal fill and vent procedure is not entirely used or is not desired to be used. The combination of OTN-EM-00001 and ODP-ZZ-00310 provide adequate means to fill and vent the EM system following maintenance activities requiring the draining of the EM system.

The EM portion of the suction piping from the RWST to the safety injection pump (SIP) does not have vents on the piping. The SIPs do have casing vents which provide a means to vent the pump. These casing vents along with the vents located in the RWST piping and the RWST tank itself provide an adequate means to fill and vent the safety injection pumps' suction piping from the RWST.

Procedure OSP-SA-00003 is used to satisfy TS Surveillance Requirement 3.5.2.3 (SR 3.5.2.3) for periodic verification of piping fullness. This procedure provides specific instructions on opening the vent valves, the timing of any gas vented, and comparing any gas vented to the acceptance criteria stated in the procedure.

EN – Containment Spray

Procedure OTN-EN-00001 provides the instructions for the filling and venting of the Containment Spray System (CSS). The procedure provides guidance for a means to statically and dynamically fill and vent the CSS. It provides instructions for the venting of branch lines (i.e. the Eductor line) in the CSS. Procedure OTN-EN-00001 provides adequate guidance for the backfilling of level and/or flow instruments after having drained them.

The filling and venting instructions for portions of the EN system not covered in OTN-EN-00001 are developed using ODP-ZZ-00310. This procedure provides instructions for Workman's Protection Assurance (WPA) and Caution tagging. ODP-ZZ-00310 provides direction for the filling and venting of various systems (EN being one of them) when the normal fill and vent procedure is not entirely used or is not desired to be used. The combination of OTN-EN-00001 and ODP-ZZ-00310 provide adequate means to fill and vent the EN system following maintenance activities requiring the draining of the EN system.

The CSS is not subject to a Technical Specification or other requirement for periodic on-line venting or fullness verification.

EP – Accumulators

The Safety Injection Accumulators and the individual discharge headers are filled and vented per procedure OTN-EP-00001 Addendum 03, "Initial Fill and Vent of SI Accumulators," utilizing the Safety Injection Pumps and the RWST as the water supply.

Additional filling and venting guidance is contained in ODP-ZZ-00310, "WPA and Caution Tagging," Attachment 5, "Fill and Vent Guide." Refer to the discussion above regarding usage of this program to ensure that the systems are sufficiently full to accomplish their intended safety function.

Finally, additional procedural guidance is provided in OTN-EM-00001, "Safety Injection System," section 5.4, "Venting ECCS Systems Via the Safety Injection System Test Line."

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

The results are presented by system:

BG – Centrifugal Charging portion of the Chemical and Volume Control System

The centrifugal charging pumps (CCPs), including the common and individual suction headers, and the individual discharge headers are filled and vented per procedure OTN-BG-00001, "Chemical And Volume Control System." This procedure does not include specific venting criteria (i.e., vent for 1 to 2 minutes after obtaining a solid stream of water) or provisions for venting instrument lines. Recommended revisions to OTN-BG-00001 include:

(1) Establish and provide specific venting criteria for each vent location (i.e., vent for 1 to 2 minutes after obtaining a solid stream of water).
(2) Establish and provide specific venting criteria for instrument lines for each instrument loop in the drained portion of the system.

Additional filling and venting guidance is contained in ODP-ZZ-00310, "WPA and Caution Tagging," Attachment 5, "Fill and Vent Guide." This guide is generic and does not contain specific venting criteria. Recommended revisions to ODP-ZZ-00310 include:

(1) Establish and provide specific venting criteria for each vent location (i.e., vent for 1 to 2 minutes after obtaining a solid stream of water).
(2) Establish and provide specific venting criteria for instrument lines for each instrument loop in the drained portion of the system.
(3) Strengthen the review and approval requirement by Systems Engineering to provide specific instructions for review and concurrence during WPA restoration.

Revisions to these procedures were completed on September 25, 2008. The revisions were tracked by Action 4.1.4 of Reference 6.

