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Ref. # 10 CFR 50.54(f)

October 14, 2008

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION, DOCKET NOS. 50-445 AND 50-446, NINE MONTH RESPONSE TO NRC GENERIC LETTER 2008-01, "MANAGING GAS ACCUMULATION IN EMERGENCY CORE COOLING, DECAY HEAT REMOVAL, AND CONTAINMENT SPRAY SYSTEMS" (TAC NOS. MD7813 AND MD7814)

REFERENCE:

1. NRC Generic Letter 2008-01 "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems" dated January 11, 2008 (ML072910759)
2. Luminant Power letter, Logged TXX-08060, from Mike Blevins to the Nuclear Regulatory Commission dated April 10, 2008
3. NRC Letter from Balwant K. Singal to M. R. Blevins dated September 9, 2008

Dear Sir or Madam:

The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2008-01 (Reference 1) to request that each licensee evaluate the licensing basis, design, testing, and corrective action programs for the Emergency Core Cooling System (ECCS), or Residual Heat Removal (RHR) system, and Containment Spray System (CSS), to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

GL 2008-01 requested each licensee to submit a written response in accordance with 10 CFR 50.54(f) within nine months of the date of the GL to provide the information summarized below:

> "(a) A description of the results of evaluations that were performed pursuant to the requested actions;
>
> (b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that were determined to be necessary to assure compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems; and,
>
> (c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule."

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NRR

The attachment to this letter contains the Luminant Generation Company, LLC (Luminant Power) nine-month response to NRC GL 2008-01. This response contains the information requested within 9 months of the date of the GL, with the exception of confirmatory Unit 1 walkdown activities noted below. The contingent alternate course of action described in Luminant Power's three month response (Reference 2) is not required. On September 9, 2008, in Reference 3 the NRC accepted the alternate course of action provided in Reference 2 provided it is consistent with the clarifications and associated requests discussed in the enclosure to Reference 3.

During the final reviews of walkdown results, it was determined that for Unit 1 six local high points need to have a confirmatory Ultrasonic Test (UT) performed. Confirmatory UTs could not be performed at these locations at the time they were identified (i.e., the subject system configuration had changed since the Unit 1 refueling outage began on September 27, 2008). These six confirmatory Unit 1 UTs will be performed following the completion of the Unit 1 2008 fall refueling outage. This schedule was discussed with the NRC (B. K. Singal, et. al.) and determined to be acceptable. Luminant Power will issue a supplemental report within 30 days after MODE 1 is achieved for Unit 1. The supplemental report will confirm completion of the remaining Unit 1 UTs and that the conclusions provided in this letter remain unchanged.

Based on the evaluations supporting the response to this Generic Letter, Luminant Power believes that subject systems are in compliance with the current licensing and design bases and applicable regulatory requirements, and that suitable design, operational, and testing control measures are in place for maintaining this compliance.

Commitments are identified in the attachment to this letter.

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

Executed on October 14, 2008.

Should you have any questions, please contact Mr. Carl Corbin at (254) 897-0121.

Sincerely,

Luminant Generation Company LLC

Mike Blevins

By: [signature]
Fred W. Madden
Director, Oversight & Regulatory Affairs

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

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, Comanche Peak

Comanche Peak Steam Electric Station

Nine-Month Response to NRC Generic Letter 2008-01

"Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"

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

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EXECUTIVE SUMMARY OF COMANCHE PEAK RESPONSE TO GL 2008-01

This Attachment contains the Luminant Generation Company, LLC (Luminant Power) nine-month response to NRC Generic Letter (GL) 2008-01 "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008. In GL 2008-01, the NRC requested "that each addressee evaluate its ECCS, DHR system, and containment spray system licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified."

The following information is provided in this response:

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

b) A description of the corrective actions determined necessary to assure compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license with respect to the subject systems (see Section B of this Attachment), and

c) A statement regarding which corrective actions have been completed, the schedule for the corrective actions not yet complete, and the basis for that schedule (see Section B of this Attachment).

The following systems were determined to be in the scope of GL 2008-01 for Comanche Peak Steam Electric Station (Comanche Peak):

- Emergency Core Cooling System (ECCS) (Portions of the Chemical and Volume Control System (CVCS) which include using the Centrifugal Charging Pumps (CCPs) for high head injection, Safety Injection (SI) for intermediate head injection, and Residual Heat Removal (RHR) for low head injection, and recirculation)
- RHR (phases of shutdown cooling)
- Containment Spray System (CSS)

This evaluation provides the results of Luminant Power's assessment of the ECCS, RHR and CSS for Comanche Peak as requested in NRC Generic Letter 2008-01. It demonstrates that the subject systems are in compliance with the current licensing and design bases and applicable regulatory requirements, and that suitable design, operational, and testing control measures are in place for maintaining Comanche Peak in compliance.

A comprehensive walkdown process was completed including verification that the as-built configuration matches the design documents and identification of local high points. Local and system high points have been examined using ultrasonic testing (UT) to detect any gas pockets in the systems. One small gas pocket was found on each unit that was well within the acceptance criteria. This result was after a full 18 month cycle in Unit 1 with an SI accumulator leaking for 9 months (not currently active). On Unit 2, the result is after five months of operation with an active SI accumulator leak. In neither case was identified accumulator leakage the source of gas found.

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

During the final reviews of walkdown results it was determined that for Unit 1 six local high points need to have a confirmatory Ultrasonic Test (UT) performed. Confirmatory UTs could not be performed at these locations at the time they were identified (i.e., the subject system configuration had changed since the Unit 1 refueling outage began on September 27, 2008). These six confirmatory Unit 1 UTs will be performed following the completion of the Unit 1 2008 fall refueling outage. This schedule was discussed with the NRC (B. K. Singal, et. al.) and determined to be acceptable. Luminant Power will issue a supplement within 30 days after MODE 1 is achieved for Unit 1. The supplement will confirm the completion of the remaining Unit 1 UTs and that the conclusions provided in this letter remain unchanged.

Comanche Peak concludes that design and configuration of the piping system as well as the extensive procedural processes to ensure that the systems are full result in the systems remaining full even with gas intrusion vulnerabilities that have resulted in gas pockets at other plants. A list of potential gas intrusion sources has been identified. Comanche Peak is confident that the systems are completely full at the conclusion of each unit refueling outage and the corrective action process is used to identify gas intrusion during the operating cycle.

However, in light of the continued industry issues with inadvertent gas intrusion or potential draining of the subject systems, Comanche Peak will develop and implement a comprehensive Gas Intrusion Program (GIP) that:

- Confirms via Ultrasonic Testing (UT) measurements of selected system and local high points that the pipes are full after a unit refueling outage
- Provides conditional monitoring and UT when gas intrusion vulnerabilities exist
- Requires Engineering evaluation for fill and vent for work orders that breech ECCS, RHR, or CCS
- Adds a design impact for Gas Intrusion Program to the design control process
- Provides training for Operations, Maintenance and Engineering on gas intrusion potential

Additionally, some modifications will be made to add pressure instrumentation to piping sections to facilitate gas acceptance criteria determination. New vents will be added in seven local high point locations in Unit 1. The corresponding locations in Unit 2 already have a vent installed. One new vent valve will be added at a local high point in Unit 2 (similar Unit 1 vent valve not required). Some minor procedure clarifications will be accomplished for the fill and vent process.

Based on the evaluations supporting the response to this Generic Letter, Luminant Power believes that subject systems are in compliance with the current licensing and design bases and applicable regulatory requirements, and that suitable design, operational, and testing control measures are in place for maintaining this compliance.

