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Ref. # 10 CFR 52

December 18, 2008

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555
ATTN: Stephen R. Monarque, Project Manager
US-APWR Projects Branch
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

Reference: NRC Letter, S.R. Monarque to M. L. Lucas, "Acceptance Review for the Comanche Peak Nuclear Power Plant, Units 3 and 4 Combined License Application and Associated Federal Register Notice," dated December 2, 2008 (ML082420435)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits this response to the NRC request for additional information transmitted in the referenced letter. The FSAR will be updated to reflect this response in a future revision. If there are any questions regarding this response, please contact Mr. Don Woodlan at (254) 897-6887 or at Donald.Woodlan@luminant.com.

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

Executed on December 18, 2008.

Sincerely,

Luminant Generation Company LLC

M. L. Lucas

By: Donald R. Woodlan
Donald R. Woodlan
Manager, Nuclear Regulatory Affairs

Attachment - Response to Request for Additional Information

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.: NO.1 REVISION 0

SRP SECTION: 2.4.13

APPLICATION SECTION: 2.4.13

DATE OF RAI ISSUE: 12/02/2008

QUESTION NO. : 2.4.13-1

Please provide additional site specific measured hydrologic parameters necessary to perform radionuclide transport under the assumed release scenario as requested in 10 CFR 100.20(c). Specifically, please provide data and discussion to describe the ability of the applicable aquifers and surface water bodies to disperse, dilute and/or concentrate accidental releases along potential flow paths.

ANSWER NO. :2.4.13-1

The following site-specific hydrogeological parameters, which are necessary to perform an analysis in accordance with 10 CFR 100.20(c), are addressed in the corresponding FSAR sections:

- Porosity – FSAR Subsection 2.4.12.2.5.1
- Permeability – FSAR Subsection 2.4.12.2.5.2
- Groundwater Velocity – FSAR Subsection 2.4.12.3
- Groundwater Travel Time – FSAR Subsection 2.4.12.3
- Hydraulic Conductivity – FSAR Subsection 2.4.12.3
- Soil Distribution Characteristics (K_d) – FSAR Subsection 2.4.13 and Table 2.4.13-1
- Groundwater Gradient – FSAR Subsection 2.4.12.3.1

Additional information is provided in the responses to RAIs 2.4.13-4 through 2.4-13-6, using both geologic and hydrogeologic data and models from Units 3 and 4, and using data and information from Units 1 and 2.

The tank failure analysis for Units 3 and 4 was performed in accordance with Branch Technical Position (BTP) 11-6. The computer code model utilized in the tank failure analysis was the RATAF computer code for pressurized water reactors that is provided in NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants." The RATAF code defines the hydrological travel time as the time it takes for the liquid waste of a failed tank to reach the nearest potable water supply or nearest surface water in an unrestricted area.

The tank failure analysis, as described in DCD Subsection 11.2.3.2, was performed in accordance with Standard Review Plan (SRP) 2.4.13 and takes no credit for the dilution effects of groundwater nor retention or retardation in the regolith, undifferentiated fill, or the Glen Rose Formation. Because there is no "unrestricted" potable water supply or surface water body in close proximity to the Comanche Peak site, the analysis was conservatively performed by considering the potential for the liquid radioactive release to reach either the Unit 1 and 2 restricted potable water supply wells or Squaw Creek Reservoir (SCR). The vertical pathway to the Twin Mountains formation, where the Unit 1 and 2 potable water supplies exist, was eliminated from consideration, as discussed in the attached response to RAI 2.4.13-6. The horizontal pathway through the regolith/undifferentiated fill and shallow bedrock was assumed to be a straight line to SCR. In reality, actual groundwater flow from the postulated release point to SCR would be more tortuous, resulting in longer transport times. Therefore, a simplified, straight-line pathway through the two media identified is a more conservative, worse-case scenario than simulating flow through a complex, three-dimensional flow path. The A-zone undifferentiated fill or regolith, and the B-zone shallow bedrock geologic hydrogeologic characteristics indicate that the liquid release will not concentrate in these zones. It is conservatively assumed that the liquid release would travel with the groundwater through the impermeable limestone to SCR.

