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June 7, 2012

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
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 6358
(SECTION 9.2.5)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Request for Additional Information (RAI) No. 6358 (CP RAI #252) for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. The RAI addresses the ultimate heat sink design.

Should you have any questions regarding this response, 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 June 7, 2012.

Sincerely,

Luminant Generation Company LLC

Donald R. Woodlan for

Rafael Flores

Attachment: Response to Request for Additional Information No. 6358 (CP RAI #252)

D090
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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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-18

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(3) and 9.2(28) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, "Cooling Water".

The applicant does not provide an evaluation or discussion in the COL FSAR for possible cooling tower plume interference and recirculation effects with other safety related air intakes and other cooling towers in the vicinity. Specifically, the applicant is requested to address in the FSAR:

- Ultimate Heat Sink (UHS) cooling tower interference (tower effluent being drawn into the air inlet of a downwind tower). This should include interference among all cooling towers at the site, including between units) related to the design performance of the UHS cooling towers.
- Cooling tower plume recirculation effects with other safety-related air intakes at the site.

ANSWER:

Cooling tower plume interference and recirculation effects could adversely affect HVAC systems and other cooling tower operation due to potential increased humidity and air temperature. The UHS cooling towers are designed and located to withstand the expected effects without significant compromise of the functions of the other UHS cooling towers of the same unit and the UHS cooling towers of the other unit, the Gas Turbine Generator (GTG) safety-related air intakes for both units, and air intakes for safety-related HVAC systems for both units. The cooling tower shape combined with the cooling tower height is designed to achieve an air discharge velocity and height that ensures proper dissipation of the plume, which minimizes plume interference and recirculation on the other UHS cooling towers and nearby safety-related air intakes. The temperature of plume exhausted from the cooling tower is higher than the local ambient air temperature, so buoyancy causes the thermal plume to rise under low wind conditions. However, high wind conditions that could direct a plume toward the intakes, would result in rapid air dispersion and mixing that cools the plume.

FSAR Subsection 9.2.5.2.1 has been revised to clarify that the cooling tower design minimizes plume interference and recirculation.

Impact on R-COLA

See attached marked-up FSAR Revision 2 page 9.2-14.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

used to calculate the required capacity of the cooling tower and the ESW pump design flow rate is conservatively specified as 13,000 gpm. RCOL2_09.02.05-20

Cooling tower plume interference and recirculation effects could adversely affect HVAC systems and other cooling tower operation due to potential increased humidity and air temperature. The UHS cooling towers are designed and located to accept the expected effects without significant compromise of the functions of the other UHS cooling towers of the same unit and of the UHS cooling towers of the other unit, the Gas Turbine Generator (GTG) safety-related air intakes for both units, and air intakes for safety-related HVAC systems for both units. The cooling tower shape combined with the cooling tower height is designed to achieve an air discharge velocity and height that ensures proper dissipation of the plume which minimizes plume interference and recirculation on the other UHS cooling towers and nearby safety-related air intakes. RCOL2_09.02.05-18

As noted in DCD Subsection 5.4.7.1, “Design Bases,” and DCD Subsection 5.4.7.3, “Performance Evaluation,” with ESW water temperature of 95° F, the RHRS is capable of reducing the reactor coolant temperature from 350° F to 200° F within 36 hours after shutdown. As the Technical Specifications surveillance ensures that the UHS basin water temperature to be 93° F or less, the evaluation provided in DCD Section 5.4.7 is bounding.

Inside dimensions of each basin are approximately 123 feet x 123 feet footprint and 31 feet deep at normal water level. The basin water volume is calculated based on a usable area of 120 feet x 120 feet. The cooling towers utilize the basins for structural foundation. RCOL2_09.02.05-22

The ESW intake basin located underneath the ESW pump house occupies the southwest corner of the UHS basin. The ESW intake basin is 12 feet deeper than the UHS basin. Water volume occupying this 12 feet depth in the ESW intake basin is not included in the UHS basin inventory. This is to assure adequate NPSH to the ESW pump. The UHS basin floor elevation (791 feet) is the reference point for measuring the basin water level.

The UHS operates in conjunction with the ESWS. The ESWS is described in Subsection 9.2.1. P&IDs of the UHS are provided in Figure 9.2.5-1R. The UHS design and process parameters are provided in Table 9.2.5-3R. The normal makeup water to the UHS inventory is from Lake Granbury via the circulating water system described in Subsection 10.4.5. A control valve with instrumentation located in each makeup line maintains basin water level during normal operation. A control valve and isolation valve in each makeup line are located in the UHSRS for accessibility and to not be affected by potential plume and heat from a cooling tower. The blowdown water is discharged to Lake Granbury via the circulating water system. RCOL2_09.02.05-23

The normal maintained water level in the UHS basin is elevation 822 feet. Grade elevation in the vicinity of the basin is 822 feet. A four feet thick basin wall extends four feet above grade level to elevation 826 feet providing a curb around the

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-19

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(3) and 9.2(28) and finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, "Cooling Water". Specifically, the applicant is requested to address in the FSAR:

> UHS piping materials (including the UHS transfer piping material) that are not described in the FSAR. For the UHS piping system, outside the scope of the ESWS, describe the materials to be utilized (carbon or alloy), ASME Code class, and if the system is internal lined and/or has cathodic protection. This FSAR description should be similar to US-APWR DCD and COL FSAR Sections 9.2.1.2.2.5, "Piping".

ANSWER:

The UHS piping material, including the UHS transfer piping, is carbon steel with an internal polyethylene lining. The piping is not buried, so cathodic protection is not provided. The UHS piping material description has been added to FSAR Subsection 9.2.5.2.1.

The ASME Code class piping is described in Figure 9.2.5-1R. The equipment class of piping of the ESW return line and the UHS transfer line is EC3, and the equipment class of the piping of the CWS makeup water main header line is EC5.

Impact on R-COLA

See attached marked-up FSAR Revision 2 page 9.2-13.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

The source of cooling water and location of the UHS are discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW intake structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW discharge structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

9.2.5.2.1 General Description

CP COL 9.2(1)
CP COL 9.2(3)
CP COL 9.2(4)
CP COL 9.2(5)
CP COL 9.2(18)
CP COL 9.2(19)
CP COL 9.2(20)
CP COL 9.2(21)

Replace DCD Subsection 9.2.5.2.1 with the following.

Each unit is provided with its own independent UHS, with no sharing between the two units. The UHS for each unit consists of four 50 percent capacity mechanical draft cooling towers, one for each ESWS train, and four ~~33~~ one-third percent capacity basins to satisfy the thirty day cooling water supply criteria of RG 1.27.