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

A. EVALUATION RESULTS

(Note - this Section includes information item (a) requested by GL 2008-01)

A.1. Licensing Basis Evaluation

The Comanche Peak Licensing Basis Documents (LBDs) were reviewed with respect to gas accumulation in the ECCS, RHR, and CSS. This review included the Technical Specifications (TS), TS Bases, Technical Requirements Manual (TRM), Final Safety Analysis Report (FSAR), responses to NRC generic communications, Regulatory Commitments, and License Conditions. The ECCS consists of the Centrifugal Charging, Safety Injection, and Residual Heat Removal pumps, accumulators, Residual Heat Removal heat exchangers, Refueling Water Storage Tank along with the associated piping, valves, instrumentation, and other related equipment.

Containment Spray System is a separate system utilizing the Refueling Water Storage Tank as the primary water supply during the injection phase.

The RHR transfers heat from the Reactor Coolant System (RCS) to the Component Cooling Water System to reduce the temperature of the reactor coolant to the cold shutdown temperature at a controlled rate during the second part of normal plant cooldown and maintains this temperature until the plant is started up again. Parts of the RHR also serve as parts of the ECCS during the injection and recirculation phases of a Loss of Coolant Accident (LOCA). The RHR 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 outage.

TS Surveillance Requirement (SR) 3.5.2.3 requires the ECCS piping be verified full of water. Venting of the ECCS pump casing and discharge piping high points prior to MODE 3 ensures system will perform properly. The Technical Specifications and TRM do not include a Surveillance Requirement for verifying containment spray piping full of water.

A review of the Comanche Peak LBDs did not identify requirements with respect to gas accumulation for the subject systems. The pumps are flow tested every 3 months in accordance with the Inservice Testing Plan.

A.1.1. Summary of the results of the review of these documents:

The above documents and regulatory commitments were evaluated for compliance with applicable regulatory requirements.

A review of the Comanche Peak licensing basis documents identified no proposed changes. However, Comanche Peak will develop a Gas Intrusion Program to support operability of ECCS, RHR, and CSS between required Technical Specification surveillance intervals. This program will be designed to monitor for gas when plant conditions indicate that gas intrusion is possible.

Comanche Peak has not historically had issues with gas intrusion or accumulation is these systems. The Comanche Peak incidents were associated with a less than adequate procedure which has been subsequently revised. Comanche Peak has not experienced pump cavitation during the inservice testing 3-month starts as a result of gas in the systems. As described in the later sections, extensive UT examinations for gas during times when significant SI accumulator leakage has been present have resulted in no gas. Actual plant data from the full flow flush has been evaluated and it has been determined that air remaining in the system after it is filled is expelled by the flush prior to setting the reactor vessel head. Based upon this history, data and analysis Comanche Peak has concluded that a condition based monitoring program is the best method to ensure that the systems are operable.

Monitoring frequency will be established based upon the conditions rather than an arbitrarily selected time period. The program will be built to monitor plant conditions as well as work planned to be accomplished on the systems. In this way the UT examinations will be performed at times when the presence of gas has been determined to be possible. Any gas found will be tracked and trended and a determination made of its source. Comanche Peak plans to make this program into a station level procedure with appropriate design documents.

A.1.2. Summary of the changes to licensing basis documents (corrective actions):

No changes were made to Comanche Peak LBDs as a result of evaluations performed for the GL response.

A.1.3. Items that have not been completed (See Section B.2 for a schedule for their completion, and the basis for that schedule).

1) A Gas Intrusion Program will be implemented as described in Section A.3.2.

2) TS improvements are being addressed by the Technical Specifications Task Force (TSTF) to provide an approved TSTF Traveler for making changes to individual licensee's TS related to the potential for unacceptable gas accumulation. The development of the TSTF Traveler relies on the results of the evaluations of a large number of licensees to address the various plant designs. Luminant Power is continuing to support the industry and Nuclear Energy Institute (NEI) Gas Accumulation Management Team activities regarding the resolution of generic TS changes via the TSTF Traveler process. After NRC approval of the Traveler, Luminant Power will evaluate its applicability to the Comanche Peak Units 1 and 2, and evaluate adopting the Traveler to either supplement or replace the current TS requirements within one year of TSTF approval by the NRC.

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A.2. Design Evaluation

The Comanche Peak design basis was reviewed with respect to gas accumulation in the Emergency Core Cooling, Residual Heat Removal, and Containment Spray Systems. This review included Design Basis Documents, Calculations, Engineering evaluations, and Vendor Technical Manuals.

A.2.1. Results of the review of the design basis documents.

Design Basis Documents (DBDs) provide limited discussion of drain and vent connections provided at piping low and high points. The DBDs do not include any periodic venting requirements other than normal post-outage startup venting, pump-swap venting, or venting after performing online maintenance.

Descriptions of active "keep-fill" systems are not provided since the ECCS and CSS System are expected to be maintained full as specified. There are portions of these systems that are provided with level alarms that support verification of required level are maintained or made up (e.g., RWST, CSS Header Riser, SI Accumulators). Passive "keep-fill" of the systems is provided by the required/specified valve alignments between the systems in Standby and the RWST that is maintained at least at the required minimum water level. The RWST provides the necessary hydrostatic head pressures and water volume to ensure that these systems are maintained full in support of design basis functions.

Areas of dry pipe (by design) have been evaluated considering their design function and impact on pump suction or dynamic effects on discharge. Physical layout that facilitates gravity fill or slow acting valves have been provided accordingly. Examples are downward sloping Containment sump piping, use of vortex breakers for ECCS, CSS return to the RWST, and slow opening Containment Spray Isolation Valves. The sump lines are routed with a constant slope down from the sump to the isolation valve such that the line will be self-venting into the containment atmosphere. This arrangement is required to assure that as the sump fills with spilled coolant during a LOCA, the sump suction line will also fill with coolant and not allow a void to form in the line.

During realignments, ECCS and CSS pumps are not stopped during DBA conditions with the exception of SI pump for cold leg to hot leg injection realignment. For the SI pump realignment, running RHR pumps continue to provide supply pressure to the SI suction without interruption.

Potential for air intrusion from the Containment sumps into the ECCS and CSS suction lines has been addressed as follows. The total area provided allows for 50 percent of the area sump screens to be blocked. Under this 50% blocked condition, the approach velocity to the vertical surfaces is less than 0.015 fps. Two suction pipes are provided from each sump; one to feed the CSS, and the other to feed the ECCS. Inside the sump, each suction line inlet is fitted with a 20 degree conical opening and covered by an anti-vortexing screen made of grating. The anti-cavitation and vortexing design was tested in a full scale model of the Comanche Peak sump.

System and component calculations were also reviewed. As indicated within the respective calculation, condition of fullness of the piping on the suction and discharge sides of pumps and valves was considered. For the subject systems, in all cases for pump design, analysis

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confirmed adequate Net Positive Suction Head ($NPSH_{available}$) during various operational phases of the system to include realignments or switchovers.

The RWST is provided with an anti-vortex suction line sparger and serves as the source for SI, RHR, and CSS injection water. Upon receipt of an RWST EMPTY alarm, the immediate concern is adequate suction to the ECCS pumps. The suction line from the RWST to the CCPs is higher than the SI sparger and presents the most limiting NPSH and vortex concern. Stopping the CCPs is the highest priority and is performed as soon as possible, after receiving the RWST EMPTY alarm. Calculations have been performed to determine when surface cavitation and vortexing would be likely to form. Empty level determination for the RWST and the ECCS pump protection is based on water entry velocity into the RWST sparger piping and depth of submergence in order to prevent the formation of surface vortices during maximum pumping rates for CSS.

Computed water levels supporting various operating conditions form the basis for minimum water level setpoints and alarms or manual actions as mentioned above.

Prior to the issuance of GL 2008-01 and this supporting evaluation, a SmartForm (SmartForm is the Comanche Peak Corrective Action Program document used for the identification and resolution of problems) was written documenting the lack of an analysis of potential vortexing from the Chemical Additive Tank in the containment Spray system. A design calculation was performed supporting the operability conclusion that the amount of air ingestion will be far less than 2% void fraction at the pump suction.