The BTP 11-6 tank failure analysis used an equivalent volume of water reported in SCR of 4.4×10^{10} gallons. This same dilution volume was used in the Unit 1 and 2 SRP 2.4.13 and 10 CFR 100.20(c)(3) assessments. The BTP 11-6 tank failure analysis conservatively assumed that the travel time to the SCR was 365 days. It was also assumed that there would be no retardation or retention by the subsurface strata and that groundwater would not dilute the released liquid radioactive waste. As discussed in the responses to RAIs 2.4.13-4 and 2.4.13-5, liquid radioactive waste is expected to move slowly and remain in the subsurface media. There will be no concentration of the release because there is no credible mechanism in these subsurface strata. It should also be noted that no credit is taken in the tank failure analysis for retardation or retention in the subsurface media, or dilution in the groundwater.

Impact on R-COLA

The FSAR will be updated in a future revision to reflect this response.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

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.: NO.1 REVISION 0

SRP SECTION: 2.4.13

APPLICATION SECTION: 2.4.13

DATE OF RAI ISSUE: 12/02/2008

QUESTION NO. : 2.4.13-2

Please discuss the screening process used to select the radionuclides for the site specific sorption (Kd) analysis from the list of possible radionuclides included in the selected source tank.

ANSWER NO. :2.4.13-2

The site-specific solid/liquid distribution coefficients (K_d) are not used in the tank failure analysis. Specifically, no credit is taken for the distribution of liquid radiological waste to the surrounding subsurface media and groundwater when performing the tank failure analysis.

Although the K_d coefficients were not utilized, they were used to identify the radionuclides of interest. However, no credit was taken for the distribution coefficients when calculating travel time of the waste through the undifferentiated fill or regolith A-zone or the shallow bedrock B-zone. Nevertheless, the site-specific K_d coefficients were selected based upon radionuclides listed in 10 CFR 20, Appendix B, Table 2.

The K_d determination was accomplished in the following manner. Three soil borings were chosen for sampling characteristics. Dry wells exhibiting very slow recharge and the aquifer testing observation wells were not considered for sampling. Soil boring samples gathered from the two hydraulically upgradient wells and hydraulically downgradient wells were submitted to Argonne National Laboratory for analysis of the radionuclides listed in FSAR Subsection 2.4.13. That subsection addresses radionuclides that are listed in 10 CFR 20, Appendix B and that were considered in the failure analysis because they would be expected to exist in the tanks.

Since the Auxiliary Building is where the boric acid, holdup, and waste holdup tanks are to be located in Units 3 and 4, appropriate values were evaluated for "nuclides of interest" identified in FSAR Table 2.4.13-201. This was based upon transport to SCR without retardation or retention through subsurface media. Using the conservative transport time analysis and considering nuclide decay times, those nuclides that could be expected to challenge 10 CFR 20, Appendix B concentration limits were considered. The boric acid tank was identified as the tank that had the greatest volume and largest concentration of radionuclides. Cs-137 and Cs-134 were nuclides of interest in the boric acid tank. Cs-137 was one of the nuclides selected for K_d analysis since this was one of the only nuclides remaining in the tank that was not removed by removal equipment or demineralizer beds. Movement of Cs-134 through the subsurface media would be similar to Cs-137 because they have similar chemical and radiological characteristics. The purpose of the K_d analysis was to estimate the potential migration of accidental releases from the footprint areas of the proposed new units. The K_d results presented in FSAR Table 2.4.13-201 indicate that the radionuclides would be delayed in their movement through the groundwater pathway to SCR. The tank failure analysis assumed conservatively that the contaminants would transport along the groundwater pathway horizontally to SCR without retardation or retention in the subsurface media and that there would be no groundwater dilution prior to reaching SCR.

Impact on R-COLA

The FSAR will be updated in a future revision to reflect this response.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

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.: NO.1 REVISION 0

SRP SECTION: 2.4.13

APPLICATION SECTION: 2.4.13

DATE OF RAI ISSUE: 12/02/2008

QUESTION NO. : 2.4.13-3

Provide discussion on the presence or absence of chelating agents in the tank used for the source in the accidental release analysis.

ANSWER NO. :2.4.13-3

No chelating agents are used in the plant system design in order to provide chemical control of the reactor coolant. Only a very small amount of chelating agents is used in the sampling system for analysis. The sampling drain, which contains only a small amount of chelating agents is sent directly to the dedicated chemical drain tank and treated separately. There are no chelating agents in the boric acid tank and therefore, no effect on the source used in the accidental release analysis.