Each cooling tower consists of two cells with fans and motors, drift eliminators, film fills, risers, and water distribution system all enclosed and supported by a seismic category I reinforced concrete structure. Cooling tower components are designed per equipment Class 3 and quality group C requirements. Each basin includes an ESWP intake structure that contains one 50 percent capacity ESWP and one 100 percent capacity UHS transfer pump, and associated piping and components. The UHS system is classified as a moderate-energy system. The UHS piping material, including the UHS transfer piping, is carbon steel with an internal polyethylene lining. The piping is not buried; therefore, cathodic protection is not utilized. Tornado missile protection for the cooling tower components, ESWPs and piping is provided by the UHS safety-related seismic category I structures and ESW pipe tunnel as discussed in Subsection 3.8.4. The UHS structural design, including pertinent dimensions, is also discussed in Subsection 3.8.4.

RCOL2_09.02.05-25
RCOL2_09.02.05-19

Each cooling tower consists of two cells, each with a motor driven fan driven with a right-angle gear reducer. The fan motors are powered from the Class 1E normal ac power system. On loss of offsite power (LOOP), the motors are automatically powered from their respective division emergency power source.

The cooling towers are designed for the following conditions: water flow of 12,000 gpm, hot (inlet) water temperature of 128° F, cold (outlet) water temperature of 95° F, ambient wet bulb temperature of 80° F, and DBA design heat load of 196.00×10^6 Btu/hr.

Each ESW pump is designed to provide 13,000 gpm. In general, the efficiency of removing heat from the cooling tower improves if the supply flow rate to the cooling tower is large. Therefore, the supply flow rate to the cooling tower is estimated to be smaller than the realistic flow rate. The flow rate of 12,000 gpm is

RCOL2_09.02.05-20

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-20

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(18) finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, "Cooling Water". Specifically, the applicant is requested to address in the FSAR:

The applicant stated in several places (for example FSAR 9.2.5.2.1 and 9.2.5.2.3), that the cooling towers are designed for 12,000 gpm whereas Table 9.2.5-3R, "Ultimate Heat Sink System Design Data," states the design flow rate of the ESWS pumps is 13,000 gpm. This discrepancy needs to be clarified.

COL FSAR Section 9.2.5.2.2 describes that the UHS transfer pump and the ESW pump from the same basin do not operate simultaneously. Describe what controls are in place, such as interlocks, during quarterly UHS transfer pump testing (COL FSAR Table 3.9-202, "Site-Specific Pump IST Requirements,") that prevent the ESWS pumps from operating simultaneously with the UHS transfer pump; for instance if there were an automatic start signal of the ESWS pumps during a ECCS actuation signal, as described in DCD Section 9.2.1.2.3.2, "Emergency Operations."

- Also describe in the FSAR if the UHS transfer system remains full of water or placed in 'layup' after UHS transfer pump testing and what chemical controls (to prevent pipe wall thinning) are used if extended wet layup conditions is utilized.

ANSWER:

- Each ESW pump is designed to provide 13,000 gpm. In general, the efficiency of removing heat from the cooling tower improves if the supply flow rate to the cooling tower is large. Therefore, the supply flow rate to the cooling tower was assumed to be less than the actual flow rate. A flow rate of 12,000 gpm was used to calculate the required capacity of the cooling tower and the ESW pump design flow rate was conservatively specified as 13,000 gpm. This clarification has been added to FSAR Subsection 9.2.5.2.1.

- FSAR Subsection 9.2.5.2.2 states:

  > The UHS transfer pump(s) operate during accident conditions, during IST in accordance with plant Technical Specifications, during maintenance, and for brief periods during cold weather conditions for recirculation.

  Although it is not a normal operating condition, the UHS transfer pump and the ESW pump in the same basin may operate simultaneously. Under these conditions the UHS transfer pump and ESW pumps will be able to perform their safety functions because the basin water inventory is sufficient even at the minimum allowable basin water level for both pumps to operate simultaneously until the UHS transfer pump is stopped by operators. The water inventory of the basin will decrease if the operator does not realize that both the ESW pump and the UHS transfer pump of the same basin are operating. An alarm will annunciate in the main control room when the basin water level reaches the low water set point and the operator will stop the UHS transfer pump. There is no adverse impact on the safety function in this case because water can be supplied by starting the UHS transfer pump in an idle basin if necessary.

  This description has been added to FSAR Subsection 9.2.5.2.2.

- FSAR Subsection 9.2.5.2.1 states:

  > A chemical injection system is designed to provide non-corrosive, non-scale forming conditions in the UHS basin and ESWS piping to limit biological film formation. The type of biocide, algaecide, pH adjuster, corrosion inhibitor, scale inhibitor and silt dispersant is determined by the Lake Granbury water quality.

  The chemical condition and quality of the ESW is controlled. The UHS transfer system piping is carbon steel with an internal polyethylene lining to reduce corrosion and water does not flow in the transfer piping except during periodic operation of the UHS transfer pump. The UHS transfer system is designed such that pipe wall thinning will not occur. After UHS transfer pump testing, the UHS transfer system remains full of chemically treated ESW except for the discharge piping from the basin inlet valve, which is drained.

  The above description has been added to FSAR Subsection 9.2.5.2.2.

Impact on R-COLA

See attached marked-up FSAR Revision 2 page 9.2-13, 9.2-14, 9.2-16 and 9.2-17.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

The source of cooling water and location of the UHS are discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW intake structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW discharge structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

9.2.5.2.1 General Description

CP COL 9.2(1)
CP COL 9.2(3)
CP COL 9.2(4)
CP COL 9.2(5)
CP COL 9.2(18)
CP COL 9.2(19)
CP COL 9.2(20)
CP COL 9.2(21)

Replace DCD Subsection 9.2.5.2.1 with the following.

Each unit is provided with its own independent UHS, with no sharing between the two units. The UHS for each unit consists of four 50 percent capacity mechanical draft cooling towers, one for each ESWS train, and four 33 one-third percent capacity basins to satisfy the thirty day cooling water supply criteria of RG 1.27.

Each cooling tower consists of two cells with fans and motors, drift eliminators, film fills, risers, and water distribution system all enclosed and supported by a seismic category I reinforced concrete structure. Cooling tower components are designed per equipment Class 3 and quality group C requirements. Each basin includes an ESWP intake structure that contains one 50 percent capacity ESWP and one 100 percent capacity UHS transfer pump, and associated piping and components. The UHS system is classified as a moderate-energy system. The UHS piping material, including the UHS transfer piping, is carbon steel with an internal polyethylene lining. The piping is not buried; therefore, cathodic protection is not utilized. Tornado missile protection for the cooling tower components, ESWPs and piping is provided by the UHS safety-related seismic category I structures and ESW pipe tunnel as discussed in Subsection 3.8.4. The UHS structural design, including pertinent dimensions, is also discussed in Subsection 3.8.4. RCOL2_09.02.05-25 RCOL2_09.02.05-19

Each cooling tower consists of two cells, each with a motor driven fan driven with a right-angle gear reducer. The fan motors are powered from the Class 1E normal ac power system. On loss of offsite power (LOOP), the motors are automatically powered from their respective division emergency power source.

The cooling towers are designed for the following conditions: water flow of 12,000 gpm, hot (inlet) water temperature of 128° F, cold (outlet) water temperature of 95° F, ambient wet bulb temperature of 80° F, and DBA design heat load of 196.00×10^6 Btu/hr.