The design documents contain a discussion of allowable leakage between high pressure and low pressure interfaces of the RCS to the SI injection header could result in a "simmering" of the American Society of Mechanical Engineers (ASME) pressure relief valve at a value of 10% above design pressure for the header. It was also noted that when the reactor coolant pressure approaches 1000 psig during plant startup, the SI and CCPs are available and the accumulator isolation valves are unlocked and opened. Prior to opening the accumulator isolation valves, the check valves are checked for proper seating to prevent overpressurizing the lower design pressure accumulators.

The ECCS is designed with the capability to determine leakage from the RCS to the ECCS through any of the series check valves which are located in each accumulator, residual heat removal pump, safety injection pump, and charging pump cold leg or hot leg injection line. Tests are performed to verify that each series check valve can independently sustain a differential pressure across its disc and also to verify that the valve is in its closed position.

The Comanche Peak design control program requires that design inputs be identified as part of the design change process. Changes that could impact the formation of gas pockets in the ECCS or CSS systems would require a qualified mechanical engineer to evaluate the changes. The effect on NPSH and filled status of the piping system is expected to be identified as a design input. The design control program includes a process for design impacts that ensures that cognizant individuals for site procedures and/or programs are notified when changes could affect those programs/procedures. Currently there is no specifically identified design impact for consideration of gas in these systems. The addition of a design impact will be addressed in the Gas Intrusion Program discussed in Section A.3.2.

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A.2.2. Results of the 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 (See Section B.2 for a schedule of any corrective actions and the basis for that schedule).

A.2.2.a) Pump Suction Piping

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

	Single-Stage	*Multi-Stage*	*Multi-Stage*
		Stiff Shaft	Flexible Shaft
Steady-State	2%	2%	2%
Transient(1)	5% for 20 sec.	20% for 20 sec.	10% for 5 sec.
$Q_{B.E.P.}$(2) Range	70%-120%	70%-140%	70%-120%
Pump Type (transient data)	WDF(3)	CA(3)	RLIJ(3), JHF(3)

(1) The transient criteria are based on pump test data and vendor supplied information.
(2) Best Efficiency Point
(3) Pump Models

Comanche Peak procedures provide assurance that the volume of gas in the pump suction piping for the subject systems is limited such that pump gas ingestion is within the above PWROG program established interim criteria.

Comanche Peak has identified through the walkdowns that there are local high points in the suction piping which could trap gas. Comanche Peak has created an acceptance requirement for gas volume that may be present at each specific location on the suction side of the pumps so as to ensure that no pump would see more than continuous 2% void fraction or transient void fraction above at its suction.

A.2.2.b) Pump discharge piping which is susceptible to pressure pulsation after a pump start

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, i.e., axial forces that are less than the design rating of the axial restraint(s).

Luminant Power has implemented this methodology for Comanche Peak and established the applicable limits for gas accumulation in the discharge piping of the subject systems. Comanche Peak procedures provide assurance that any gas in the subject systems discharge piping is limited to within the acceptance criteria determined by the Comanche Peak specific application of the joint Owner's Group program method.

Comanche Peak application of this method will be to determine the limiting void percentage that would result in a pressure pulsation that would not lift any system relief valve and a force on the piping system that would result in less than the weight of the full horizontal pipe section. This evaluation has resulted in a generic acceptance criteria of 3% void at any horizontal pipe location. This small void fraction limit is not expected to significantly challenge any piping, piping support, relief valve setpoint, or system flowrate.

The 3% void fraction acceptance requirement is based upon the most limiting case. As such, all other locations contain some amount of margin. If a void larger than 3% is detected at any of these locations an exact value for that location will be determined in order to evaluate acceptability at that horizontal pipe location.

A.2.2.c) Pump discharge piping which is not susceptible to water hammer or pressure pulsation following a pump start

1. The design basis of Comanche Peak includes a detailed calculation of the force imbalances during the filling of the Containment Spray discharge header that shows the resultant force imbalances to be within the margin of the pipe hangers.

2. A PWROG methodology has been developed to assess when a significant gas-water waterhammer 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 waterhammer 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 Comanche Peak RHR flow path for switchover to hot leg injection has an upstream valve that has an opening time of approximately 10 seconds and the downstream path to the RCS is only restricted by check valves. Therefore, consistent with the PWROG program methodology, no significant waterhammer will occur, i.e., none of the relief valves in the subject systems would lift, or none of the piping restraints would be damaged.

   The Comanche Peak SI flow path for switchover to hot leg injection has highly throttled valves downstream of the hot leg injection valve and the PWROG methodology cannot be used. As such, a detailed plant specific evaluation was performed to assess the influence of the downstream flow restriction(s). The Comanche Peak specific evaluation concluded that no significant waterhammer will occur, i.e., none of the relief valves in the subject systems would lift, or none of the piping restraints would be damaged as a result of the throttled valve(s) in the flow path provided we meet 3% void fraction acceptance criteria in Section A.2.2.b above.

A.2.2.d) RCS Allowable Gas Ingestion

The PWROG qualitatively evaluated the impact of non-condensable gases entering the RCS on the ability of the post-accident core cooling functions of the RCS. This evaluation assumed that 5 cubic feet of non-condensable gas at 400 psig was present in the 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 the quantities of gas that will not prevent the ECCS from performing its core cooling function.

Comanche Peak 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. Comanche Peak procedures also provide assurance that the gas accumulation in any sections of the centrifugal charging 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.

A.2.3. Summary of the changes, if any, to the design basis documents (corrective actions) (See Section B.2 for a schedule for completion of the corrective actions and the basis for that schedule).

No changes are necessary to the design basis documents.

Luminant Power will follow industry initiatives regarding void migration and the effects of void ingestion on pumps. Luminant Power will evaluate the results of those initiatives for any impact on the Comanche Peak design basis documents.

Also, a Comanche Peak Gas Intrusion Program will be implemented as described in Section A.3.2. This program will include a design impact in the design control program for any piping configuration change to the ECCS, RHR, or CSS.

A.2.4. Results of the system piping and instrument drawings and isometric drawing reviews to identify all system vents and high points.

The piping and instrumentation, and isometric drawings for the ECCS (SI and CCPs), RHR, and CSS were reviewed to identify vents and high points. Simple one line isometrics (suction and discharge path for the subject systems) were used during the review. Specifically, the following flow paths were reviewed:

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- Charging Injection flow path
  - Refueling Water Storage Tank (RWST) to Centrifugal Charging Pump (CCP) suction
  - CCP to Reactor Coolant System (RCS) cold legs
- Safety Injection (SI) flow path
  - RWST to SI pump suction
  - SI pump to RCS cold legs
  - SI pump to RCS hot legs
- Accumulator flow path
  - Accumulators to RCS cold Legs
- Residual Heat Removal Injection (RHR) and Recirculation flow path
  - RWST to RHR pump suction
  - Containment sump to RHR pump suction
  - RHR pump discharge to RCS cold legs
  - RHR pump discharge to RCS hot legs
  - RHR pump discharge to CCP suction, and SI pump suction
- Containment Spray System (CSS) flow path
  - RWST to CSS pump suction
  - CSS pump discharge to the CSS header
  - Containment recirculation sumps to the CSS pump suction
- RHR Shutdown Cooling
  - RCS hot legs to RHR pump suction

A review of the drawings was performed to identify system vents and high points. These drawings consisted of the original system flow diagrams and associated piping isometric drawings used for fabrication and installation. System high points may include areas where gas would be expected to accumulate in the system, including isolated branch lines, valve bodies, heat exchangers, improperly sloped piping, or located upstream of components in horizontal lines.

During this review process, piping elevation diagrams were developed to aid the review process. The drawings depict the horizontal runs of pipe and the major equipment. These drawings represent the relative locations of the RWST with piping elevations, in-line valves, high point vents, low point drains, pumps, and other interfacing Structures, Systems, and Components. These drawings will also be useful in work planning, plant modification, and will be used in the Gas Intrusion Program.

