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U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 6348 (SECTION 9.2.1)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein supplemental information for the response to Request for Additional Information (RAI) No. 6348 (CP RAI #251) for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. The supplemental information addresses void detection in the essential service water system.

Should you have any questions regarding the supplemental information, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

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

Executed on December 3, 2012.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

Rafael Flores

Attachment: Supplemental Response to Request for Additional Information No. 6348 (CP RAI #251)

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NRO

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SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 6348 (CP RAI #251)

SRP SECTION: 09.02.01 - Station Service Water System

QUESTIONS for Balance of Plant and Technical Specifications Branch (BPTS)

DATE OF RAI ISSUE: 3/13/2012

QUESTION NO.: 09.02.01-9

Related to COL Item 9.2(32), void detection, COL FSAR Section 9.2.1.2.3.1, "Power Operations," states that level switches are installed in the vertical piping before the cooling tower spray header to annunciate if system inventory reduction occurs. The detail of the detector is described in Subsection 9.2.5.5, "Instrumentation Requirements".

COL FSAR Section 9.2.5.5 states that level switches are installed in the vertical piping upstream of the cooling tower spray header to annunciate if system inventory reduction occurs. The factors considered for detector position are the allowable leakage rate for the ESW pump discharge check valve and motor-operated butterfly valve, allowable voiding volume and maintenance durations.

COL FSAR Figure 9.2.5-1R (sheets 1 and 2), "Essential Service Water System Piping and Instrumentation Diagram," shows the level switches with low water alarms in the vertical piping upstream of the cooling tower spray header.

Information related to the system inventory instrumentation related to void protection is missing or incomplete. The COL applicant is requested to address the following items:

1. The safety classification of the void protection instruments and power supplies, as described in Section 9.2.1 and 9.2.5 of the COL, is not specifically provided and should be added to the COL FSAR.
2. COL Chapter 14 testing or site specific inspections, test, analyses, and acceptance criteria, (ITAAC) are not specifically described for these ESWS voiding instruments and should be added to the COL application.
3. Failure Modes and Affects Analysis (FMEA) should be considered related to failures of these instruments to detect voiding.

SUPPLEMENTAL INFORMATION:

This supplemental response includes additional information based on NRC feedback regarding the response to this question. The information provided in the first supplemental response (ML12255A326) remains correct. This amended response pertains to water hammer and the UHS spray header level switches.

The last remaining FSAR references to the level switches were deleted when Figure 9.2.5-1R was deleted in the first supplemental response to CP RAI #254 (ML12269A462). The level switches are unnecessary as a void detection system for water hammer prevention because water hammer will not occur in Units 3 and 4 as described below.

According to EPRI Report TR-106438, "Water Hammer Handbook for Nuclear Plant Engineers and Operators," the causes of water hammer are the following:

1. Water Cannon
2. Steam/water Counterflow
3. Steam Pocket Collapse
4. Low Pressure Discharge
5. Water Slug
6. Valve Slam
7. Column Rejoining

Except for item 7, water hammer at the spray nozzles is not applicable to the items above. The phenomenon at the spray nozzles is only that water enters into an air space and the air is vented from the nozzles. Hence, the phenomenon is different from item 7 as well.

In addition, the ESW pump outlet MOVs open slowly, taking approximately 30 seconds from startup of the ESW pump to fully open. This is to sweep air from the cooling tower spray riser and distribution piping so there is no rapid increase in spray riser water level. Water hammer is prevented by this design. Therefore, the level switches which were installed in the spray headers as an additional precaution and defense-in-depth have been deleted. Failure of the safety-related outlet MOV to open slowly is considered to be a single failure.

The descriptions of the level switches have been deleted from the FSAR and the switches are not included in ITAAC or the FMEA.

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 1.8-50, 9.2-4, 9.2-5, 9.2-24, 9.2-29, 14.2-5, 14.2-6, and 14.2-7.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

CP COL 1.8(2)