Impact on R-COLA

The FSAR will be updated in a future revision to reflect this response.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Unit 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: NO.1 REVISION 0

SRP SECTION: 2.4.13

APPLICATION SECTION: 2.4.13

DATE OF RAI ISSUE: 12/02/2008

QUESTION NO. : 2.4.13-4

Please provide a description of the process used to develop alternate conceptual models of groundwater flow which account for the effects of specific issues including a lack of equilibrium in groundwater levels (especially in the shallow bedrock) and potential effects of construction (i.e. the addition of fill, areas of increased or reduced recharge, etc.) on groundwater flow paths. Refer to NUREG-0800, Standard Review Plan (SRP) 2.4.13, "Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters."

ANSWER NO. :2.4.13-4

The process used to develop alternative conceptual models of groundwater flow which account for the effects of a lack of equilibrium in groundwater levels and potential effects of construction are discussed in two parts.

Part 1 – Process Used to Develop Alternative Conceptual Models of Groundwater Flow that Account for Effects of Lack of Equilibrium in Groundwater Levels

Units 3 and 4 will be constructed on the Glen Rose Formation limestone, which is essentially impermeable and ranges from 217 to 271 ft thick. The Glen Rose Formation is underlain by the Twin Mountains Formation, which contains the first aquifer beneath the site. The mean elevation for the top of the Twin Mountains Formation is approximately 592 ft mean sea level (msl). The Glen Rose Formation is considered impermeable and confines the groundwater in the underlying Twin Mountains Formation. Figures 2.5.5-202 and 2.5.5-203 provide a generalized cross section of the pre-construction site conditions.

Squaw Creek Reservoir (SCR) is located north and east of the proposed Units 3 and 4. SCR is located within the Glen Rose Formation. Fill material was placed near SCR and is expected to remain in place following construction. Groundwater within the existing fill is controlled by the water level in the adjacent SCR. Filled swale areas northeast of Unit 4 and east of Unit 3 extend to the SCR shoreline. The fill is in hydraulic communication with the SCR and a perched groundwater table at or near the elevation of the reservoir pool exists in the fill. The proposed power block area is overlain by undifferentiated fill and regolith material. Fill in the power block will be removed during construction.

As discussed in FSAR Subsection 2.4.12.2.4, 20 monitoring well clusters (47 wells total) were installed in October - November 2006. One aquifer pump test well and three aquifer pump test observation wells were installed in February 2007. Due to the variable nature of groundwater reported at the CPNPP site, the well clusters were installed in zones from west to east across the proposed reactor area. The wells define the groundwater bearing capabilities and properties of the zones, and identify the hydraulic connectivity between the zones, if any. The well zones are defined as follows.

- A-zone wells: Regolith or undifferentiated fill monitoring wells were installed where greater than 10 ft of soil was encountered above hollow-stem auger refusal.
- B-zone wells: Shallow bedrock monitoring wells were generally completed in the upper 40 to 65 ft of bedrock in a zone of alternating stratigraphy containing claystone, mudstone, limestone, and shale sequences.
- C-zone wells: Bedrock monitoring wells were generally completed in deeper bedrock zones consisting of alternating stratigraphy and competent bedrock.

Further discussion of hydrogeologic characteristic for each of these zones is provided below.

A-zone (regolith)

The A-zone regolith is considered to contain perched groundwater and is not continuous across the site. Hydrographs generated from monthly groundwater measurements (Figure 2.4.12-209) show that the water level trend in the regolith monitoring wells coincides with rainfall at the site, indicating surface water recharge. As described in FSAR Subsection 2.4.12.2.4, groundwater steadily increased from December 2006 to July 2007 in monitoring wells completed in this zone. Water levels remained constant or decreased slightly from August 2007 to November 2007. Overall, the water level trend in the regolith monitoring wells coincided with rainfall totals at the site, indicating recharge from infiltration.

As described in FSAR Subsection 2.4.12.2.4, representative potentiometric surface maps (Figure 2.4.12-210, Sheets 1 - 4) show that the general shallow groundwater movement in vicinity of Units 3 and 4 mimics the surface topography. A northerly flow from the Unit 3 and 4 areas to SCR was observed.

The regolith will be removed in the power block area prior to construction of Units 3 and 4. This will remove the A-zone hydrologic unit (perched groundwater) from this area. Fill areas near SCR are expected to remain in place and in communication with SCR. A dewatering system will not be required during construction. Normal construction practices will be employed to remove water from seepage and rainfall. Post-construction conditions are discussed in Part 2 of this response.