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Seven locations were identified during the drawing reviews to be inverted "U" type pipe configurations with no installed vent. These locations were in Unit 1. The corresponding locations in Unit 2 have an installed vent valve. One new vent valve will be added at a local high point in Unit 2 (similar Unit 1 vent valve not required). Vents will be added at these locations:

Unit 1 vent valves:

- RWST discharge line 24-SI-1-029-151R-2 near valve 1SI-0047.
- The local high point upstream of 1-8924
- The local high point on the line containing 1-8923A
- The inverted "U" piping on line 4-SI-1-045-1501R-2
- The inverted "U" piping on line 4-SI-1-044-1501R-2
- The inverted "U" piping on line 4-SI-1-039-1501R-2
- The local high point on the line containing 1-8821B

Unit 2 vent valve:

- The local high point at the horizontal elbow on line 16-CT-2-120-151R-2 near check valve 2CT-0149

In review of the vendor drawings for in-line valves, valve bonnet chambers were identified as possible air traps. The valves identified were large check valves and gate valves with some small globe valves.

Gas trapped in the bonnet region of gate valves is not considered to be a concern for operation of systems within the scope of GL 2008-01. As the system is filled and system pressure increases, gas in a gate valve body above the top of the run pipe will compress and will not be removed. Even with a dynamic filling operation, most of the gas in a gate valve bonnet will remain trapped because most of the opening between the flow path and the bonnet region is blocked by the withdrawn disk. Since there is no flow into the bonnet region to remove the gas; the trapped gas is not a concern with regard to entrainment.

The containment isolation valves for the CSS suction valves to the containment sumps are oriented so that the bonnet is below the valve. In this configuration, the valve bonnets will be filled when the valve is stroked open. The procedure for the stroke test calls for the downstream pipe to be re-filled after each stroke test. In this way, these valve bonnets and the pipe downstream are maintained full of water.

The containment isolation valves for the RHR suction valves to the containment sumps are oriented so that the bonnet is below the valve. The stroke test for these valves is accomplished with the pipes drained. Therefore, the valve bonnets are assumed to be full of air. The volume of air contained in the bonnet is less than the acceptance criteria to prevent more than 5% air void for 20 seconds reaching the pump. The acceptance requirement for this horizontal pipe location will be reduced by the volume of the air in the bonnet. The procedure for the stroke test calls for the downstream pipe to be re-filled after each stroke test.

Check valve bonnet regions are considered to be local high points in the GL 2008-01 systems that can trap gas in a location where it is likely to be mobilized when flow is increased in that portion of the system. The portion of a check valve body above the elevation of the top of attached pipes is a shallow trap for gas. If a dynamic flush with flow through the check valve is

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used for system fill, it is likely that the gas will be removed. However, if the fill is static or if the pipe is filled from the direction that closes the valve, it is likely that gas will be trapped. The check valves on the suction sides of the pumps are filled with flow through the valve.

Globe valve bonnets can be considered local high points. The globe valves in GL 2008-01 systems are 3" and smaller. The potential void size would typically be smaller than a similar size check valves. Therefore, gas accumulated in the globe type valves in these systems are not a concern.

The vertical standpipes leading to relief valves or isolated sections of piping can trap gas. These pipes are not vented until flow is established in the line. However, for similar reasons described above for gate valve bonnet regions, gas that is trapped in these standpipes is out of the flow path and is compressed by the system pressure so that the gas/water interface is above the entrance to the pipe. Therefore, the small amounts of gas accumulated will not be transported to pump inlets and the volume is too small for the pressure fluctuations to be significant.

Tube bundles in heat exchangers in the GL 2008-01 systems (i.e., RHR heat exchanger and the containment spray heat exchanger) are potential gas traps. When the heat exchangers have been drained, the system is typically refilled using the vacuum fill method and removal of remaining air is accomplished during the full flow flush.

Orifice plate and pipe reducers in horizontal lines can be gas traps back to the next horizontal to vertical elbow or other line size change. These locations were considered to be local high points during the walkdown process.

Additionally, some modifications will be made to add pressure instrumentation to piping sections to facilitate gas acceptance criteria determination. Ultrasonic Testing (UT) can provide an accurate void volume when the pressure and temperature are considered.

The results of this review facilitated and supported the selection of areas in the plant for further walkdown and UT examination. See Section A.2.6 for further discussion.

A.2.5. Identification of new vent valve locations, modifications to existing vent valves, or utilization of existing vent valves based on the drawing review, and summary of the Corrective Actions (See Section B.2 for a schedule for completion of the Corrective Actions and the basis for that schedule).

Seven locations were identified during the drawing reviews to be inverted "U" type pipe configurations with no installed vent. These locations were in Unit 1. The corresponding locations in Unit 2 have an installed vent valve. One new vent valve will be added at a local high point in Unit 2 (similar Unit 1 vent valve not required). Vents will be added at these locations:

Unit 1 vent valves:

- RWST discharge line 24-SI-1-029-151R-2 near valve 1SI-0047
- The local high point upstream of 1-8924
- The local high point on the line containing 1-8923A
- The inverted "U" piping on line 4-SI-1-045-1501R-2

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- The inverted "U" piping on line 4-SI-1-044-1501R-2
- The inverted "U" piping on line 4-SI-1-039-1501R-2
- The local high point on the line containing 1-8821B

Unit 2 vent valve:

- The local high point at the horizontal elbow on line 16-CT-2-120-151R-2 near check valve 2CT-0149

Install Pressure gauges in Unit 1 and 2:

- On SI and RHR pump discharge paths downstream of the discharge check valves
- In containment on the SI hot leg and CCP injection lines
- On the SI test header in containment

A.2.6. Results (including the scope and acceptance criteria used) of the system confirmation walkdowns that have been completed for the portions of the systems that require venting to ensure that they are sufficiently full of water.

Walkdown Summary:

Comanche Peak has performed walkdowns of piping in the subject systems to ensure that the as built configuration of the piping matches the design documentation and to identify local high points. Comanche Peak performed laser scanning of the rooms in the plant in which the subject piping is located. The only piping not included in the scope of the laser scan was that piping inside the reactor coolant loop rooms in containment. The laser scanning provided a detailed slope report for the piping. From the slope report and the new piping elevation drawings the local high points were identified. Ultrasonic Testing (UT) of these locations was performed to determine if gas was present at any of the identified locations. One location in each unit was found to have a small quantity of gas that was well within the operability acceptance requirement at each location.

Walkdown Methodology:

For piping inside the reactor coolant loop rooms in containment, a walkdown of the piping isometrics was performed by the Comanche Peak system engineer. The scope of this walkdown was to verify general arrangement of the piping and the location of valves and other piping components as they appear on the drawings. Specific consideration was given to the location of vent valves and orientation of inline valves matching the design document. No discrepancies between the field installation and the design drawings were identified. The slopes of these horizontal piping segments were evaluated to be non-relevant. These horizontal lines directly attach to the Reactor Coolant System (RCS) and contain the first-off check valve and are downstream of the second-off check valves. Any gas in these lines would be immediately ingested into the RCS and would not create pressure pulsations in the piping system.

For the remainder of the piping both inside containment and outside, the walkdown was accomplished primarily by use of the laser scan results. The laser scan device captures data 360 degrees horizontally and 320 degrees vertically from the location of the scanner. At each location the scanner captures the coordinates, density, and intensity of approximately 40,000,000 points. This data when combined with multiple scans in each room provide a complete three dimensional replication of the room and the components in the room. Locations were selected for maximum coverage of the piping systems in each room.

An "as-designed" three-dimensional computer aided drawing (CAD) model of the piping systems was created from isometric drawings. Software was then used to compare the as-design model to the three-dimensional scanned replication of the piping system. From this comparison, links to the lines were created. Then the application created best fit cylinders to each segment of the piping system. These cylinders were nominally 60 inches in length. Shorter segments were used to model short sections of pipe and finish long runs. Segments were terminated at piping components such as valves, tees, elbows, and flanges. From these individual pipe segments that were best fit to the pipes, a three dimensional "as-built" model of the piping was created as well as a pipe slope report for the piping.