Table 1.8-201 (Sheet 39 of 71)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 9.2(28)	The COL Applicant is to provide the piping, valves, materials specifications, and other design details related to the site-specific UHS.	9.2.5.2.2 9.2.5.2.3	3a
COL 9.2(29)	The COL Applicant is to provide the safety evaluation of the capability of the ESWS to: (1) isolate its site-specific, nonsafety-related portions; and (2) provide measures to prevent long-term corrosion and organic fouling that may degrade its performance, per Generic Letter (GL) 89-13.	9.2.1.3 13.5.2.1	3a
COL 9.2(30)	The COL Applicant shall conduct periodic inspection, monitoring, maintenance, performance and functional testing of the ESWS and UHS piping and components, including the heat transfer capability of the CCW heat exchangers and essential chiller units, consistent with GL 89-13 and GL.89-13 Supplement 1. The COL Applicant is to develop operating procedures to periodically alternate the operation of the trains to ensure performance of all trains is regularly monitored.	9.2.1.4 13.4 13.5 13.5.2.1	3a
COL 9.2(31)	The COL Applicant is to verify the system layout of the ESWS and UHS and is to develop operating procedures to assure that the ESWS and UHS are above saturation conditions for all operating modes.	9.2.1.2.1 9.2.5.2.2 9.2.5.2.3	3a
COL 9.2(32)	The COL Applicant is to ~~provide a void detection system with alarms to detect system voiding~~evaluate the need for a void detection system..	9.2.1.2.3.1 ~~9.2.5.5~~	3a
COL 9.2(33)	The COL Applicant is to provide the design details of the strainer blowdown line, vent line, and their discharge locations.	9.2.1.2.2.2	3a
COL 9.3(1)	The COL Applicant is to provide the high pressure nitrogen gas, low pressure nitrogen gas, the hydrogen gas, carbon dioxide, and oxygen supply systems.	9.3.1.2.1.3 9.3.1.2.2.3 Figure 9.3.1-201	3a

RCOL2_09.02.01-9 S02

backwash line to the basin ~~is interlocked to~~ closes when the ESW pump is stopped to preclude the system inventory drain down which can lead to water hammer at pump restart. Table 9.2.1-2R shows the redundancy for above functions. RCOL2_14.0 2-16 S01

An automatic vent valve is also installed to sweep out air introduced into the piping system by the vacuum breakers that are installed to prevent water hammer. The drainage is discharged as a floor drain of the UHSRS.

9.2.1.2.2.5 Piping

CP COL 9.2(7) Replace the fourth to seventh sentences with the following. RCOL2_09.0 2.01-8

~~The lining of inner surface for piping, fittings and flanges of ESWS is polyethylene.~~The rest of the ESWS piping, fittings, and flanges are carbon steel internally lined with polyethylene. Periodic visual inspections of the lining will be conducted to detect cracking, peeling, lining separation, abnormal color, or extraneous incrustation. The inspection will utilize the manholes and hand holes, and the pipe end flanges can be removed if necessary.

9.2.1.2.3.1 Power Operation

STD COL 9.2(32) ~~Replace the thirteenth sentence of the seventh paragraph in DCD Subsection 9.2.1.2.3.1 with the following:~~Replace the sentence starting with "The COL applicant is" in the seventh paragraph in DCD Subsection 9.2.1.2.3.1 and the subsequent conceptual design information regarding voiding with the following: RCOL2_09.0 2.01-9 S01 RCOL2_09.0 2.01-9 S02

~~Level switches are installed in the vertical piping before the cooling tower spray header to annunciate if system inventory reduction occurs. The detail of the detector is described in Subsection 9.2.5.5.~~Based on the following considerations, a void detection system is not required in the ESWS/UHS piping because:

- Operational procedures are in place to minimize the potential for water hammer (such as system filling, venting, and keeping most of the ESWS full of water).
- An analysis has been completed for the ESWS for water hammer impact with no adverse effects identified.
- The piping system has been designed to withstand potential water hammer forces, and

- An evaluation of inadvertent water hammer events has been completed and considered in the design.

RCOL2_09.02.01-9 S02

In addition, the air in the ESWS is vented from the cooling tower spray nozzles and ESW pump outlet MOVs open slowly so that a rapid increase in water level will not occur.

STD COL 9.2(7) Replace the sixth sentence of the eighth paragraph in DCD Subsection 9.2.1.2.3.1 with the following:

The IST program with detailed criteria, including valve leak rates committed to in the implementation milestones, is identified in Table 13.4-201.

9.2.1.3 Safety Evaluation

STD COL 9.2(1) Replace the sixteenth paragraph in DCD Subsection 9.2.1.3 with the following.

Design of the basin provides adequate submergence of the pumps to assure the NPSH for the pumps. The basin is divided into two levels. One is approximately 12 feet lower than the other, and directly above it is installed the ESWP. The ESWP is designed to operate with the lowest expected water level (after 30 days of accident mitigation). The basins have sufficient water inventory to assure adequate cooling and NPSH for 30 days without makeup. This is discussed further in Subsection 9.2.5.2.

Recovery procedures contained in the Operating and Maintenance Procedures (see Subsection 13.5.2.1) are implemented if the UHS approaches low water level.

CP COL 9.2(2) Replace the seventeenth paragraph in DCD Subsection 9.2.1.3 with the following.

Based on the lowest anticipated ambient temperature, the following countermeasures are provided to prevent the ESW from freezing in the basins or piping:

- The basins are located below grade and thus ground temperature prevents water from freezing.