Each ESW pump is designed to provide 13,000 gpm. In general, the efficiency of removing heat from the cooling tower improves if the supply flow rate to the cooling tower is large. Therefore, the supply flow rate to the cooling tower is estimated to be smaller than the realistic flow rate. The flow rate of 12,000 gpm is RCOL2_09.02.05-20

used to calculate the required capacity of the cooling tower and the ESW pump design flow rate is conservatively specified as 13,000 gpm. RCOL2_09.02.05-20

Cooling tower plume interference and recirculation effects could adversely affect HVAC systems and other cooling tower operation due to potential increased humidity and air temperature. The UHS cooling towers are designed and located to accept the expected effects without significant compromise of the functions of the other UHS cooling towers of the same unit and of the UHS cooling towers of the other unit, the Gas Turbine Generator (GTG) safety-related air intakes for both units, and air intakes for safety-related HVAC systems for both units. The cooling tower shape combined with the cooling tower height is designed to achieve an air discharge velocity and height that ensures proper dissipation of the plume which minimizes plume interference and recirculation on the other UHS cooling towers and nearby safety-related air intakes. RCOL2_09.02.05-18

As noted in DCD Subsection 5.4.7.1, “Design Bases,” and DCD Subsection 5.4.7.3, “Performance Evaluation,” with ESW water temperature of 95° F, the RHRS is capable of reducing the reactor coolant temperature from 350° F to 200° F within 36 hours after shutdown. As the Technical Specifications surveillance ensures that the UHS basin water temperature to be 93° F or less, the evaluation provided in DCD Section 5.4.7 is bounding.

Inside dimensions of each basin are approximately 123 feet x 123 feet footprint and 31 feet deep at normal water level. The basin water volume is calculated based on a usable area of 120 feet x 120 feet. The cooling towers utilize the basins for structural foundation. RCOL2_09.02.05-22

The ESW intake basin located underneath the ESW pump house occupies the southwest corner of the UHS basin. The ESW intake basin is 12 feet deeper than the UHS basin. Water volume occupying this 12 feet depth in the ESW intake basin is not included in the UHS basin inventory. This is to assure adequate NPSH to the ESW pump. The UHS basin floor elevation (791 feet) is the reference point for measuring the basin water level.

The UHS operates in conjunction with the ESWS. The ESWS is described in Subsection 9.2.1. P&IDs of the UHS are provided in Figure 9.2.5-1R. The UHS design and process parameters are provided in Table 9.2.5-3R. The normal makeup water to the UHS inventory is from Lake Granbury via the circulating water system described in Subsection 10.4.5. A control valve with instrumentation located in each makeup line maintains basin water level during normal operation. A control valve and isolation valve in each makeup line are located in the UHSRS for accessibility and to not be affected by potential plume and heat from a cooling tower. The blowdown water is discharged to Lake Granbury via the circulating water system. RCOL2_09.02.05-23

The normal maintained water level in the UHS basin is elevation 822 feet. Grade elevation in the vicinity of the basin is 822 feet. A four feet thick basin wall extends four feet above grade level to elevation 826 feet providing a curb around the

positive pressure at the spray nozzle headers. This together with the high point vents minimize system drain down in the idle trains or upon loss of offsite power and subsequent pump trip.

The following features preclude or minimize water hammer forces:

- On loss of off-site power (LOOP), the discharge MOV of the operating train is closed by DC power. This, together with the discharge check valve, prevents draindown to the basin.
- The ESW pump start logic interlocks the discharge MOV operation with the pump operation. The re-start of the tripped pump or start of the stand-by pump, opens the discharge valve slowly after a pre-determined time delay, sweeping out voids from the discharge piping and CT riser and distribution piping.
- The system valve lineup and periodic inservice testing of the idle trains, including testing of the high point vents, help minimize potential voids and water hammer forces.

Four 100% capacity UHS transfer pumps, one located in each UHS ESW pump house, are provided to transfer cooling water from a non-operating UHS basin to the operating UHS basins when required during accident conditions.

All transfer pumps discharge into a common header which in turn discharges to individual UHS basins. All discharge piping is located in missile protected and tornado protected areas. The common discharge header and other UHS system piping are designed to seismic Category I requirements. The piping is located in seismic Category I structures. There is no non-seismic piping in the vicinity of this header, and there are no seismically induced failures. Pipes are protected from tornado missiles. The UHS transfer pump(s) operate during accident conditions, during IST in accordance with plant Technical Specifications, during maintenance, and for brief periods during cold weather conditions for recirculation. As the header is normally not in service, deterioration due to flow-accelerated corrosion is insignificant. Transfer of water inventory is required assuming one train/basin of ESW/UHS is out of service (e.g., for maintenance), and a second train is lost due to a single failure. When a transfer pump is in operation, fluid velocity in the header is approximately 5.1 ft/sec. Operating conditions are approximately 20 psig and 95° F. Therefore, header failures are not considered credible.

The UHS transfer pump is designed to supply 800 gpm flow at a total dynamic head (TDH) of 40 feet. Transfer pump capacity is more than adequate to replenish the maximum water inventory losses from two operating ESWS trains. Minimum available net positive suction head (NPSHA) is approximately 40 feet. This is based on the lowest expected water level of approximately 12 feet in the UHS ESW intake basin and 95° F water temperature. Transfer pump location and submergence level precludes vortex formation. In addition, the transfer pump and the ESW pump from the same basin typically do not operate simultaneously. RCOL2_09.02.05-20

Although it is not a normal operating condition, the UHS transfer pump and the ESW pump in the same basin may operate simultaneously. Under these conditions the UHS transfer pump and ESW pumps will be able to perform their safety functions because the basin water inventory is sufficient even at the minimum allowable basin water level for both pumps to operate simultaneously until the UHS transfer pump is stopped by operators. The water inventory of the basin will decrease if the operator does not realize that both the ESW pump and the UHS transfer pump of the same basin are operating. An alarm will be annunciated to the MCR when the basin water level reaches the low water set point and the operator will stop the UHS transfer pump. There is no adverse impact on the safety function in this case because water can be supplied by starting the UHS transfer pump in an idle basin. RCOL2_09.02.05-20

The chemical condition and quality of the ESW is controlled. The UHS transfer system piping is carbon steel with an internal polyethylene lining to reduce corrosion and water does not frequently flow other than periodic operation of the UHS transfer pump. The UHS transfer system is designed such that pipe wall thinning will not occur. After UHS transfer pump testing, the UHS transfer system remains full of chemically treated ESW except for the discharge piping from the basin inlet valve to another basin, which is drained.

The UHS transfer pumps and the ESWPs located in each basin are powered by the different Class 1E buses, e.g., for basin A, the ESWP is powered from bus A, and the UHS transfer pump is powered from bus C or D, depending on manual breaker alignment. The power operated valve at each transfer pump discharge and instrumentation associated with each individual transfer pump are powered from the same buses as the transfer pump. The power operated valves at the transfer lines discharging into the UHS basins are powered from different buses than the transfer pumps in their respective basins.