EJ – Residual Heat Removal

Portions of the RHR system are filled and vented per procedure OTN-EJ-00002, "Residual Heat Removal System." This procedure does not include specific venting criteria (i.e., vent for 1 to 2 minutes after obtaining a solid stream of water) or provisions for venting instrument lines. Recommended revisions to OTN-EJ-00002 include:

(1) Establish and provide specific venting criteria for each vent location (i.e., vent for 1 to 2 minutes after obtaining a solid stream of water).
(2) Establish and provide specific venting criteria for instrument lines for each instrument loop in the drained portion of the system.

Additional filling and venting guidance is contained in ODP-ZZ-00310, Attachment-5. This guide is generic and does not contain specific venting criteria. Recommended revisions to ODP-ZZ-00310 were discussed above.

Revision of OTN-EJ-00002 is ongoing and will be completed by the point in time when the systems are returned to service during refueling outage RF16 which began on October 11, 2008. The revision to the procedure is tracked by Action 4.1.6 of Reference 6.

EM – Safety Injection

Procedure OTN-EM-00001 is used to fill and vent the safety injection system following draining. This procedure previously lacked termination criteria for the venting activity. This procedure has been revised to include criteria to vent until a solid stream of water is observed for 1 to 2 minutes.

Additional filling and venting instructions are contained in ODP-ZZ-00310 Attachment 5. This guide is generic and does not contain specific venting criteria. Recommended revisions to ODP-ZZ-00310 were discussed above.

EN – Containment Spray

Procedure OTN-EN-00001 is to use to fill and vent the CSS. The CSS currently does not have acceptance criteria for venting. Filling and venting currently is performed on the CSS only following the draining of the system. The scope for the verification that the CSS is adequately filled and vented is accomplished by venting through the valves noted in OTN-EN-00001 and the dynamic venting of portions of the system. Ultrasonic testing is currently not being implemented. No changes are identified as being necessary for this procedure.

Dependent on resolution of the Technical Specification Task Force activities as they pertain to the Containment Spray Technical Specifications, a change to OTN-EN-00001 may be required. Those changes will occur as part of the change management activities associated with the licensing activities determined necessary and prudent. Given that the TSTF and NRC activities are all to occur in the future, no changes are required at this time.

Additional filling and venting guidance is contained in ODP-ZZ-00310 Attachment 5. This guide is generic and does not contain specific venting criteria. Recommended revisions to ODP-ZZ-00310 were discussed above.

<u>EP – Accumulators</u>

The Safety Injection Accumulators (including the individual discharge headers) are filled and vented per procedure OTN-EP-00001, "Accumulator Safety Injection System," Addendum 3, "Initial Fill and Vent of SI Accumulators," utilizing the Safety Injection Pumps and the RWST as the water supply. No changes are identified as being necessary for this procedure..

Additional filling and venting guidance is contained in ODP-ZZ-00310 Attachment 5. This guide is generic and does not contain specific venting criteria. Recommended revisions to ODP-ZZ-00310 were discussed above.

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

The residual heat removal (RHR) system functions to remove heat from the RCS when RCS pressure and temperature are below approximately 400 psig and 350°F, respectively. Heat is transferred from the RHR system to the component cooling water system. The RHR system also is used to transfer refueling water between the refueling cavity and the refueling water storage tank at the beginning and end of the refueling operations. The RHR system is designed to be isolated from the RCS whenever the RCS pressure exceeds the RHR system design pressure.

During normal approaches to cold shutdown, the RHR system is placed in operation approximately 4 hours after reactor shutdown when the temperature and pressure of the RCS are below approximately 350°F and 400 psig, respectively. The RHR system is isolated from the RCS on the suction side by two motor-operated valves in series on each suction line. Each motor-operated valve is interlocked to prevent its opening if RCS pressure is greater than 360 psig. A control room alarm will actuate if an RHR suction isolation valve is not fully closed and RCS pressure is greater than the design pressures for RHR system operation. The RHR system is isolated from the RCS on the discharge side by two check valves in each return line.

The RHR system is designed to be fully operable from the control room for normal operation. Manual operations required of the operator are: opening the suction isolation valves, positioning the flow control valves downstream of the RHR heat exchangers, and starting the residual heat removal pumps. By nature of its redundant two-train design, the RHR system is designed to accept all major component single failures with the only effect being an extension in the required cooldown time. For two low-probability electrical system single failures, i.e., failure in the suction isolation valve interlock circuitry or diesel generator failure in conjunction with loss of offsite power, operator action outside the control room is required to open the suction isolation valves.