- In the operating trains, water is continuously circulated which helps to prevent freezing. Ultimate heat sink (UHS) transfer pumps can be used to circulate water from the idle basins. Plant procedures are developed to operate the pumps in this mode based on the basin water and ambient temperatures.

Continuous system operation at pressures and flows near accident conditions, periodic heat exchanger performance tests, surveillance tests and monitoring of various parameters assure that the ESWS and UHS perform their safety functions in accordance with the requirements of GDC 46.

The inspection and testing provisions described above are subject to programmatic requirements and procedural controls as described in FSAR Section 13.5.

Manholes, handholes, inspection ports, ladder, and platforms are provided, as required, for periodic inspection of system components.

Maintenance and test procedures to monitor debris build up and flush out debris in the UHS are discussed in Subsection 9.2.1.2.1.

9.2.5.5 Instrumentation Requirements

STD COL 9.2(24)
~~STD COL 9.2(32)~~

Replace the first paragraph in DCD Subsection 9.2.5.5 with the following. RCOL2_09.02.01-9 S02

Water level in each of the basins is controlled by safety-related level instrumentation that opens or closes the automatic valves in the makeup lines. RCOL2_09.02.05-22

Two level transmitters and associated signal processors are provided for each basin to indicate water level in the basin and annunciate in the MCR for both the high and low water levels in the basin. Loss of one electrical train still leaves at least one instrument functional since the level transmitters and associated signal processors are powered by different Class 1E trains. RCOL2_09.02.05-22

A water level signal at six inches below the normal water level causes the makeup water control valve to open. A signal at normal water level then causes the makeup control valve to close. A low level alarm annunciates in the MCR whenever the water level falls one foot below the normal water level.

During accident conditions, level indications from the operating basins are used to alert the MCR operator to start the UHS transfer pump to transfer water from the idle basin to the operating basins.

Blowdown rate is controlled manually. The blowdown control valves close automatically upon receipt of a low water level signal or emergency core cooling system actuation signal. The valve is designed to fail in the close position. Failure of the valve to close is indicated in the MCR.

The non safety-related conductivity cells are provided at the ESW pump discharge line and conductivity are indicated in the MCR. RCOL2_09.02.05-22

Safety related ~~T~~temperature elements are provided in each basin and temperatures are indicated in the MCR. RCOL2_09.02.05-22

This COL Item is addressed in Subsection 9.2.1.2.1, 9.2.5.2.2, 9.2.5.2.3.

CP COL 9.2(32)
STD COL 9.2(32)

9.2(32) *Void detection system*

This COL Item is addressed in Subsection 9.2.1.2.3.1~~, 9.2.5.5~~.

RCOL2_09.02.01-9 S02

STD COL 9.2(33) ***9.2(33)*** *Design detail of the strainer backwash line, vent line, and their discharge locations*

This COL Item is addressed in Subsection 9.2.1.2.2.2.

STD COL 14.2(10) Add new item after item C.7 in DCD Subsection 14.2.12.1.90 as follows.

8. Verify that local offsite fire departments utilize hose threads or adapters capable of connecting with onsite hydrants, hose couplings, and standpipe risers.

Replace DCD Subsections 14.2.12.1.113 and 14.2.12.1.114 with the following.

STD COL 14.2(10) **14.2.12.1.113 Ultimate Heat Sink (UHS) System Preoperational Test**

A. Objectives

1. To demonstrate operation of the UHS cooling towers and associated fans, essential service water (ESW) pumps, ~~and~~ UHS transfer pumps, and associated valves. RCOL2_14.02-16 S01 RCOL2_09.02.05-21

2. ~~With the basin at minimum level (end of the 30 day emergency period), to demonstrate that the ESW pumps and the UHS transfer pumps maintain design flow rates.~~ To demonstrate that the ESW pumps and the UHS transfer pumps have adequate NPSH and maintain design flow rates without vortex formation with the basin at minimum level (end of the 30-day emergency period). RCOL2_09.02.01-6

3. ~~To demonstrate the operation of the UHS transfer pumps.~~ To demonstrate the operation of the UHS basin water level and temperature sensors, logic, and associated control functions; water chemistry monitors, logic, and associated control functions; ESW pump start logic, interlocks, and associated control functions; ESW pump discharge strainer isolation and backwash valves and valve logic; associated makeup and blowdown equipmen~~and spray header level switches and logic~~. RCOL2_14.02-16 S01 RCOL2_14.02-21 RCOL2_09.02.01-9 S01

4. ~~To demonstrate the operation of the UHS basin water level sensors and basin water level controls, and water chemistry monitors, controls, basin water level logic, and associated blowdown equipment.~~ To demonstrate the absence of any significant water hammer during ESW pump and UHS transfer pump starts and stops with voids in the spray headers or nozzles. RCOL2_14.02-16 S01 RCOL2_14.02-21 RCOL2_09.02.01-9 S02