The cooling tower fans are automatically activated by the emergency core cooling system (ECCS) actuation signal, the LOOP sequence actuation signal, or the remote manual actuation signal in case of automatic actuation failure.

The ECCS actuation signal ensures continuous cooling to the reactor during accidents to allow the reactor to be brought to safe shutdown condtions. The LOOP sequence actuation signal automatically starts the Class 1E gas turbine generators (GTGs) to resume power to the active components in each UHS train during LOOP events.

The basins are concrete seismic category I structures and are located mostly below grade. Hence, a complete failure resulting in loss of water inventory is considered highly improbable.

Operation details of the ESWS, including chemical treatment, pump NPSH, and freeze protection operation, are provided in Subsection 9.2.1.

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-21

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(19) finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, "Cooling Water". Specifically, the applicant is requested to address in the FSAR:

Neither COL FSAR Section 9.2.5 or Section 8.3 clearly states what the power supplies for the UHS transfer pumps, associated pump discharge motor operated valves (MOVs), and associated basin inlet MOVs are based on since no reference drawings, figures, or tables could be found in the COL FSAR. This information should be provided in the FSAR.

The applicant is requested to discuss how electrical separation will be maintained in the ESW pump house considering there may be multiple trains of safety related power in the same room susceptible to flooding or fire.

The FSAR for Chapter 14 testing and site-specific ITAAC should clearly describe testing of the UHS transfer pumps and associated MOVs from their safety-related power supplies.

ANSWER:

- The power supplies are based on each of the four basins having a 33 1/3% capacity of the 30-day cooling requirement. The power supply for the UHS transfer pumps, associated pump discharge MOVs, and associated basin inlet MOVs is based on moving water from a non-operating basin to the other two operating basins.

  The power supplies for the UHS transfer pumps and associated pump MOVs are shown in Table 1. These pumps and MOVs are safety-related components powered by safety-related power sources. Class 1E electrical trains are different for each ESW pump. The UHS transfer pumps and the ESW pumps located in each basin are powered by different Class 1E buses. The MOV at each transfer pump discharge is powered from the same bus as the transfer pump. The MOVs at the transfer lines discharging into the UHS basins are powered from the same buses as the ESW pump in their respective basins. FSAR Subsection 9.2.5.2.2 currently provides this discussion.

Table 1: Power supply train for ESWP/UHS related components

Component	Power Supply Train
A-ESW Pump	A Train
B-ESW Pump	B Train
C-ESW Pump	C Train
D-ESW Pump	D Train
A-UHS Transfer Pump	D1 Train
B-UHS Transfer Pump	D1 Train
C-UHS Transfer Pump	A1 Train
D-UHS Transfer Pump	A1 Train
A-UHS Transfer Pump outlet MOV	D1 Train
B-UHS Transfer Pump outlet MOV	D1 Train
C-UHS Transfer Pump outlet MOV	A1 Train
D-UHS Transfer Pump outlet MOV	A1 Train
A-Basin inlet MOV	A Train
B-Basin inlet MOV	B Train
C-Basin inlet MOV	C Train
D-Basin inlet MOV	D Train

- Electrical separation between the UHS transfer pump, associated basin inlet MOVs and instrumentation, the ESW pump, and associated basin outlet valves and instrumentation is maintained by routing cables within the respective fire area.

- The requirement regarding safety-related power supply for the UHS transfer pumps and associated MOVs has been added to FSAR Subsection 14.2.12.1.113. COLA Part 10 Appendix A.1 Table A.1-1 Items 6, 8, and 9 provide site-specific ITAAC for the UHS transfer pumps and associated MOVs.

<u>Impact on R-COLA</u>

See attached marked-up FSAR Revision 2 pages 14.2-5 and 14.2-6.

<u>Impact on S-COLA</u>

None; this response is site-specific.

<u>Impact on DCD</u>

None.

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 RCOL2_09.02.01-6

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).

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; and operation of associated makeup and blowdown equipment. RCOL2_14.02-16 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.~~

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.

C. Test Method

1. System component control and interlock circuits and alarms are verified, including cooling tower fan logic, basin water level sensors, makeup water control, basin process chemical sensors, and blowdown control valves. RCOL2_14.02-16 S01

2. The performance of each ESW pump and UHS transfer pump ~~are~~is monitored as basin water level is decreased to the minimum water level (end of the 30 day emergency period).

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.

D. Acceptance Criteria

1. With the basin at minimum level (end of the 30 day emergency period), each ESW pump and UHS transfer pump maintain design flow rates.

2. ~~UHS transfer pumps operate as discussed in Subsection 9.2.5.~~ESW pumps, UHS transfer pumps and associated motor-operated valves operate from their associated Class 1E buses as discussed in Subsections 9.2.1 and 9.2.5. RCOL2_09.02.05-21

3. ~~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; and associated makeup and blowdown equipment operate as discussed in Subsection 9.2.1 and 9.2.5. RCOL2_14.02-16 S01

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-22

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2 (19, 20, and 22) finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 44, "Cooling Water". Specifically, the applicant is requested to address in the FSAR:

- The applicant states two different dimensions for the UHS Basin (approximately 123 ft x 123 ft) in FSAR Section 9.2.5.2.1 and 120 ft X 120 ft in FSAR Section 9.2.5.3. This needs to be clarified.
- FSAR Section 9.2.5 is unclear about what UHS instrumentation is safety related and what has safety grade electrical power. Instrumentation of concern includes: basin water level, basin water temperature, conductivity, flow/pressure, cooling tower fan vibration, and spray header level switches. Note: Part 10 (ITAAC - Table A.1-2) of the COL only has the UHS basin level and water temp as safety class 1E and seismic category I.
- Figure 9.2.5-1R describes that each UHS basin has two level instruments with high and low alarms. Since the UHS transfer pumps have different power supplies than the ESWS pump in the same pump house, describe the respective power supplies for the redundant UHS basin water level instruments. Since the ESWS A pump is supplied by bus A and the UHS transfer pump A is powered from bus C or D, describe in the FSAR the basis for concluding that, in the event of loss of a single power supply (say A), basin level indication is still available for level determination to operated the UHS transfer pump powered from bus C or D.
- Table 9.2.5-4R, "UHS Failure Modes and Effects Analysis," does not adequately describe the 'safety function' related to the effects on system safety function capability related to the loss of the UHS transfer pumps and discharge/inlet valves.
- Table 9.2.5-4R, "UHS Failure Modes and Effects Analysis," has a valve numbering error, AOV-560 in three places (should be AOV-577).

ANSWER:

- The dimension of 123 ft x 123 ft is the physical inside dimensions of each UHS basin for the basin footprint. The dimension of 120 ft x 120 ft is the calculated useable area of each UHS basin, excluding areas which do not contribute to the basin water volume (e.g., any column or wall sections). This clarification has been added to FSAR Subsection 9.2.5.2.1.