During RHR system operation, reactor coolant flows from the RCS to the residual heat removal pumps, through the tube side of the residual heat exchangers, and back to the RCS. The heat is transferred to the component cooling water circulating through the shell side of the residual heat exchangers. The RCS cooldown rate is manually controlled by regulating the reactor coolant flow through the tube side of the RHR heat exchangers. The flow control valve in the bypass line around each RHR heat exchanger automatically maintains a constant return flow to the RCS. Instrumentation is provided to monitor system pressure, temperature, and total flow.

Startup of the RHR system includes a warm-up period during which time reactor coolant flow through the heat exchangers is limited to minimize thermal shock. The rate of heat removal from the reactor coolant is manually controlled by regulating the coolant flow through the residual heat exchangers. By adjusting the control valves downstream of the residual heat exchangers, the mixed mean temperature of the return flows is controlled.

Operation of the system is in accordance with procedure OTN-EJ-00001, "Residual Heat Removal System," and addenda which establish the appropriate limits and precautions for system operation. Operators have indication in the control room to allow diagnosis of abnormal system operation. Abnormal operating procedures exist to allow the operators to respond to the abnormal condition and return the system to its normal mode of operation. During high-risk evolutions, such as drain down of the RCS to the mid point of the hot legs, additional risk management actions and operations oversight is put in place. Indication of RCS level is available. The operators have been trained to recognize the symptoms of cavitation due to vortexing, and they have been trained on the actions to take to respond to those symptoms.

Procedure OTN-EJ-00002 provides the steps to accomplish fill and vent evolutions to ensure the system is capable of performing both its shutdown cooling function as well as its low pressure injection function. The evaluation of OTN-EJ-00002 was previously provided.

4. Summarize the results of the procedure reviews performed to determine that gas intrusion does not occur as a result of inadvertent draining due to valve manipulations specified in the procedures, system realignments, or incorrect maintenance procedures.

The evaluation considerations included the following:

- Leakage from accumulators or other high-pressure sources resulting in gases coming out of solution
- Leakage from the reactor coolant system (RCS) resulting in the formation of steam pockets or hydrogen coming out of solution
- Degassing of dissolved gas due to a pressure reduction such as through control valves, orifices, and emergency sump screens, or because of elevation changes or venting
- Inadvertent draining, system realignments, and incorrect maintenance and testing procedures

- Air in-leakage through system pathways that allow drainback
- Failure of level instruments to indicate the correct level for tanks used as a pump suction source resulting in gas intrusion
- Leakage through isolation valves in the test header system or through check valves resulting in gas transport to other locations in the ECCS
- Leakage through vent valves when the local system pressure is less than the nominal atmospheric vent pressure
- Temperatures at or above saturation temperature due to heat conduction through piping connected to the RCS or due to leakage of RCS fluid through isolation valves

The vast majority of the leakage types outlined above would occur very slowly and be identified during the monthly ECCS venting surveillance. Faster leakage is more easily recognized through log readings, inventory balances, and observation of system parameters as part of the normal system walkdowns and log taking. Upon identifying gas voiding in the system, appropriate troubleshooting and/or corrective actions would be taken to address the gas voiding. Gas identified during the surveillance would be reported via the corrective action program, and therefore, evaluations would be performed to determine its source, as well as to evaluate operability, reportability, and the need for increased venting frequencies. See the corrective action program discussion later in this document for additional details.

In addition to the monthly ECCS venting surveillance, System Engineering personnel trend and monitor the Safety Injection Accumulators level and pressures. Upon identifying an adverse trend in either level and/or pressure, appropriate troubleshooting and/or corrective actions would be taken to eliminate or reduce the leakage.

Measures are in place to guard against gas intrusion because of inadvertent draining, system realignments, incorrect maintenance procedures or other evolutions. System restoration from draining activities during outage or on-line maintenance is performed in accordance with ODP-ZZ-00310, "WPA and Caution Tagging," and the appropriate system operating procedure. Requirements contained in these and other procedures governing maintenance activities and plant status control ensure that all fill & vent activities are controlled through approved procedures. Criteria for involving the system engineer in the fill and vent plan development already exist. Based on the plan developed between Operations and System Engineering, additional locations of the system may require separate fill and vent evolutions or confirmatory UTs to ensure all portions of ECCS, RHR or CS piping are full.