In FSAR Subsection 2.4.12.3.1, two postulated groundwater pathway scenarios are described through the A-zone as straight-line pathways from Unit 3 to SCR and from Unit 4 to SCR. The selection of these postulated release pathways is discussed in the response to RAI 2.4.13-5 as Scenarios 1 and 3.

B-zone (shallow bedrock)

As stated in FSAR Subsection 2.4.12.3, the groundwater in the Glen Rose Formation is poorly developed and groundwater flow within the shallow bedrock is dominated by isolated layers of claystone, mudstone, limestone, and shale. FSAR Figure 2.5.4-213 depicts that the top-of-rock contours for the Glen Rose Formation slope northeast and north from Units 3 and 4 to SCR, respectively. Groundwater levels measured in B-zone wells varied from dry to measurable, but minimal, water levels. Some wells exhibited variable water levels, with no indication of reliable equilibrium conditions where compared to other wells with similar screened zone. The non-equilibrium of groundwater in the B-zone wells suggests that the groundwater measured in these wells is isolated or perched and not continuous across the site.

Groundwater levels measured in monitoring well MW-1217b, located near the center point of Unit 3, varied significantly over time; and groundwater was measured in MW-1215b located near the center point of Unit 4. Therefore, groundwater flow within the B-zone from the reactor to SCR was considered as an alternative conceptual model for groundwater transport from the reactor area to SCR.

The foundation subgrade elevation at this location will be 782 ft msl. The basemat for the Auxiliary Building will be located at elevation 786 ft msl and the tank bottom will be located at an elevation of 798 ft msl. The existing subsurface materials from 860 ft msl to 782 ft msl will be removed including the B-zone directly adjacent to the foundation. B-zone material from elevation 822 ft msl to 780 ft msl will remain in place outside the power block area after construction.

Although quarterly groundwater gradient maps (Figure 2.4.12-210, Sheets 5 - 8) depict a more southeast flow for Unit 4, subsurface conditions, topography, and the difference in groundwater levels between monitoring well MW-1215b and SCR suggest that groundwater flow from Unit 4 to SCR is a more likely scenario and this pathway was considered as a pathway for groundwater flow.

C-zone (deeper bedrock)

Wells completed within the C-zone limestone were generally dry or contained less than 1 ft of water. Of the 13 groundwater monitoring wells screened in the deeper bedrock, eight contained no or a negligible amount of water over the monitoring period, indicating that groundwater is not present in the formation. The remaining five monitoring wells exhibited a slow to steady increase in water levels with no indication of reliable equilibrium conditions, indicating perched groundwater at these locations.

The Glen Rose Formation at this depth is not considered a groundwater-bearing unit beneath the site. Additionally, groundwater was not encountered in the Glen Rose Formation limestone during construction of Units 1 and 2.

In summary, the process used to develop alternative conceptual models of groundwater flow that account for the effects of lack of equilibrium in groundwater levels included the following:

- Groundwater flow pathways were developed based on groundwater measured in monitoring wells in the Unit 3 and 4 plant areas, measured elevations in SCR, surface topography, and observed water levels over time.

- Groundwater measured in all three zones was considered perched based on measurements. Groundwater in the A-zone regolith was attributed to surface water infiltration. Groundwater measured in the undifferentiated fill near SCR was attributed to SCR.

- Groundwater in the B-zone was not continuous across the site. Non-equilibrium conditions and the reported dry wells in the B-zone wells indicated that the groundwater was perched. Groundwater located in fill areas near SCR was found to be in communication with SCR.

- Negligible groundwater was gauged in the C-zone wells, representing essentially dry conditions. Consequently, this zone was not considered a groundwater bearing unit.

Part 2 - Potential Effects of Construction on Groundwater Flow Paths

The current soil and rock material comprising the hydrologic A-zone and B-zone will be removed for construction and will result in the removal of the perched groundwater from the power block area. Post-construction surface water infiltration to the Glen Rose Formation limestone will be reduced by the construction of surface water diversion and impoundment features and by a drainage system throughout the Unit 3 and 4 areas. The grading and drainage plan and placement of engineered fill material are designed to preclude surface water buildup near the plant foundation. This will reduce the possibility of surface water infiltration into the limestone on which the foundation will be constructed.