- The description of safety-related or non safety-related for each instrument has been added in FSAR Subsection 9.2.5.5. The safety-related basin water level and the basin water temperature instruments are powered by safety-related power supplies.

- FSAR Subsection 9.2.5.5 describes the two basin water level instruments. Since the redundant instruments are powered by different Class 1E power trains, a basin water level instrument is available to operate the UHS transfer pump in the event of a power supply failure in one of the two trains servicing the basin. The description of the power supplies for the level instruments has been added to FSAR Subsection 9.2.5.5.

- Descriptions regarding the failure effects on system safety function capability related to the loss of the UHS transfer pumps and discharge/inlet valves have been added in Table 9.2.5-4R.

- The correct valve number for the ESWS Blowdown Main Header Isolation Valve to the CWS blowdown main header is AOV-577. This correction was made in TXNB-11090 (ML12012A101, ML12012A140) dated December 20, 2011.

Impact on R-COLA

See attached marked-up FSAR Revision 2 pages 9.2-14, 9.2-23, 9.2-37, and 9.2-38.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

used to calculate the required capacity of the cooling tower and the ESW pump design flow rate is conservatively specified as 13,000 gpm. RCOL2_09.02.05-20

Cooling tower plume interference and recirculation effects could adversely affect HVAC systems and other cooling tower operation due to potential increased humidity and air temperature. The UHS cooling towers are designed and located to accept the expected effects without significant compromise of the functions of the other UHS cooling towers of the same unit and of the UHS cooling towers of the other unit, the Gas Turbine Generator (GTG) safety-related air intakes for both units, and air intakes for safety-related HVAC systems for both units. The cooling tower shape combined with the cooling tower height is designed to achieve an air discharge velocity and height that ensures proper dissipation of the plume which minimizes plume interference and recirculation on the other UHS cooling towers and nearby safety-related air intakes. RCOL2_09.02.05-18

As noted in DCD Subsection 5.4.7.1, "Design Bases," and DCD Subsection 5.4.7.3, "Performance Evaluation," with ESW water temperature of 95° F, the RHRS is capable of reducing the reactor coolant temperature from 350° F to 200° F within 36 hours after shutdown. As the Technical Specifications surveillance ensures that the UHS basin water temperature to be 93° F or less, the evaluation provided in DCD Section 5.4.7 is bounding.

Inside dimensions of each basin are approximately 123 feet x 123 feet footprint and 31 feet deep at normal water level. The basin water volume is calculated based on a usable area of 120 feet x 120 feet. The cooling towers utilize the basins for structural foundation. RCOL2_09.02.05-22

The ESW intake basin located underneath the ESW pump house occupies the southwest corner of the UHS basin. The ESW intake basin is 12 feet deeper than the UHS basin. Water volume occupying this 12 feet depth in the ESW intake basin is not included in the UHS basin inventory. This is to assure adequate NPSH to the ESW pump. The UHS basin floor elevation (791 feet) is the reference point for measuring the basin water level.

The UHS operates in conjunction with the ESWS. The ESWS is described in Subsection 9.2.1. P&IDs of the UHS are provided in Figure 9.2.5-1R. The UHS design and process parameters are provided in Table 9.2.5-3R. The normal makeup water to the UHS inventory is from Lake Granbury via the circulating water system described in Subsection 10.4.5. A control valve with instrumentation located in each makeup line maintains basin water level during normal operation. A control valve and isolation valve in each makeup line are located in the UHSRS for accessibility and to not be affected by potential plume and heat from a cooling tower. The blowdown water is discharged to Lake Granbury via the circulating water system. RCOL2_09.02.05-23

The normal maintained water level in the UHS basin is elevation 822 feet. Grade elevation in the vicinity of the basin is 822 feet. A four feet thick basin wall extends four feet above grade level to elevation 826 feet providing a curb around the

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.

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

Non safety-related ~~L~~local flow rate and pressure indicators located in each UHS transfer pump discharge header are used for pump performance testing. RCOL2_09.02.05-22

The cooling tower fan is equipped with non safety-related vibration sensors that alarm in the control room in the event of high vibration. RCOL2_09.02.05-22

Non safety-related ~~L~~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 RCOL2_09.02.05-22

CP COL 9.2(22)

Table 9.2.5-4R (Sheet 1 of 3)

Ultimate Heat Sink System Failure Modes and Effects Analysis

Description of Component	Safety Function	Plant Operating Mode	Failure Mode(s)	Method of failure Detection	Failure Effect on System Safety Function Capability	General Remarks
UHS Cooling Tower Fan (UHS-~~OEQ~~MFN-001A, B, C, D and UHS-MFN-002A, B, C, D)	Circulates ambient air through cooling tower to cool ESW	All	Fails to start upon command	Fan status indication light in MCR	None, Remaining three 50 percent capacity cooling towers are available. Minimum two towers are required for safe shutdown.	One Train out due to maintenance does not affect safety function, because minimum of two cooling towers are required.
			Trips for any reason	Fan status indication light in MCR	None, Same as the failure mode "Fails to start upon command".	
UHS Transfer Pump (UHS-MPP-001A, B, C, D)	Transfers 33-1/3 percent of required 30 days cooling water from inoperable basin to two (2) operating basins	Accident, Safe shutdown, Cooldown – loss of offsite power	Fails to start upon command	Pump status light indication in MCR	None, Even if the single failure is assumed to the transfer pump, the cooling tower located at the same basin as the inoperable transfer pump can use own basin water. It is not necessary to transfer this basin water to other basin.	
			Trips for any reason	Pump status light indication in MCR	None. Even if the single failure is assumed to the transfer pump, the cooling tower located at the same basin as the inoperable transfer pump can use its own basin water. It is not necessary to transfer this basin water to other basin.	

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RCOL2_09.02.05-22

Table 9.2.5-4R (Sheet 2 of 3)

Ultimate Heat Sink System Failure Modes and Effects Analysis

Description of Component	Safety Function	Plant Operating Mode	Failure Mode(s)	Method of failure Detection	Failure Effect on System Safety Function Capability	General Remarks
UHS Transfer Pump Discharge Valve (MOV-503A, B, C, D), fail as is, motor operated valve	Opens to provide flow path	Accident, Safe shutdown, Cooldown – loss of offsite power	Fails to open upon command	Position indication in MCR	None, Even if the single failure is assumed to the valve, the cooling tower located at the same basin as the inoperable valve can use own basin water. It is not necessary to transfer this basin water to other basin.	
			Closes for any reason	Position indication in MCR	None. Even if the single failure is assumed to the valve, the cooling tower located at the same basin as the inoperable valve can use own basin water. It is not necessary to transfer this basin water to other basin.	RCOL2_09.02.05-22
UHS Transfer Line Basin Inlet valve (MOV-506A, B, C, D), fail as is, motor operated valve	Opens to provide flow path	Accident, Safe shutdown, Cooldown – loss of offsite power	Fails to open upon command	Position indication in MCR	None, This failure effect is bounded by the failure effect of UHS Cooling Tower Fan.	
			Closes for any reason	Position indication in MCR	None. This failure effect is bounded by the failure effect of UHS Cooling Tower Fan.	RCOL2_09.02.05-22

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-23

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(21) finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 2, "Design Basis for Protection Against Natural Phenomena and GDC 44, "Cooling Water". Specifically, the applicant is requested to address in the FSAR:

· Given a possible seismic event, describe if a UHS basin siphon event is possible (drain-down event) from the interconnection from the nonsafety-related normal water basin makeup from the circulating water system (CWS) (Figure 9.2.5-1R).
· Describe how normal make-up from the CWS is isolated during accident conditions to preclude flooding the UHS basins.
· Clarify location of the makeup control valves shown on Figure 9.2.5-1R, since they appear to be between the two cooling towers.