Surveillances that involve stroke testing the Containment Sump Isolation Valves require draining of RHR or CS system suction piping. These tests are conducted during refueling before the systems are filled. The procedure restoration steps direct that ultrasonic testing be performed per the applicable void monitoring surveillance.

The system evaluations are documented in Reference 6. The evaluation results are that adequate provisions are in place to detect and correct gas accumulation prior to it impeding the ability of the ECCS, RHR or CS system's ability to perform its specified safety function. System design features are adequate to preclude a common mode failure due to a single instrument or component failure. [Reference 6, Actions 2.2.1.5, 2.2.2.5, 2.2.3.5, 2.2.4.5, and 2.2.5.5]

5. Describe how gas voids are documented (including the detection method such as venting and measuring or UT and void sizing and post venting checks), dispositioned (including method(s) used such as static or dynamic venting), and trended, if found in any of the subject systems.

Until the time when the TS Bases can be revised as previously described, all gas accumulation identified during periodic testing is to be documented in the corrective action program. Although some of the test procedures have acceptance criteria for void volumes (by which to assess operability), all gas accumulation is to be conservatively considered a nonconforming or degraded condition. The size of a gas void is determined by ultrasonic testing and a combination of calculations based on pipe geometry and/or vented gas volumes. Post-venting ultrasonic testing is not required but may be performed to confirm the absence of gas voids. Voids found during periodic testing are trended by the system engineers to determine the rate of development, possible sources, and need for increased venting or UT frequency. When gas accumulation has occurred unexpectedly, sampling of the gas has been performed to determine its composition and as an aid in identifying its source.

Refer to the corrective action program description below for a more comprehensive description of the reporting expectations, operability evaluation, management review, and resolution process.

In the aggregate, the above-described actions and provisions ensure that the ECCS, RHR, and CS systems are capable of performing their intended safety function.

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

Refer to Item 2 in the "Corrective Actions Evaluation" section that follows.

Corrective Actions Evaluation

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

Corrective Action Program

APA-ZZ-00500, "Corrective Action Program," discusses the process behind finding and fixing problems at Callaway. Site personnel are trained on the importance of capturing adverse conditions in the corrective Action database and just recently were re-baselined with a site-wide Computer Based Training (CBT) module on CAP initiation. In addition, site management reviews the plant status and corrective action database and provides a constant expectation to site personnel to support and provide input to the corrective action program.

An adverse condition is defined (in APA-ZZ-00500) as an encompassing term that includes the following:

- An event, defect, characteristic, state or activity that prohibits or detracts from safe, efficient nuclear plant operation.
- A condition that could credibly impact nuclear safety, radiological safety, personnel safety, or plant reliability
- A condition NOT in compliance with federal, state, or local regulations; Callaway's operating license, license basis documents, design specifications, permits, commitments, procedures, policies or configuration management documentation
- A trend in performance or frequency of occurrence which indicates performance adverse to the expected or established standard
- The identification or a performance gap between Callaway performance, process effectiveness, program effectiveness, or equipment performance and a recognized industry standard, regulatory expectation, or Callaway Management established standard
- The identification of industry operating experience applicable to Callaway
- A condition adverse to quality or conditions identified at management discretion

This definition encompasses systems degraded due to voiding.

Originators are required to contact the Shift Manager/Control Room if the condition that they are documenting impacts the plant (including non-conforming conditions like a gas void). As documentation of his/her separate review of adverse conditions, the shift manager completes an Operations Review worksheet for each adverse condition. This ensures that the control room is aware of any conditions that could impact the plant. Immediate and past operability or functionality reviews are performed or requested by Operations.

As an added barrier to missing degraded conditions, and to review potentially degraded conditions prior to restoring from a plant refueling or other outage, Adverse Conditions that denote potentially degraded conditions are marked with a RIS DEGR NCC keyword. This same keyword is added if the Shift Manager has performed an immediate operability or functionality evaluation, regardless of the results of that evaluation. This creates a conservative list of potentially degraded conditions for additional reviews or future trending.