5. To demonstrate the ability of the UHS, in conjunction with the ESWS, CCWS, and RHRS, to cool down the RCS. RCOL2_14.02-20

6. To demonstrate that simultaneous operation of ESW pumps and UHS transfer pumps will not result in vortices that would interfere with each other. RCOL2_09.02.05-20 S02

B. Prerequisites

1. Required construction testing is completed.
2. Component testing and instrument calibration is completed.
3. Test instrumentation is available and calibrated.
4. Required support systems are available.
5. Required system flushing/cleaning is completed.
6. Required electrical power supplies and control circuits are energized and operational.
7. Makeup water to the UHS basins is available.
8. CS/RHRS, CCWS, and ESWS are available during hot functional testing. RCOL2_14.0 2-20

C. Test Method

1. System component control and interlock circuits and alarms are verified, including cooling tower fan logic, basin water level sensors, temperature sensors, makeup water control, basin process chemical sensors, ~~spray header level switches,~~ blowdown control valves and ESW return line drain valves. RCOL2_14.0 2-16 S01; RCOL2_09.0 2.01-9 S01; RCOL2_14.0 2-21
2. The performance of each ESW pump and UHS transfer pump are monitored as basin water level is decreased to the minimum water level (end of the 30 day emergency period) and with various amounts of voiding in the spray headers and nozzles. RCOL2_14.0 2-21 S01; RCOL2_09.0 2.01-9 S02
3. Basin water level and chemistry controls are monitored during continuous operations in the water level and chemistry control mode using the ESWS blowdown feature.
4. The capability of the ESWS to provide water to the FSS is demonstrated by opening the isolation valves and obtaining a total flow of at least 150 gpm to the hose stations located in the R/B and ESWS pump house while maintaining required ESWS flows and pressures.
5. UHS performance data is monitored during RCS cooldown in conjuction with hot functional testing. RCOL2_14.0 2-20
6. ESW pump and UHS transfer pump in the same basin are operated simultaneously. The performance of each ESW pump and UHS transfer pump are monitored as basin water level is RCOL2_09.0 2.05-20 S02

decreased to the minimum water level (end of the 30 day emergency period) during simultaneous operation of two pumps. RCOL2_09.0 2.05-20 S02

D. Acceptance Criteria

1. With the basin at minimum level (end of the 30 day emergency period), each ESW pump and UHS transfer pump has adequate NPSH and maintain design flow rates without vortex formation. RCOL2_14.0 2-21

2. The UHS fans operate as discussed in Subsection 9.2.5, including speed and direction.

3. ~~UHS transfer pumps operate as discussed in Subsection 9.2.5.~~ESW pumps, UHS transfer pumps, associated ~~manual valves and~~ motor-operated valves operate from their associated Class 1E buses as discussed in Subsections 9.2.1 and 9.2.5. RCOL2_14.0 2-21 S02 RCOL2_14.0 2-21 S01

4. ~~UHS basin water level sensors and basin water level controls, and water chemistry monitors, controls, interlocks and associated blowdown equipment operate as discussed in Subsection 9.2.5.~~The UHS basin water level and temperature sensors, logic, and associated control functions; water chemistry monitors, logic, and associated control functions; ESW pump start logic, interlocks, and associated control functions; ESW pump discharge strainer isolation and backwash valves and valve logic; associated makeup and blowdown equipment~~; and spray header level switches and logic; and electric heat tracing~~ operate as discussed in Subsections 9.2.1 and 9.2.5. RCOL2_14.0 2-16 S01 RCOL2_14.0 2-16 S01 RCOL2_14.0 2-21 RCOL2_09.0 2.01-9 S01 RCOL2_14.0 2-21 S01

5. ESWS maintains required flows and pressures while water is provided to the FSS as described in Subsection 9.2.1.3. RCOL2_14.0 2-21 S02

6. Significant water hammer does not occur during ESW pump and UHS transfer pump starts and stops with voids in the spray headers or nozzles. RCOL2_14.0 2-21 RCOL2_09.0 2.01-9 S02

7. The UHS is capable of cooling down the RCS as discussed in Subsections 9.2.1 and 9.2.5. RCOL2_14.0 2-20

8. With the basin at minimum level (end of 30 day emergency period), significant vibration or cavitation is not observed with each ESW pump and UHS transfer pump during two-pump operation whether vortex exists or not. RCOL2_09.0 2.05-20 S02

STD COL 14.2(10)

14.2.12.1.114 UHS ESW Pump House Ventilation System Preoperational Test

A. Objectives