ANSWER:

- The makeup water discharge piping outlet of the CWS piping is installed above the normal water level of the UHS basin. Thus, a UHS basin siphon event will not occur during normal power operation. During a seismic event, coincident with a failure to close the AOV on the CWS makeup water piping, a UHS basin siphon event may occur for only short periods due to sloshing of water in a UHS basin. However, since only a small amount of water would flow out due to the makeup water discharge piping outlet level, there is minimal impact on the amount of water available to perform the UHS/ESWS function.

- Since the normal make-up water line from CWS is non-safety related, it is not likely to be isolated during accident conditions. However this is not a concern for the following reason.

  FSAR Subsection 9.2.5.2.1 states:

  > The normal maintained water level in the UHS basin is elevation 822 feet. Grade elevation in the vicinity of the basin is 822 feet. A four feet thick basin wall extends four feet above grade

level to elevation 826 feet providing a curb around the basin. The basin is not expected to overflow. In the unlikely event of water level reaching the top of the curb wall, it will spill over and flow to site drainage. No special design for the spillway or drain pipe is deemed necessary.

- Figure 9.2.5-1R is a simplified P&ID. The UHS makeup water control valves, the UHS makeup control isolation valves, and the makeup control bypass are located in the UHSRS as shown in FSAR Table 3.2-201(Sheet 2 of 3) to avoid potential plume and heat effects from the cooling tower. The makeup control isolation valves and the makeup control bypass valves are locally operated and are located in the UHSRS. Requirements for the location of these valves have been added in FSAR Subsection 9.2.5.2.1.

Impact on R-COLA

See attached marked-up FSAR Revision 2 page 9.2-14.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

used to calculate the required capacity of the cooling tower and the ESW pump design flow rate is conservatively specified as 13,000 gpm. RCOL2_09.02.05-20

Cooling tower plume interference and recirculation effects could adversely affect HVAC systems and other cooling tower operation due to potential increased humidity and air temperature. The UHS cooling towers are designed and located to accept the expected effects without significant compromise of the functions of the other UHS cooling towers of the same unit and of the UHS cooling towers of the other unit, the Gas Turbine Generator (GTG) safety-related air intakes for both units, and air intakes for safety-related HVAC systems for both units. The cooling tower shape combined with the cooling tower height is designed to achieve an air discharge velocity and height that ensures proper dissipation of the plume which minimizes plume interference and recirculation on the other UHS cooling towers and nearby safety-related air intakes. RCOL2_09.02.05-18

As noted in DCD Subsection 5.4.7.1, “Design Bases,” and DCD Subsection 5.4.7.3, “Performance Evaluation,” with ESW water temperature of 95° F, the RHRS is capable of reducing the reactor coolant temperature from 350° F to 200° F within 36 hours after shutdown. As the Technical Specifications surveillance ensures that the UHS basin water temperature to be 93° F or less, the evaluation provided in DCD Section 5.4.7 is bounding.

Inside dimensions of each basin are approximately 123 feet x 123 feet footprint and 31 feet deep at normal water level. The basin water volume is calculated based on a usable area of 120 feet x 120 feet. The cooling towers utilize the basins for structural foundation. RCOL2_09.02.05-22

The ESW intake basin located underneath the ESW pump house occupies the southwest corner of the UHS basin. The ESW intake basin is 12 feet deeper than the UHS basin. Water volume occupying this 12 feet depth in the ESW intake basin is not included in the UHS basin inventory. This is to assure adequate NPSH to the ESW pump. The UHS basin floor elevation (791 feet) is the reference point for measuring the basin water level.

The UHS operates in conjunction with the ESWS. The ESWS is described in Subsection 9.2.1. P&IDs of the UHS are provided in Figure 9.2.5-1R. The UHS design and process parameters are provided in Table 9.2.5-3R. The normal makeup water to the UHS inventory is from Lake Granbury via the circulating water system described in Subsection 10.4.5. A control valve with instrumentation located in each makeup line maintains basin water level during normal operation. A control valve and isolation valve in each makeup line are located in the UHSRS for accessibility and to not be affected by potential plume and heat from a cooling tower. The blowdown water is discharged to Lake Granbury via the circulating water system. RCOL2_09.02.05-23

The normal maintained water level in the UHS basin is elevation 822 feet. Grade elevation in the vicinity of the basin is 822 feet. A four feet thick basin wall extends four feet above grade level to elevation 826 feet providing a curb around the

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-24

This is a follow-up to RAI 3762 (Question 09.02.05-14).

In the applicant's response to this RAI, the applicant provided a FSAR markup of Technical Specifications (TS) 3.7.9, "Ultimate Heat Sink" and Bases. This response has been incorporated into Revision 2 of the Comanche Peak, Units 3 and 4 TS.

The staff finds the Bases associated with Action B.1 in need of clarification. Specifically, TS Action B.1, which describes the actions required for exceeding 95 °F, should describe the reason for the B.1 Action due to the UHS basin water temperature exceeding 93 °F, which is addressed under SR 3.7.9.2 and the LCO Bases.

ANSWER:

A temperature instrument with indication, control, and alarm functions is installed in each UHS basin. The basin water temperature is kept below 93°F to ensure that the maximum allowable ESWS and UHS basin temperature of 95°F is not exceeded during accident conditions.

Technical Specifications LCO and Bases 3.7.9 for Action B.1 were revised to change the 95°F water temperature of the UHS basin to 93°F to be consistent with DCD Chapter 16. This change was submitted in letter TXNB-12015 on May 31, 2012.

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

None; this response is site-specific.

<u>Impact on DCD</u>

None.

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-25

COL FSAR Section 3.6.1.3, “Postulated Failure Associates with Site-Specific Piping,” states that there is no site-specific high-energy piping within the protective walls of the ESWPT and UHSRSs and therefore, high-energy pipe breaks are not postulated for site-specific piping within these protective walls. The site-specific moderate-energy piping systems are the ESWS and the fire protection water supply system (FSS).