Operating Experience Program

Industry Operating Experience (OE) including OE items related to gas intrusion is documented in the corrective action program. Operating experience that is determined to be applicable to Callaway is screened as an Adverse Condition and is subject to an Operations Review for Operability, Functionality, and Reportability issues. A table summarizing the applicable OE since 1996 that has been evaluated (with responses taken) is attached to Reference 6. (See "Gas Intrusion OE Table" Attachment to the CAR.)

In addition, APA-ZZ-00500, “Corrective Action Program,” requires an evaluation of the implementation of the Operating Experience program during the root cause analyses performed for adverse conditions identified as Significant Conditions Adverse to Quality.

Training Program

Consistent with INPO Significant Event Report (SER) 2-05, Rev 1, “Gas Intrusion in Safety Systems,” training is provided to plant personnel on gas intrusion / accumulation issues as described below. The training is provided in the context of the required skills and knowledge needed by the work group. For example, Operations training focuses on different areas than Engineering training.

Consistent with the SER’s recommendations, Callaway’s training program provides initial and continuing training on gas intrusion to personnel responsible for the design, performance monitoring, operation, and maintenance of safety systems susceptible to gas intrusion or systems and components that may cause gas intrusion in safety systems. This includes personnel who direct and perform fill and vent evolutions. This training addresses the following:

- reviews of site and industry gas intrusion events, including actual and potential consequences and lessons learned
- causal factors and conditions for gas intrusion—design characteristics, operating practices, equipment performance problems
- plant-specific actions and strategies for identification, prevention, and mitigation of gas intrusion
- association of the void location on a pump suction line or pump discharge line with the physical phenomenon it causes and the part of the design basis adversely affected (e.g., reduction in core and containment cooling, lower $NPSH_A$, air binding, flow reduction, delay in flow, pressure pulse, relief valve opening and re-closing, force loads on hangers and pipe)

Engineering Design Process Controls

Consideration of GL 2008-01 was incorporated into the Engineering Design Guide ZZ-006, Rev 15, in Attachment 1, "Essential Design Inputs," under Item 46. This action helps ensure that individuals developing, reviewing and implementing future design changes are aware of this issue and have considered it during the development of design changes. This item is presented in the design guide as follows:

> 46. *Consider if the design change introduces or increases the potential for gas accumulation as described in the NRC Generic Letter (GL) 2008-01: "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems" and provide the necessary justification. [Ref: 6.2.36]*

Engineering Design Guide ZZ-006, Rev. 15 was approved 8/5/08.

Identified Actions

Actions identified from the above-described reviews and evaluations are summarized and listed in Section B, "Description of Necessary Corrective Actions", and Section C, "Corrective Action Schedule".

Items affecting or potentially affecting the license or design basis and physical configuration of the ECCS, RHR and CSS systems were (are) separately evaluated to determine their impact on Operability. Such evaluation were (are) performed in accordance with procedure APA-ZZ-00500, "Correction Action Program." Separate immediate and prompt operability determinations, if required, were (are) documented in the corresponding corrective action document identifying the adverse condition.

B. DESCRIPTION OF NECESSARY CORRECTIVE ACTIONS

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

Corrective Action	Basis for the corrective action
Tech Spec Bases for Surveillance Requirement (SR) 3.5.2.3 requires revision. The SR Bases will be revised to make clear the applicability to both the suction and discharge sides of the pumps as well as define that the SR's requirement to be "full of water" means sufficiently full to ensure operability of the system given the considerations outlined in the GL.	The current language is subject to interpretation and misinterpretation and does not explicitly provide the expected scope of the surveillance.
The FSAR description for ECCS systems in section 6.3.2.2 will be revised to include the same description as the Tech Spec Bases. This action is contingent on the previous action.	The current language is subject to interpretation and misinterpretation and does not explicitly provide the expected scope of the surveillance. This action also ensures consistency between license basis documents.
Revision of procedure OTN-EM-00001, Safety Injection System, was completed to include explicit criteria for termination of venting e.g. vent until a solid stream of water is observed for 1 to 2 minutes.	Provides explicit criteria for termination of system venting.
Revision of procedure OTN-BG-00001, Chemical And Volume Control System, was completed to include: (1) specific venting criteria for each vent location (i.e., vent for 1-2 minutes after obtaining a solid stream of water). (2) specific venting criteria for instrument lines for each instrument loop in the drained portion of the system.	Provides explicit criteria for termination of system venting.
Revision of procedure OTN-EJ-00002, Residual Heat Removal System, to include: (1) specific venting criteria for each vent location (i.e., vent for 1-2 minutes after obtaining a solid stream of water). (2) specific venting criteria for instrument lines for each instrument loop in the drained portion of the system.	Provides explicit criteria for termination of system venting.
Procedure ODP-ZZ-00310 guidance was generic and did not contain specific venting criteria. Revisions to ODP-ZZ-00310 included: (1) Establish and provide specific venting	Provides explicit criteria for termination of system venting and establishes better criteria for determining systems engineering involvement in formulating the venting plan.