During construction, the undifferentiated fill material and regolith will be removed in the power block area and replaced with engineered fill material. Shallow bedrock will be excavated from the plant foundations. A dewatering system will not be required during construction. Normal construction practices will be employed to remove water from seepage and rainfall.

The A-zone groundwater flow path near the SCR and north of the power block area will not be affected by construction. The removal of the A-zone in the power block area will remove overlying perched water, reducing infiltration into the B-zone. Improved storm water controls and the placement of engineered fill material will reduce surface water infiltration in power block area and will also serve to eliminate perched groundwater currently measured in the B-zone.

Reference

Letter, M. L. Lucas to D. B. Matthews, "Resolution of Docketing Issues Regarding FSAR Subsection 2.4.13," November 6, 2008 (ML083150716)

Impact on R-COLA

The FSAR will be updated in a future revision to reflect this response.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

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.: NO.1 REVISION 0

SRP SECTION: 2.4.13

APPLICATION SECTION: 2.4.13

DATE OF RAI ISSUE: 12/02/2008

QUESTION NO. : 2.4.13-5

Please describe how the alternate conceptual models were used to determine a bounding set of plausible groundwater flow paths and how the most conservative flow path(s) were selected for the accidental release analysis.

ANSWER NO. :2.4.13-5

The alternative conceptual models were used to determine a bounding set of plausible groundwater flow paths by considering the nearest surface water body, SCR. Groundwater elevations measured in wells near the proposed plant area, the measured pool elevation of SCR (gradient to the SCR), and a conservative pathway from a postulated release point to SCR were utilized and are further described below.

Four postulated groundwater pathway scenarios were considered: two from Unit 3 to SCR (through the regolith and through shallow bedrock) and two from Unit 4 to SCR (through the regolith and through shallow bedrock). In all four cases, the location of the most limiting tank, the boric acid tank, was the northeast corner of the Auxiliary Building. The four pathways utilized conservative straight-line flow paths, or worse-case scenarios. The basis for selecting these pathway scenarios is discussed below.

Actual groundwater flow from the postulated release point to SCR is expected to be tortuous and result in long transport times. To define a conservative worse-case scenario, a simplified, straight-line pathway through the two media was utilized. This simplified approach was selected rather than simulating flow through a complex, three-dimensional flow path. The limestone in C-zone beneath the foundation is considered impermeable. Although groundwater was identified within the undifferentiated fill and regolith and bedrock beneath the Units 3 and 4 sites, the groundwater was considered "perched" as evidenced by the lack of equilibrium in the groundwater monitoring wells.

The four scenarios are presented in FSAR Table 2.4.12-211 and in the November 6, 2008 letter referenced in the response to RAI 2.4.13-4. Determination of the actual tortuous pathway utilizing a three-dimensional analysis would be less conservative than the theorized pathways through the regolith (Scenarios 1 and 3) or the shallow bedrock limestone (Scenarios 2 and 4).

To further add conservatism, the highest measured hydraulic conductivity and steepest measured gradient were used in the velocity calculations for travel time to SCR. Actual hydraulic conductivity would be variable along the actual groundwater pathways and would result in a lower effective hydraulic conductivity for the groundwater flow path. The four scenarios and the calculated travel times are:

- Scenario 1 estimates the groundwater travel time between the northeast corner of the Unit 3 Auxiliary Building and SCR through the undifferentiated fill and regolith. Groundwater levels from groundwater monitoring well MW-1217a, a screened well in the regolith/undifferentiated fill zone, and the surface water elevation of SCR were used. The steepest measured groundwater gradient within the undifferentiated fill material was 0.104 ft/ft. Based on the average effective porosity of 0.20 and a hydraulic conductivity of 5.00×10^{-4} cm/s, the velocity was estimated to be 0.7350 ft/day. Using these parameters, the groundwater travel time was 720.9 days (approximately 2 years).

- Scenario 2 estimates the groundwater travel time between the northeast corner of the Unit 3 Auxiliary Building and SCR through the shallow bedrock. Groundwater levels from groundwater monitoring well MW-1217b, a screened well in the shallow bedrock zone, and the surface water elevation of SCR were used. The steepest measured groundwater gradient within the shallow bedrock zone was 0.0974 ft/ft. Based on the average effective porosity of 0.14 and a hydraulic conductivity of 1.37×10^{-5} cm/s, the velocity was estimated to be 0.0270 ft/day. Using these parameters, the groundwater travel time was 19,615.0 days (approximately 54 years).