The verification that the piping is installed as designed was accomplished using the three-dimensional solid models of the "as-designed" compared to the "as-built." The application allowed for the two models to be over-laid. Deviations in the piping and location of piping components were then easily determined. Additionally, the piping was viewed in the three dimensional replication of the rooms to determine that the major valve components are installed as designed. If there were any components that could not be verified on the laser scan as located "as-designed", then it was verified in the field.

For every horizontal run of pipe, the slope reports were analyzed and converted to the pipe topography graphs. From these graphs, adverse local high points were identified. If a horizontal pipe sloped in such a way as to allow gas to travel to another high point so as not to be trapped in that horizontal run then it was not considered to be an adverse local high point. If the slope was less than 0.2 inches, it was determined to be so slight that it was not an adverse local high point. The quantity of gas that could be held at such a location is insignificant.

These local high points were then included in a plan to perform UT examination of the piping systems to determine if the piping systems are water solid. These points were located on the new piping elevation diagrams. The location of the points could then be evaluated to determine the gas intrusion method for each location. Points were then grouped into isolatable sections of the piping and gas intrusion source. In each of these groups, it was concluded that if one point were to have gas then other points would have a potential for gas. Likewise, in each group a single point was identified that would have the highest probability of gas in that group. That point was then included as a mandatory UT location. The other points in that group were identified as contingent locations based on the finding at the mandatory location.

Piping Insulation:

Comanche Peak determined that it is not necessary to remove the insulation for the piping to obtain accurate walkdown results using the method described above for the purposes of this evaluation. The purpose of these walkdowns is two fold: first is to verify that the general arrangement of the piping system matches the drawings, and second to identify any local high points due to piping installation. This allows for the evaluation to determine what locations in the piping systems could become traps for gas accumulation.

It was determined that piping components that could result in a gas trap could be seen with the insulation on with the possible exception of reducers. Even the smallest pipe size change at a

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reducer can be identified as the insulation is tight fit to the piping. Therefore, the noticeable pipe diameter change identified the location of reducers. What can be difficult to determine is if the reducer is an eccentric or concentric reducer. The impact of reducer type and orientation could make a difference as to the size or existence of a gas trap. The reducer was either field verified by examination with the insulation removed or assumed to be in the worst case configuration for determination of local high point and acceptance criteria. Other pipe components such as valves and orifices are easily identified as to location and orientation.

The insulation types at Comanche Peak are custom fit to the specific pipe and are tightly bound to the pipe. As such, using the method described above to determine the elevation of the individual pipe segments provides a high degree of confidence in the elevations determined for the center line of the pipe. The cylinders applied to each pipe segment were best fit to the known pipe diameter. This easily compensates for any local inconsistencies in the outer surface of the insulation due to the 60-inch length of the segments. Further, it is logical to assume that the pipe, if it slopes, does so over some length of more than 60 inches. Therefore, when the segments are joined together a continuous slope is determined. Most slopes are instigated at a weld in the straight run of pipe or at an elbow, tee, or flange. Some sagging may occur but the result of that would be a lower actual elevation for the center line with the same slope indication and magnitude.

To support these conclusions Comanche Peak analyzed a section of piping through the processes described above with insulation on and then again with the insulation removed. The segment used for this comparison had formed fiberglass insulation with metal sheathing. This is the softest type of insulation and would therefore, result in the highest potential sagging. The calcium silicate and other blanket type insulation would be bounded by any deviations found with the fiberglass. The result was that the insulation consistently sagged for 0.25 to 0.30 inches. However, the high points in the pipe identified with the insulation on and off were at the exact same location and the variation from low point to high point was 0.30 inches with the insulation removed and 0.32 inches with the insulation installed. These results support the conclusion that insulation will not have any effect on the ability to determine the local high points that may exist in the piping system.

Walkdown Results:

Comanche Peak Unit 1 and Unit 2 walkdowns were performed using the methodology described above. Vent valves were found to be installed in the location and orientation depicted on the design drawings. The routing of the piping system was verified to be as shown on the design drawings. No deviation from the dimensioned piping isometric drawings was identified that fell outside the +/- 2 inch construction tolerance. Valves, orifices, flanges, and other piping components were also verified to be as depicted on the design documents for both location and orientation. SMF-2008-002997 documents a valve depicted as a vent on one drawing and on another drawing as a drain. The valve was field verified to be a drain.

In Unit 1, as a result of the pipe slope evaluation, 74 locations were identified as either local or system high points. Twenty-two of these points were on the suction side of the pumps with the remaining 52 locations on the discharge side. UT examinations were performed to determine if the pipes were full of water on 13 of the suction side locations. A small pocket of gas was identified at one of these locations and was documented in the Comanche Peak corrective action program for operability determination (SMF-2008-003048). Comanche Peak determined that the amount of gas was within the acceptance requirement and operability of the system was not affected. There are 2 suction side locations that remain to be UT examined. The remaining 7 locations identified as local high points are bounded by the finding of full pipe at the other 15 suction side locations. As described above, 20 of the 52 locations on the discharge side were determined to be locations where UT examinations are required to determine if the pipes were water solid. In all 16 of these locations, the pipes were found to be water solid. As a result, the remaining 32 contingent locations were not required to be examined. There are 4 discharge side locations that remain to be UT examined.

The six local high points (2 suction and 4 discharge) could not be UT examined due to the plant conditions at the time they were identified (i.e., the subject system configuration had changed since the Unit 1 refueling outage began on September 27, 2008). These six confirmatory Unit 1 UTs will be performed following completion of the Unit 1 2008 fall refueling outage. Even though these UT examinations have not been completed, there is reasonable assurance of operability for the following reasons:

- The same locations were UT examined on Unit 2 with all pipe found to be full. The piping configurations are very similar with only a few dimensional differences. Both units employ the same static and dynamic fill and vent processes. Additionally, the full flow flush process has been completed in Unit 1 as part of the return to power from 1RF13.
- For the four discharge side locations, the gas intrusion source would be a leaking SI accumulator. There has not been a leaking accumulator in Unit 1 for the last nine months of operation.
- For the two suction side locations, the high points may capture a limited amount of gas than could remain after a fill and vent. That amount of gas is less that the acceptance criteria determined at its location. Therefore, even if gas is found at these locations the system will be operable.

In Unit 2, as a result of the pipe slope evaluation, 76 locations were identified as either local or system high points. Thirty of these points were on the suction side of the pumps with the remaining 46 locations on the discharge side. UT examinations were performed on all 30 suction side locations to determine if the pipes were full of water. A small pocket of gas was identified at one of these locations and was documented in the Comanche Peak corrective action program for operability determination (SMF-2008-003245). Comanche Peak determined that the amount of gas was within the acceptance requirement and operability of the system was not affected. As described above, 25 of the 46 locations on the discharge side were determined to be mandatory locations and were UT examined to determine if the pipes were water solid. In all 25 locations, the pipes were found to be water solid. As a result, the remaining 21 contingent locations were not required to be examined.

A.2.7. Identification of new vent valve locations, modifications to existing vent valves, or utilization of existing vent valves that resulted from the confirmatory walkdowns, and summary of the corrective actions (See Section B.2 for a schedule for completion of the corrective actions and the basis for that schedule).

No vent valves were required to be added as a result of the walkdown to determine local high points. The local high points fall into one of two conditions. Either the local high points result in an amount of gas lower than the suction or discharge acceptance criteria or the high points are in locations in which the voids are removed by full flow testing.

A.2.8. Results of the fill and vent activities and procedure reviews for each system. (Note that routine periodic surveillance testing is addressed in the "Testing Evaluation" section (A.3) of this response.)