NUREG-0800, NRC Branch Technical Position 3-3, “Protection Against Postulated Piping Failures in Fluid Systems Outside Containment,” Revision 3 states that:

A. General Design Criterion (GDC) 2, “Design Bases for Protections Against Natural Phenomena,” requires that SSCs important to safety be designed to withstand the effects of natural phenomena such as earthquakes. The BTP 3-4 does not consider full-circumferential breaks in moderate-energy piping, only through-the-wall cracks.

It is the intent of this design approach that postulated piping failures in fluid systems should not cause a loss of function of essential safety-related systems and that nuclear plants should be able to withstand postulated failures of any fluid system piping outside containment, taking into account the direct results of such failure and the further failure of any single active component, with acceptable offsite consequences.

In NUREG-0800, NRC Branch Technical Position 3-3, Appendix A to J.F. O'Leary Letter of July 12, 1972, C.2.a. the following leakage cracks are postulated at the locations specified by the criteria listed under B.

Moderate-Energy Fluid Systems: a. through-wall leakage cracks in piping and branch runs exceeding a nominal pipe size of 1 inch, where the crack opening is assumed as ½ the pipe diameter in length and 1/2 the pipe wall thickness in width.

COL FSAR Section 3.6, does not specially address the UHS transfer system or classify the UHS transfer system (high-energy or moderate-energy). Since the UHS transfer header system connects all four UHS trains, the staff is unable to determine if the UHS transfer system is designed for through-wall cracks.

Specifically,

1. Describe in the FSAR the 'energy' of the UHS transfer system; reference US-APWR DCD Section 3.6.1.1, "Design Basis", and Table 3.6-1, "High and Moderate Energy Fluid Systems".
2. Describe in the FSAR how the UHS transfer system is designed against postulated piping leak paths in the UHS transfer portions. Also describe the bounding conditions related to piping leak size and locations.
3. Describe in the FSAR the consequences of such a piping leak path in the common UHS, looking at the UHS water transfer between UHS basins, post DBA.
4. Describe in FSAR Table 9.2.5-4R, "UHS Failure Modes and Effects Analysis," this failure mode and the effects on the UHS system safety function.

ANSWER:

1. The UHS system is classified as a moderate-energy system. This description has been added to FSAR Subsection 9.2.5.2.1.

2. Branch Technical Position (BTP) 3-4 referred to in BTP 3-3 defines an exception from postulating leakage cracks as follows:

   B. Moderate-Energy Fluid System Piping

   (iii) Fluid Systems in Areas Other Than Containment Penetration.

   (1) Leakage cracks should be postulated in piping located adjacent to structures, systems, or components important to safety, except:

   (c) For ASME Code, Section III, Class 2 or 3 and non-safety-class piping, where the stresses calculated[2] by the sum of Eqs. (9) and (10) in NC/HD- 3653 are less than 0.4 times the sum of the stress limits given in NC/ND-3653.

   [2] For those loads and conditions for which Level A and Level B stress limits have been specified in the design specification (including the operating basis earthquake).

   US-APWR DCD Section 3.6.2.1.2.2 states that the moderate-energy fluid system piping in areas other than PCCV penetrations is designed to comply with BTP 3-4 B(iii)(1)(c) as follows:

   Leakage cracks are postulated in the following piping systems located adjacent to SSCs important to safety.

   - For ASME Code, Section III (Reference 3.6-9), Class 2 and 3 and nonsafety class piping, at axial locations where calculated stress by the sum of Equations 9 and 10 in NC/ND-3653 exceed 0.4 times the sum of the stress limits given in NC/ND-3653.

   In the US-APWR, BTP 3-4 is applicable to the safety-related portions of the UHS and the postulation of cracks is not required for the following reasons:

   The safety-related portions of the UHS are designed in accordance with ASME Code, Section III, Class 3, which is described as an applicable condition in BTP 3-4 for moderate-energy piping systems. Additionally, the stress levels in the US-APWR UHS safety-related piping will be designed to be less than the stress levels stated in BTP 3-4.

A description stating that the postulation of cracks for safety-related UHS piping is not required has been added to FSAR Subsection 9.2.5.3.

3. As stated above, cracks are not required to be postulated in UHS transfer system piping.

4. A description stating that the postulation of cracks of the UHS transfer system piping is not required has been added to the FSAR. Because of this addition, Table 9.2.5-4R is not affected.

Impact on R-COLA

See attached marked-up FSAR Revision 2 pages 9.2-13 and 9.2-20.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

The source of cooling water and location of the UHS are discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW intake structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW discharge structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

9.2.5.2.1 General Description

CP COL 9.2(1)
CP COL 9.2(3)
CP COL 9.2(4)
CP COL 9.2(5)
CP COL 9.2(18)
CP COL 9.2(19)
CP COL 9.2(20)
CP COL 9.2(21)

Replace DCD Subsection 9.2.5.2.1 with the following.

Each unit is provided with its own independent UHS, with no sharing between the two units. The UHS for each unit consists of four 50 percent capacity mechanical draft cooling towers, one for each ESWS train, and four ~~33~~ one-third percent capacity basins to satisfy the thirty day cooling water supply criteria of RG 1.27.

Each cooling tower consists of two cells with fans and motors, drift eliminators, film fills, risers, and water distribution system all enclosed and supported by a seismic category I reinforced concrete structure. Cooling tower components are designed per equipment Class 3 and quality group C requirements. Each basin includes an ESWP intake structure that contains one 50 percent capacity ESWP and one 100 percent capacity UHS transfer pump, and associated piping and components. The UHS system is classified as a moderate-energy system. The UHS piping material, including the UHS transfer piping, is carbon steel with an internal polyethylene lining. The piping is not buried; therefore, cathodic protection is not utilized. Tornado missile protection for the cooling tower components, ESWPs and piping is provided by the UHS safety-related seismic category I structures and ESW pipe tunnel as discussed in Subsection 3.8.4. The UHS structural design, including pertinent dimensions, is also discussed in Subsection 3.8.4. RCOL2_09.02.05-25 RCOL2_09.02.05-19

Each cooling tower consists of two cells, each with a motor driven fan driven with a right-angle gear reducer. The fan motors are powered from the Class 1E normal ac power system. On loss of offsite power (LOOP), the motors are automatically powered from their respective division emergency power source.

The cooling towers are designed for the following conditions: water flow of 12,000 gpm, hot (inlet) water temperature of 128° F, cold (outlet) water temperature of 95° F, ambient wet bulb temperature of 80° F, and DBA design heat load of 196.00×10^6 Btu/hr.

Each ESW pump is designed to provide 13,000 gpm. In general, the efficiency of removing heat from the cooling tower improves if the supply flow rate to the cooling tower is large. Therefore, the supply flow rate to the cooling tower is estimated to be smaller than the realistic flow rate. The flow rate of 12,000 gpm is RCOL2_09.02.05-20

9.2.5.3 Safety Evaluation

CP COL 9.2(22) Replace DCD Subsection 9.2.5.3 with the following.

The results of the UHS capability and safety evaluation are discussed in detail in Subsection 9.2.5.2.3 and in this Subsection. The UHS is capable of rejecting the heat under limiting conditions as discussed in Subsection 9.2.5.2.3.