- Scenario 3 estimates the groundwater travel time between the northeast corner of the Unit 4 Auxiliary Building and SCR through the undifferentiated fill and regolith. Groundwater levels from groundwater monitoring well MW-1215a, a screened well in the regolith/undifferentiated fill zone, and the surface water elevation of SCR were used. The steepest measured gradient was 0.109 ft/ft. Based on an average effective porosity of 0.20 and a hydraulic conductivity of 5.00×10^{-4} cm/s, the velocity was estimated to be 0.7760 ft/day. Using these parameters the groundwater travel time was 782.6 days (approximately 2 years).

- Scenario 4 estimates the groundwater travel time between the northeast corner of the Unit 4 Auxiliary Building and SCR through the shallow bedrock. Groundwater levels from groundwater monitoring well MW-1215b, a screened well in the shallow bedrock zone, and the surface water elevation of SCR were used. The steepest measured gradient within the shallow bedrock zone was 0.0962 ft/ft. Based on an average effective porosity of 0.14 and a hydraulic conductivity of 1.37×10^{-5} cm/s the velocity was estimated to be 0.0267 ft/day. Using these parameters the groundwater travel time was 22,737.6 days (approximately 62 years).

Plausible groundwater flow pathways were developed based on the groundwater gradient determined from groundwater elevations measured in the proposed plant area and the elevation of SCR, on surface topography, and on observed water levels over time. These pathways, together with conservative assumptions, were then used to determine the range of travel times for the accidental release analysis scenarios.

Impact on R-COLA

The FSAR will be updated in a future revision to reflect this response.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

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.: NO.1 REVISION 0

SRP SECTION: 2.4.13

APPLICATION SECTION: 2.4.13

DATE OF RAI ISSUE: 12/02/2008

QUESTION NO. : 2.4.13-6

Please clarify ambiguity in the description of the release scenario which was developed to support the accidental release analysis. Please specifically address the following:

a. Section 2.4.13 of the FSAR and your supplemental letter dated November 6, 2008, describe three tanks which were considered as potential sources for the accidental release scenario (the holdup tank, the waste holdup tank and the boric acid tank). Please state explicitly which tank was selected as the source tank for the accidental release and justify this selection by discussing how failure of this tank will result in the highest concentrations of radioactive material at the nearest unrestricted potable water supply, as described in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Branch Technical Position (BTP) 11-6, "Postulated Radioactive Releases Due to Liquid-Containing Tank Failures".

b. In your supplemental letter dated November 6, 2008, the accidental release from these tanks was reported to occur in the Northwest corner of Unit 4 or the Northeast corner of Unit 3. Please explain how these release locations relate to the location of the Auxiliary Buildings where the tanks discussed as sources are located.

c. Section 2.4.13 of the FSAR and your supplemental letter dated November 6, 2008, identify both Squaw Creek Reservoir and the Units 1 and 2 water supply wells as potential receptors. Please clarify which of these receptors is most probable given BTP 11-6 guidance that the receptor be the nearest unrestricted source of potable water and explain how this receptor resulted from the selection of the most conservative flow path(s) from the bounding set of plausible groundwater flow paths.

ANSWER NO. :2.4.13-6

a.

In performing the evaluation of postulated radioactive releases due to liquid-containing tank failures, the following tanks were considered in determining which tank would have the highest concentration and the largest volume of radionuclides:

Holdup Tank – located in the Auxiliary Building (A/B), a Seismic Class II building.

Waste Holdup Tank – located in the A/B

Boric Acid Evaporator – located in the A/B

Boric Acid Tank – located in the A/B

Volume Control Tank – located in the Reactor Building (R/B), a Seismic Class I Building.

Auxiliary Building Sump Tank – located in the A/B

Reactor Building Sump Tank – located in the R/B

Primary Makeup Water Tank – located outside

Refueling Water Storage Auxiliary Tank – located outside

Chemical Drain Tank – located in the A/B

The Volume Control Tank, Chemical Drain Tank, and Sump Tanks were eliminated from consideration based on having smaller volumes and on having radionuclide contents lower than the Boric Acid Tank (BAT). The Primary Makeup Water Tank was eliminated from consideration based upon the fact that the Primary Makeup Water Tank stores demineralized water from the Treatment System, and low level radioactive condensate water from the Boric Acid Evaporator. Condensate water contains low levels of radionuclide concentrations, including tritium. The Refueling Water Storage Auxiliary Tank was eliminated from consideration because it stores refueling water. Prior to refueling, tank water is supplied to the refueling cavity where the reactor coolant radionuclide concentration dilutes with refueling cavity water. Radionuclide concentration of cavity water is reduced by the purification system of the Chemical Volume and Control System and Spent Fuel Pit Cooling and Purification System during refueling operations. Upon completion of refueling, part of the cavity water is returned to this tank where the radionuclide concentration is low. Accordingly, the impact of a Refueling Water Storage Auxiliary Tank or a Primary Makeup Water Tank failure would be small.