Plant procedures have been developed establishing the specific valves to be used for venting during system filling. These procedures provide the sequential steps in order to accomplish the desired system condition.

Procedures for the ECCS and CSS systems have steps that provide for static/dynamic fill and vent. The dynamic filling operation involves running of the pump with the discharge return back to the RWST. Notation is highlighted in the procedure identifying that air may still be trapped in the system. If the discharge pressure and flow indicate air in the system, it may be necessary to stop the pump and vent the system again.

The RHR and CSS systems procedures also provide steps for a vacuum filling technique. Again, procedures provide steps and alignment of the system for vacuum fill and vent. The pump discharges are closed and the heat exchanger and associated piping are drained to preclude formation of a loop seal. The pumps and suction piping are statically filled and vented. A vacuum is then established on the heat exchanger and discharge piping up to the header isolation valves. The pump discharge valves are opened allowing water to be drawn through the pumps filling the heat exchanger and piping.

After the systems have been filled and vented, in accordance with the specific system procedure, the plant conducts a full flow flush process. This procedure is the ECCS check valve operability test. During this procedure flow rates are developed that are sufficient to remove gas from the piping on the discharge side of the pumps. This process provides dynamic venting of the lines on the discharge side of the pumps.

A.2.9. Identification of procedure revisions, or new procedures resulting from the fill and vent activities and procedure reviews that need to be developed, and summary of the Corrective Actions (See Section B.2 for a schedule for completion of the corrective actions and the basis for that schedule). (Note that routine periodic surveillance testing is addressed in the "Testing Evaluation" section A.3 of this response.)

Operating procedure OPT-521A/B, "Operations Testing Manual/ECCS Operability," will be revised to indicate that performance of the procedure is an integral part of dynamic fill for the ECCS systems and is credited as part of the GL 2008-01 response.

A.2.10. Results of review of potential gas intrusion mechanisms into each system for each piping segment that is vulnerable to gas intrusion.

Potential Credible Gas Intrusion Sources

RHR and SI systems are isolated from the Safety Injection Accumulator tanks by a single check valve. Leakage of nitrogen saturated water for the SI Accumulators at approximately 630 psig into the SI or RHR system could result in nitrogen coming out of solution in lower pressure portions of the system. In many cases, the leaking check valve tends to pressurize the piping thus preventing degassing. Comanche Peak has a history of leaking SI accumulator check valves. Comanche Peak has examined the piping systems to look for gas and found no gas in the system during such leakage. Unit 2 SI Accumulator 2-04 has been leaking into the SI cold leg line since May 2008. As documented in the walkdown section of this evaluation, Comanche Peak has performed a UT examination of 55 locations across the Unit 2 systems and found no pockets of gas that can be attributed to this leakage. These same results were found in early July 2008 when UT examination of the high point in the SI cold line was UT examined. Additionally, in 1997 extensive UT examination was performed in both units with active SI accumulator leakage and no gas was found. Comanche Peak has attributed the absence of gas in these conditions to the arrangement of the piping systems and the procedure for refilling the SI accumulators. Comanche Peak continues to monitor and trend any SI accumulator leakage in the corrective action program.

Another high pressure source is leakage past the check valves from RCS to either the SI or RHR systems. Like accumulator leakage, this could result in hydrogen coming out of solution in the lower pressure piping. The concentration of hydrogen is at Volume Control Tank (VCT) pressure which is only slightly higher than the SI or RHR pressure would be due to RWST head pressure. If the leakage pressurized the pipe then the likelihood of degassing would be low. Additionally, the periodic leak rate evaluation of RCS inventory would identify this potential for gas as part of the Comanche Peak corrective action process.

The SI test header communicates with the systems and local high points in such a way that leaking valves could allow gas and/or gas sources to move to locations that are not directly connected to the source. The valves that connect the test header are normally closed.

Draining of components in the system during power operations could introduce air into the system. Many system portions that can be filled completely during an outage cannot necessarily be completely filled with the system in operation. Any air that is left in the system after such maintenance will be evaluated.

Air that is not completely vented during the system static/dynamic fill and vent process or the subsequent full flow flush could be a source of gas. Most of the discharge side piping develops velocities similar to accident conditions during the full flow flush. Some portions of the suction side piping do not develop adequate velocities during the test, but would under accident conditions. Such air pockets will be evaluated.

The Chemical Additive Tank in the CSS at Comanche Peak has the potential to introduce air into the suction side of the CSS pumps. The setpoint for isolation of the tank on low level is such that near the end of the operation of the tank some air could be ingested into the eductor and thus sent to the suction side of the CSS pumps. A calculation has been performed that shows the maximum amount of air ingested to be far below a 2% void fraction at the pump suction.

Within several sections of procedure IPO-001A/B, "Integrated Plant Operating Procedures Manual/Plant Heatup from Cold Shutdown to Hot Standby," guidance is provided to maintain VCT overpressure as low as possible to prevent gas coming out of solution in a depressurized RCS or connecting system. However, procedural steps allow VCT pressure as high as 60 psig which could result in gas accumulation within RHR when depressurized in the standby ECCS mode. Consequently, operation in MODES 4 and 5 with high VCT pressure is considered a credible gas intrusion source. The Gas Intrusion Program will provide in the post outage UT examinations requirement to UT RHR piping if it is determined that the VCT pressure may have introduced hydrogen into the RHR system.

Non-Credible Gas Intrusion Sources

The RWST provides suction source for all ECCS and CSS pumps. The RWST suction line sparger is designed so as to eliminate the possibility of vortexing from the tank. The level setpoint design has four safety related independent fluid channels that provide redundant indication in the control room. Air entrainment due to vortexing in the RWST is not considered credible.

The containment sumps provide suction to the RHR and CSS pumps during the recirculation mode. The design of the new sumps as a result of Generic Safety Issue (GSI) 191, "Assessment of Debris Accumulation on PWR Sump Performance," is such that no air is ingested into the piping systems to the pumps. The pipes for the closed isolation valve to the sumps slope up toward the sumps and are self venting as the sumps fill. The pipes from the isolation valve to the pump suction are maintained full.

The design of the VCT is such that on low level the tank is automatically isolated and suction for the charging pumps is diverted to the RWST.

The Technical Specification low level limit for the RWST is higher than the piping systems other than the CSS in containment which is isolated at the containment isolation valves. As such, in-leakage to the system through a leaking valve, flange, or other component can not occur. Any opening in the system would leak out and no air would leak in.

Per procedure SOP-102A/B, "System Operating Procedure Manual/Reactor Coolant System," the RHR system temperature is reduced below 250 degrees F for at least one hour prior to securing and depressurizing the system. Once suction is aligned to the RWST, pump suction pressure (with pump secured) is monitored until a stable indication of RWST elevation head above the pump elevation is achieved. Until this stability is achieved, TS LCO 3.5.2 is entered to ensure the RHR system is not declared operable for ECCS injection. These procedural controls are considered adequate to prevent steam formation in the RHR system following operation in the shutdown cooling mode.

A.2.11. Ongoing Industry Programs

Industry programs are planned in the following areas which may impact the conclusions reached during the design evaluation of Comanche Peak relative to gas accumulation. Luminant Power will evaluate the results of these initiatives to determine if additional changes to the Comanche Peak design basis documents may be required or desired to provide additional margin.

- Gas Transport in Pump Suction Piping

  The Pressurized Water Reactor Owners Group (PWROG) has initiated testing to provide additional knowledge relative to gas transport in large diameter piping.

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One program performed testing of gas transport in 6-inch and 8-inch piping. Another program will perform additional testing of gas transport in 4-inch and 12-inch low temperature systems and 4-inch high temperature systems. This program will also integrate the results of the 4-inch, 6-inch, 8-inch and 12-inch testing.

- Pump Acceptance Criteria

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

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A.3. Testing Evaluation

A.3.1. Results of the periodic venting or gas accumulation surveillance procedures reviews.