The UHS is arranged to support separation of the four divisions of ESWS.

System functional capability is maintained assuming one division is unavailable due to on-line maintenance during a design basis accident with a single active failure, with or without a LOOP.

The failure modes and effects analysis for the UHS is included in Table 9.2.5-4R and demonstrates that the UHS satisfies the single failure criteria.

The safety-related SSCs of the UHS and the ESWS are classified as seismic Category I. The site-specific safety-related components are identified in FSAR Table 3.2-201. The non-seismic (NS) SSCs are segregated from the seismic Category I SSCs. Structural failure of the UHS non-safety related SSCs will not adversely impact the seismic category I SSCs. These non-safety SSCs are classified as non-seismic.

Leakage cracks and other type of pipe rupture are not postulated in the safety-related UHS piping because the UHS is a moderate energy fluid system and the piping is designed to comply with BTP 3-4 B(iii)(1)(c) and C as stated in DCD Subsection 3.6.2.1.2.2 and 3.6.2.1.3. RCOL2_09.02.05-25

The basin is designed to withstand the effect of natural phenomena, such as earthquakes, tornadoes, hurricanes, and floods taken individually, without loss of capability to perform its safety function.

The basin for the structural adequacy of the UHSRS is provided in FSAR Sections 3.3, 3.4, 3.5, 3.7, and 3.8.

Site-specific UHS design features to address limiting hydrology-related events are addressed in Subsection 2.4.8, 2.4.11, and 2.4.14.

The combined volume of water in the three basins is sufficient to provide at least 30 days required cooling capacity.

The total required 30 days cooling water capacity is approximately 8.40 million gallons, or approximately 2.80 million gallons per cooling tower (CT) basin. This is the minimum volume required in each basin to satisfy the thirty day cooling water supply criteria of RG 1.27. Each basin dimension, not including any column or wall sections, is 120 feet x 120 feet. Normal water level is maintained at 31 feet above the basin floor. A water level decrease to 30 feet above the basin floor is alarmed. Allowing 1 foot for sedimentation accumulation at the floor, with a water depth of

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.: 6358 (CP RAI #252)

SRP SECTION: 09.02.05 - Ultimate Heat Sink

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

DATE OF RAI ISSUE: 3/30/2012

QUESTION NO.: 09.02.05-26

The staff reviewed this COL FSAR supplemental information related to COL Item 9.2(23 & 30) finds that additional information is required to determined compliance with 10 CFR Part 50, GDC 45, "Inspection of Cooling Water System," and 10 CFR Part 50, GDC 46, "Testing of Cooling Water System". Specifically, the applicant is requested to address in the FSAR:

- COL Item 9.2(30) discussion appears to be missing from the Section 9.2.5 (UHS) of the FSAR.

ANSWER:

FSAR Subsection 9.2.5.4 has been revised to include the left margin notation for COL Item 9.2(30).

Impact on R-COLA

See attached marked-up FSAR Revision 2 pages 9.2-21 and 9.2-27.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

29 feet, a usable water volume of approximately 3.12 million gallons is available for each basin before the operator is alerted of abnormal conditions. The CT basin volume of 2.80 million gallons does not include the water volume located in the ESWP intake basin below the CT basin. The ESWP pump intake basin water level maintains adequate pump NPSH under design basis conditions.

During normal power operation, the UHS basin water temperature is expected to be below 93° F under the worst-case ambient condition (i.e. wet bulb temperature of 83° F based on the 0% annual exceedance value). At the initiation of the LOOP event, each basin contains approximately 3.12 million gallons of water (minimum required is 2.80 million gallons per Technical Specification 3.7.9) . The heat load peaks (196 million Btu/hr/train) four hours into the accident and then decreases continuously. The heat load is approximately 81 million Btu/hr/train at 24 hours into the accident. Cooling tower water discharge at 95° F and at a flow rate of 12,000 gpm mixing with the large quantity of basin water increases the basin water temperature (initially below 93° F). The basin water temperature increases until an equilibrium is reached. However, since the cooling tower is designed for 95° F discharge water at a peak heat load of 196 million Btu/hr, the basin water temperature will not exceed 95° F. LOCA peak heat loads are less than the safe shutdown peak heat loads. Thus, the safe shutdown analysis bounds the LOCA case.

During accident conditions, including LOCA and LOOP, makeup to the basin is presumed lost. During such conditions, the UHS transfer pump operates to permit the use of three of the four basin water volumes. The power supply for each transfer pump is from a different division than the ESWP and cooling tower in that basin. Therefore, loss of one electrical train does not compromise the ability to satisfy the short-term accident requirements.

A description and provision to prevent freezing of the ESWS and the UHS is provided in Subsection 9.2.1.

9.2.5.4 Inspection and Testing Requirements

CP COL 9.2(23)
CP COL 9.2(30)

Replace the content of DCD Subsection 9.2.5.4 with the following. RCOL2_09.02.05-26

Inservice inspection of piping is performed in accordance with the requirements of ASME Section XI, and is included in Section 6.6.

Inservice testing of pumps and valves is performed to ensure operational readiness and is included in Subsection 3.9.6.

Periodic inspections and testing of the mechanical cooling tower components, including fan, motors, and reducing gears, are performed in accordance with cooling tower manufacturer's recommendations, industry operating experience, and as a part of the monitoring required in Generic Letter 89-13 to maintain acceptable system performance.

This COL item is addressed in Subsections 9.2.1.2.1, 9.2.1.3 and 13.5.2.1.

STD COL 9.2(27) ***9.2(27)*** *Operating and maintenance procedures of water hammer prevention*

This COL Item is addressed in Subsection 9.2.2.2.2.6, 9.2.7.2.1 and 13.5.2.1.

CP COL 9.2(28) ***9.2(28)*** *Design related to the site specific UHS*

This COL Item is addressed in Subsection 9.2.5.2.2, 9.2.5.2.3. CTS-01439

CP COL 9.2(29) ***9.2(29)*** *Safety evaluation of the capability of the ESWS to: (1) isolation ofnonsafety-related portions; and (2) provision of measures per Generic Letter (GL)89-13*

This COL Item is addressed in Subsection 9.2.1.3, 13.5.2.1.

CP COL 9.2(30) ***9.2(30)*** *Conduction of periodic inspection, monitoring, maintenance, performance and functional testing of the ESWS and UHS. Development of operating procedures for periodically alternate operation of the trains for regular monitoring.*

This COL Item is addressed in Subsection 9.2.1.4, 9.2.5.4, 13.4, 13.5, 13.5.2.1. RCOL2_09.02.05-26

STD COL 9.2(31) CP COL 9.2(31) ***9.2(31)*** *Verification of the system layout of the ESWS and UHS and development of operating procedures to assure the ESWS and UHS are above saturation condition.* CTS-01440

This COL Item is addressed in Subsection 9.2.1.2.1, 9.2.5.2.2, 9.2.5.2.3. CTS-01440

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.

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.