Corrective Action	Basis for the corrective action
criteria for each vent location (i.e., vent for 1-2 minutes after obtaining a solid stream of water). (2) Establish and provide specific venting criteria for instrument lines for each instrument loop in the drained portion of the system. (3) Review and approval requirement by Systems Engineering, "When significant portions of these systems are drained, NESY concurrence of the restoration plan should be obtained if the procedural guidance does not address restoration of the drained portion" is vague and should provide specific instructions to obtain NESM review and concurrence for WPA restoration.	
Consideration of the issues presented in GL 2008-01 was incorporated into the Engineering Design Guide, ZZ-006, Rev 15 in Attachment 1 - Essential Design Inputs under Item 46. The Engineering Design Guide, ZZ-006 Rev. 15 was approved 8/5/08.	Ensures appropriate considerations are taken into account during the modification of plant structures, systems and components.

C. CORRECTIVE ACTION SCHEDULE

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

The following table provides a synopsis of the corrective actions implemented in response to the GL.

Corrective Action	Basis for the corrective action
Revision of procedure OTN-EM-00001, Safety Injection System, was completed to include explicit criteria for termination of venting e.g. vent until a solid stream of water is observed for 1 to 2 minutes.	Provides explicit criteria for termination of system venting.
Consideration of the issues presented in GL 2008-01 was incorporated into the Engineering Design Guide, ZZ-006, Rev 15 in Attachment 1 - Essential Design Inputs under Item 46. The Engineering Design Guide, ZZ-006 Rev. 15 was approved 8/5/08.	Ensures appropriate considerations are taken into account during the modification of plant structures, systems and components.
Revision of ODP-ZZ-00310, WPA and Caution Tagging	Provides explicit termination criteria for venting and involvement of systems engineering in restoration
Revision of OTN-BG-00001, Chemical and Volume Control System.	Establishes and provides specific venting criteria for each vent location (i.e., vent for 1 to 2 minutes after obtaining a solid stream of water) and adds specific venting criteria for instrument lines for each instrument loop in the drained portion of the system.

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

The following table provides a synopsis of the corrective actions to be completed in response to the GL including a description, scheduled completion date, basis for the completion date, and tracking document.

Actions Not Yet Completed	Reason for the Action	Scheduled Completion Date / Basis for the Completion Date	Tracking Document
Install vent valve and bypass line between ENV0002 and ENHV0001	Address section of piping not capable of being vented	Included in Refuel 16 which started on October 11, 2008. This is the first available opportunity.	CAR 200803462 RFR 200805681 Job 08004424 MP 08-0016 FCN 01
Install vent valve and bypass line between ENV0008 and	Address section of piping not capable of being vented	Included in Refuel 16 which started on October 11, 2008. This is the first available	CAR 200803462 RFR 200805681 Job 08004426