Comanche Peak does not have a periodic surveillance requirement for either venting or ultrasonic testing of the piping systems to ensure that they remain full. Comanche Peak verifies that the pipes are full prior to entry into MODE 3 or after any maintenance or operations activity which drains portions of the system.

Comanche Peak concludes that the operational history at the two units and the results of this evaluation prove that the procedures ensure that the piping systems are full upon MODE 3 entry and will remain full. In support of this evaluation, the piping systems in Unit 1 were UT examined after 18 months of operation and no gas was found in the ECCS flow path of the systems. Further, the Unit 2 piping systems were UT examined after 5 months of operation with an active SI accumulator leak with no gas found in the ECCS flow path of the systems. In both units, only a very small pocket of gas was found in the shutdown cooling suction line for the RHR pumps. An evaluation of the velocities developed during the full flow flush procedure OPT-521A/B indicate that the discharge piping, which contains local high points, is exposed to adequate flow to sweep remaining gas out of the system.

Industry operating experience indicates that other plants have found gas in similar conditions where none was found at Comanche Peak. The Comanche Peak process will be enhanced (See Section A.3.2) to include confirmatory UT examinations in order to provide further confidence that any condition that would challenge the operability of the systems would be identified and corrected.

Comanche Peak will develop a monitoring program of UT examinations to verify that the piping systems remain full. This program will be a condition based program issued as a station level procedure. The UT testing will be performed at selected system and local high points after each unit refueling outage and as needed to assess any operational event. This UT examination of the piping system will confirm the suction and discharge of the piping systems are full. When precursors for a gas intrusion event are identified, this program will specify additional UT examination and follow-up frequency.

A.3.2. Identification of procedure revisions, or new procedures resulting from the periodic venting or gas accumulation surveillance procedures review that need to be developed.

Comanche Peak will develop an administrative procedure that establishes the Gas Intrusion Program (GIP). The program will include as a minimum:

- Ultrasonic Testing (UT) of selected system and local high points after the end of unit refueling outages to confirm that the systems are full of water.
- Condition based evaluation process that is initiated upon the occurrence of any event identified as a potential source for gas intrusion, including UT exam and continued frequency requirements.
- Engineering evaluation of work orders identified to contain a breech of an ECCS, RHR, or CSS piping system.
- Addition of a Design Impact in the design control program for any piping configuration change to ECCS, RHR, or CSS

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- Providing additional training for Operations, Maintenance, and Engineering on gas intrusion potential.

OPT-521A/B, "Operations Testing Manual/ECCS Operability," will be revised to indicate that performance of the procedure is an integral part of dynamic fill for the ECCS systems and was credited as part of the GL 2008-01 response

A.3.3. Results of review of 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).

Filling and venting of the RHR system is performed in accordance with procedure SOP-102A/B. The procedure allows for static filling as well as vacuum filling of the system. Vacuum fill is performed if the RHR heat exchanger will be drained to allow for an adequate fill of the U-tube design RHR heat exchanger. Both fill methods repeatedly cycle multiple RHR system vents including the seal cooler vent. Additionally, both methods will bump start or flow the associated RHR pump using valve 1/2-8717 in the open position to maximize recirculation flow to the RWST. When the RHR pump is secured, the RHR system is again vented including the seal cooler vent. For the static fill method, this process is repeated until the system is full. For a vacuum fill, only a single bump start of the RHR pump is performed.

The RHR system functions to provide shutdown cooling as well as ECCS low-head injection. Operation of the RHR system during shutdown cooling operation is performed in accordance with procedure SOP-102A/B. Procedure steps require venting the seal cooler prior to starting the pump. A note is included in the procedure that allows for suspending venting of the seal cooler for ALARA concerns if an RHR pump is being started in response to ABN-104, "Abnormal Conditions Procedure Manual/Residual Heat Removal System Malfunction," for purposes other than "Erratic RHR Pump Parameters" or if the pump has been operated in the previous six hours AND the flow path has not changed. It is expected that this allowance will be used very infrequently by Operations and only if ALARA concerns are significant and operating conditions related to RHR have not changed. Additionally, this procedure contains multiple cautions to warn the operator of the potential for pump cavitation, loss of shutdown cooling, or loss of inventory as a result of operator actions.

Reduced inventory operations are strictly controlled per integrated plant operations procedure IPO-010A/B, "Integrated Plant Operating Procedures Manual / Reactor Coolant System Reduced Inventory Operations." This procedure requires monitoring of multiple, diverse RCS level indications and RHR pump motor current for indication of air ingestion. Maximum RHR flowrates are established versus RCS level and are logged every 30 minutes, as well as the above indications, during reduced inventory operations. Abnormal procedure ABN-104 provides operating instructions to respond to a loss of decay heat removal or loss of RCS inventory while operating in the shutdown cooling mode. Entry into ABN-104 is from adverse instrumentation indications including many independent annunciators. ABN-104 documents the alarms available to the operator to indicate loss of decay heat removal or loss of inventory.

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A.3.4. Summary of 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.

Measures are in place to guard against gas intrusion because of inadvertent draining, system realignments, incorrect maintenance procedures, or other evolutions, as described below. Draining activities during outage or on-line are required to be performed under a clearance order. All filling and venting activities for restoring systems from these draining activities are controlled through approved procedures or clearance restoration instructions. Administrative controls also require that restoration includes appropriate piping full verifications in accordance with the approved clearance restoration.

During maintenance activities, any change to the maintenance work scope requires a revision to the work order package controlling the activity. Before work can recommence, licensed plant operators must review and reauthorize the revised work order. Reviews of revisions to maintenance packages are based on the total maintenance work scope. This includes reviewing the adequacy of the tagging boundary, any of the system restoration procedures including fill and vent, and post-maintenance test requirements. Required changes to these documents are prepared to reflect the revised work scope. In some cases, the development of new temporary procedures, such as a fill and vent procedure, may be necessary depending on the scope and complexity of the restoration.

When work is completed, a licensed Senior Reactor Operator (SRO) analyzes and approves the restoration sequence and plant operators implement the restoration process, including the fill and vent procedures.

A.3.5. Description of 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.

Gas voids detected are documented, evaluated, and dispositioned in the Comanche Peak Corrective Action Program (CAP). The disposition would address the methods necessary to fill and vent.

As part of the response to GL 2008-01, Comanche Peak has developed conservative technical criteria for assessment of the degraded function of GL 2008-01 systems with small amounts of gas. Operators and engineers will use these criteria as an aid during the immediate operability determination process.

The Gas Intrusion Program described in Section A.3.2 will provide guidance on void tracking, trending, and monitoring program.

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A.4 Corrective Actions Evaluation

A.4.1. Summary of the results of the reviews regarding how gas accumulation is addressed.

The Comanche Peak Corrective Action Program (CAP) is governed by procedures STA-421, "Station Administration Manual/Initiation of SmartForms," and STA-422, "Station Administration Manual/Processing SmartForms." The CAP program uses the SmartForm process to identify and resolve problems. Identification of gas in the ECCS or CSS systems has been and will continue to be documented in a SmartForm as directed by these procedures. The process would require an operability determination and as well as cause and corrective actions.

Comanche Peak has a procedure STA-426, "Station Administration Manual/Industry Operating Experience Program," for evaluating industry operating experience so that improvements can be made in Comanche Peak programs. This program is used to develop corrective actions/lessons learned to preclude similar events at Comanche Peak. It also includes guidance on sharing our events and lessons learned to improve the overall safety and reliability of nuclear stations.

The new GIP program as discussed in Section A.3.2 will emphasize the importance of treating the accumulation of substantial gas as a non-conforming condition to be evaluated in the CAP program.

A.4.2. Items that have not been completed (See Section B.2 for a schedule for their completion and the basis for that schedule).

No changes to Comanche Peak's corrective action program are being made as a result of GL 2008-01 evaluations, other than possible changes to ensure consistency with the new Gas Intrusion Program described in Section A.3.2.

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B. CORRECTIVE ACTION SCHEDULE

(Note - this includes information items (b) and (c) requested by GL 2008-01 and summarizes the corrective actions, the schedule, and the basis for the schedule)

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

No corrective actions identified as a result of the evaluations performed for this GL have been completed as of the date of this submittal.

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

The commitment number is used by Luminant Power for the internal tracking of Comanche Peak commitments.

Corrective Action No. 1 - Gas Intrusion Program
(See Section A.3.2)
(Corrective Action Program (CAP) Tracking Document - SmartForm 2008-003459)
(Commitment Number 3618664)

As a result of the GL 2008-01 evaluation, a new Gas Intrusion Program is required to be developed. The program will include as a minimum:

- Ultrasonic Testing (UT) of selected system and local high points after unit refueling outages to confirm that the systems are full of water.
- Condition based evaluation process that is initiated upon the occurrence of any event identified as a potential source for gas intrusion, including UT examinations and continued frequency requirements.
- Engineering evaluation of work orders identified to contain a breech of an ECCS, RHR, or CSS piping system.
- Addition of a Design Impact in the design control program for any piping configuration change to ECCS, RHR, or CSS system.
- Providing additional training for Operations, Maintenance, and Engineering on gas intrusion potential.

Schedule/Basis for Schedule:

The Gas Intrusion Program will be developed by October 11, 2009. Comanche Peak has not historically had issues with gas accumulation in these systems. The evaluation supporting this response has indicated that the existing process is adequate.

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Corrective Action No. 2 - Install Vent Valves and Pressure Gauges
(See Section A.2.5)
(CAP Tracking Document - SmartForm 2008-003460)
(Commitment Number 3618672)

Modifications to install vent valves and pressure gauges.
Add Unit 1 vent valves at:

- RWST discharge line 24-SI-1-029-151R-2 near valve 1SI-0047
- The local high point upstream of 1-8924
- The local high point on the line containing 1-8923A
- The inverted "U" piping on line 4-SI-1-045-1501R-2
- The inverted "U" piping on line 4-SI-1-044-1501R-2
- The inverted "U" piping on line 4-SI-1-039-1501R-2
- The local high point on the line containing 1-8821B

Add Unit 2 vent valve:

- The local high point at the horizontal elbow on line 16-CT-2-120-151R-2 near check valve 2CT-0149

Install Pressure gauges (Units 1 and 2):

- On SI and RHR pump discharge paths downstream of the discharge check valves
- In containment on the SI hot leg and CCP injection lines
- On the SI test header in containment

Schedule/Basis for Schedule:

Unit 1
Prior to startup from the Unit 1 refueling outage in the spring of 2010. The current process is adequate and the next refueling outage is a logical time frame.

Unit 2
Prior to startup from the Unit 2 refueling outage in the fall of 2009. The current process is adequate and the next refueling outage is a logical time frame.

Corrective Action No. 3 - Clarify Procedure
(See Section A.3.2)
(CAP Tracking Document - SmartForm 2008-003461)
(Commitment Number - 3618694)

Procedure OPT-521A/B, "Operations Testing Manual/ECCS Operability," will be revised to clarify that performance of the procedure is an integral part of dynamic fill for the ECCS systems and was credited as part of the GL 2008-01 response.

Schedule/Basis for Schedule:

The procedure will be revised by October 11, 2009. Comanche Peak has not historically had issues with gas accumulation in these systems. The evaluation supporting this response has indicated that the existing process is adequate.

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Corrective Action No. 4 - Unit 1 Void
(See Section A.2.6)
(CAP Tracking Document - SmartForm 2008-003048)
(Commitment Number 3618697)

During UT examination of piping as part of the response to NRC Generic Letter 2008-01 performed under Work Order 3595784, a pocket of gas was found in line 12-RH-1-003-601R-2. This line slopes up from the elbow outside containment through the containment penetration to valve 1-8701A inside containment approximately 1.3 inches over the 24 feet length of the line. The measurement was taken inside containment at the high point in the line approximately 1 foot from valve 1-8701A. The measured distance from the top of the outside of the pipe to the surface of the water inside the pipe was 1.0 inches. The wall thickness of the 12 inch diameter schedule 40 pipe is 0.375 inches. Therefore, the gas void at this point is 0.625 inches. The acceptance criterion at this location is 2.5 inches.

Schedule/Basis for Schedule:

Comanche Peak determined that the amount of gas was within the acceptance requirement and operability of the system was not affected. The final cause determination will be completed by December 1, 2008.

Corrective Action No. 5 - Unit 2 Void
(See Section A.2.6)
(CAP Tracking Document - SmartForm 2008-003245)
(Commitment Number 3618705)

During UT examination of piping as part of the response to NRC Generic Letter 2008-01 performed under Work Order 3603564, a pocket of gas was found in line 12-RH-2-004-601R-2. This line slopes up from the elbow outside containment through the containment penetration to valve 2-8701B inside containment approximately 3.5 inches over the 20 feet length of the line. The measurement was taken inside containment at the high point in the line approximately 1 foot from valve 2-8701B. The measured distance from the top of the outside of the pipe to the surface of the water inside the pipe was 0.5 inches. The wall thickness of the 12 inch diameter schedule 40 pipe is 0.375 inches. Therefore, the gas void at this point is 0.125 inches. The acceptance criterion at this location is 2.5 inches.

Schedule/Basis for Schedule:

Comanche Peak determined that the amount of gas was within the acceptance requirement and operability of the system was not affected. The final cause determination will be completed by December 1, 2008.

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**Corrective Action No. 6 - Evaluate Generic Technical Specification Changes via TSTF process (See Section A.1.3)
(Commitment Number 3618706)**

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. Luminant Power 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, Luminant Power will evaluate its applicability to the Comanche Peak Units 1 and 2, and evaluate adopting the Traveler to either supplement or replace the current TS requirements within one year of TSTF approval by the NRC.

Schedule/Basis for Schedule:

Luminant Power will evaluate adopting the Traveler to either supplement or replace the current TS requirements within one year of TSTF approval by the NRC. This will allow for issues to be addressed generically by the industry and the NRC. The evaluation supporting the response to GL 2008-01 has determined that the current Comanche Peak Technical Specifications are adequate.

**Corrective Action No. 7 - Evaluate Industry Initiatives/Programs on Void effects on pumps and to determine impact on Comanche Peak Design Basis Documents
(See Sections A.2.3 and A.2.11)
(Commitment Number 3618707)**

Luminant Power will evaluate the results of industry initiatives regarding (1) void migration and the effects of void ingestion on pumps, (2) gas transport in pump suction piping, and (3) pump acceptance criteria for any impact on the design basis documents.

Schedule/Basis for Schedule:

Within one year of published results of the above industry initiatives, an impact evaluation will be completed. The evaluation supporting the response to GL 2008-01 has determined the current Comanche Peak process is adequate. The new Gas Intrusion Program described above will allow consideration of industry initiatives.

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B.3. Summary of the confirmatory action to be completed including the scope, schedule, and a basis for that schedule.

The commitment number is used by Luminant Power for the internal tracking of Comanche Peak commitments.

Confirmatory Action No. 1 - Confirmatory Unit 1 walkdown activities (six UT exams)
(See Section A.2.6)
(Commitment Number 3618708)

Luminant Power will issue a supplement within 30 days after MODE 1 is achieved for Unit 1. following completion of the Unit 1 fall refueling outage to report the completion of six confirmatory Unit 1 UTs and that the conclusions provided in this letter remain unchanged.

Schedule/Basis for Schedule:

Luminant Power will issue a supplemental report within 30 days after MODE 1 is achieved for Unit 1. The supplemental report will confirm completion of the remaining Unit 1 UTs and that the conclusions provided in this letter remain unchanged. There is a reasonable assurance of operability based on the completed confirmatory tests for both units and the operational history of both units.