Actions Not Yet Completed	Reason for the Action	Scheduled Completion Date / Basis for the Completion Date	Tracking Document
ENHV0007 Revision of OTN-EJ-00002, Residual Heat Removal System.	(1) Establish and provide specific venting criteria for each vent location (i.e., vent for 1 to 2 minutes after obtaining a solid stream of water). (2) Establish and provide specific venting criteria for instrument lines for each instrument loop in the drained portion of the system.	opportunity. Revision is ongoing and will be completed by the point in time when the system is returned to service during refueling outage RF16 which started on October 11, 2008.	MP 08-0016 FCN 01 CAR 200800298, Action 4.1.6
Tech Spec Bases for Surveillance Requirement (SR) 3.5.2.3 requires revision. The SR Bases will be revised to make clear the applicability to both the suction and discharge sides of the pumps as well as define that the SR's requirement to be "full of water" means sufficiently full to ensure operability of the system given the considerations outlined in the GL.	The current language is subject to interpretation and misinterpretation and does not explicitly provide the expected scope of the surveillance.	TS improvements are being addressed by the Technical Specifications Task Force (TSTF) to provide an approved TSTF Traveler for making changes to individual licensee's TS related to the potential for unacceptable gas accumulation. The development of the TSTF Traveler relies on the results of the evaluations of a large number of licensees to address the various plant designs. AmerenUE is continuing to support the industry and NEI Gas Accumulation Management Team activities regarding the resolution of generic TS changes via the TSTF Traveler process. After NRC approval of the Traveler, AmerenUE will evaluate its applicability to the Callaway Plant Unit 1, and evaluate adopting the Traveler to either supplement or replace the current TS requirements.	CAR 200800298, Action 4.1.8
The FSAR description for ECCS systems in section 6.3.2.2 will be revised to include the same description as	The current language is subject to interpretation and misinterpretation and does not explicitly	The FSAR changes will be accomplished in conjunction with the resolution of the wording of TS SR 3.5.2.3 and/or associated Bases. Thus, these changes	CAR 200800298, Action 4.1.9

Actions Not Yet Completed	Reason for the Action	Scheduled Completion Date / Basis for the Completion Date	Tracking Document
the Tech Spec Bases.	provide the expected scope of the surveillance. This action also ensures consistency between license basis documents.	are contingent on the resolution of the TSTF initiative discussed above.	

CONCLUSION

AmerenUE has evaluated the accessible portions of those Callaway Plant systems that perform the functions described in this GL and has concluded that those systems are capable of performing their intended specified safety functions, and are in conformance with our commitments to the applicable General Design Criteria (GDC), as stated in the Callaway Plant Unit 1 FSAR.

As committed to in Reference 5, AmerenUE will complete its evaluation of the inaccessible portions of these systems by startup from the Refuel Outage 16 and will provide a supplement to this response within 90 days thereafter.

The corrective actions identified above are ongoing and - with the exception of those pertaining to license basis document revision - will be complete prior to unit restart from Refuel Outage 16 which began on October 11, 2008. Revision of the license basis documents is on hold pending the outcome of the NRC / NEI Technical Specification Task Force (TSTF) resolution of the changes needed to the Technical Specifications and associated Bases.

References: 1. NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008. (ML072910759)

2. NRC Generic Letter 1988-17, "Loss of Decay Heat Removal," dated October 17, 1988.

3. NRC Generic Letter 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps," dated October 7, 1997.

4. NUREG-0897, "Containment Emergency Sump Performance-Technical Findings Related to USI A-43," dated October 1985.

5. ULNRC-05504, Three-Month Response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," (TAC No. MD7806) dated April 10, 2008. (ML081130717)

6. Callaway Action Request (CAR) 200800298, "Generic Letter 2008-01 Response."

7. NRC Letter from M.C. Thadani to A. C. Heflin dated September 18, 2008 re: Callaway Plant, Unit 1, "Generic Letter 2008-01, 'Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems,' Proposed Alternate Course of Action" (TAC No. MD7806). (ML082180683)

LIST OF COMMITMENTS

The following table identifies those actions committed to by AmerenUE in this document. Any other statements in this document are provided for informational purposes and are not considered commitments. Please direct questions regarding these commitments to Tom Elwood, Supervising Engineer, Regulatory Affairs and Licensing at 573-676-6479.

COMMITMENT	Due Date / Event
1) Submit the Generic Letter 2008-01 requested information to the NRC.	Within 90 days following the end of the Refuel 16 outage.
2) AmerenUE will monitor the industry resolution of the gas accumulation TS issues and submit a license amendment request, as appropriate, within 1 year following NRC approval of the TSTF Traveler or the CLIIP Notice of Availability.	One (1) year following NRC approval of the TSTF or CLIIP Notice of Availability.