After eliminating the tanks described above, the remaining tanks left to consider for the failure analysis are those in the Auxiliary Building, a seismic category II building. NUREG-0133 and the RATAF Code for pressurized water reactors were utilized in selecting the appropriate tank for the failure analysis. The concentration of the radioactive liquid in the tanks, such as the Boric Acid Evaporator, Holdup Tank, and the BAT, are larger than the Waste Holdup Tank since they receive reactor coolant water extracted from the Reactor Coolant System. Since the enrichment factor of 50 is considered for the liquid phase of the Boric Acid Evaporator, the radioactive concentrations in the liquid phase of the Boric Acid Evaporator and in the BAT (which receives the enriched liquid from the Boric Acid Evaporator) becomes large when compared to the other tanks. The BAT has been selected since its volume is larger than the liquid phase of the Boric Acid Evaporator.

b.

The BAT is located in the northeast (NE) corner of the Auxiliary Building (see DCD Figure 12.3-1). The Auxiliary Building can be seen on FSAR Figure 2.4.12-210, Sheet 1, and is the large rectangular building immediately adjacent to containment. As can be seen on Figure 2.4.12-210, the release location for the BAT (NE corner of the Auxiliary Building) is on the northwest corners of Units 3 and 4.

c.

Both SCR and the Unit 1 and 2 restricted potable water supplies were considered as receptors. Please note that the Units 1 and 2 potable water supply wells are restricted access potable water supplies. As stated in the November 6, 2008 letter referenced above, the nearest unrestricted potable water supplies completed in the Glen Rose Formation are approximately four miles south of the CPNPP site and the nearest unrestricted potable water supply wells completed in the Twin Mountains Formation are approximately 0.5 mi south of the site (FSAR Subsection 2.4.12.3.2 and Figures 2.4.12-204 and 2.4.12-206). The restricted potable water supply wells for Units 1 and 2 (Figure 2.4.1-213) were eliminated as possible receptors based upon the following.

The BAT is at elevation 798 ft msl, while the Auxiliary Building basemat elevation is at 786 ft msl. Since the Auxiliary Building is a seismic category II building, it is assumed that a crack will form in the building during a seismic event and the radioactive liquid would travel vertically into the surrounding formation. At this basemat elevation of 786 ft msl, the hydrogeologic formation is in the deeper portion of B-zone or the Glen Rose Formation, which consists primarily of impermeable limestone. For the release to reach the Twin Mountains Formation, which is approximately 150 feet below the Glen Rose Formation, the liquid release would have to travel completely through the Glen Rose Formation. Units 1 and 2 performed an analysis and provided a model of this vertical release path (Unit 1 and 2 FSAR Subsection 2.4.13.3.4). The results of the model indicate that the only radionuclide that would travel the length of the Glen Rose Formation was Cs-137 and that it would take approximately 400 years to reach the Twin Mountains Formation. The closest Unit 1 and 2 potable water supply well is approximately 1.25 miles away (Figure 2.4.1-213) from either the Unit 3 or Unit 4 Auxiliary Building (Figure 2.4.12-208). Considering that the liquid release would be in the Glen Rose Formation and the travel time vertically to the Twin Mountains formation is approximately 400 years for Cs-137, one of the radionuclides considered in the Units 3 and 4 tank failure analysis, it is concluded that the vertical pathway to the Twin Mountains formation is not plausible and accordingly, was eliminated.

Because the Unit 1 and 2 restricted potable water supplies were eliminated, the time for Cs-137 to travel through the Glen Rose Formation is approximately 400 years, and the nearest unrestricted potable water supply is approximately four miles south of CPNPP, the SCR receptor is considered the only plausible horizontal groundwater flow release path. As discussed in the response to RAI 2.4.13-4, the deeper bedrock is not conducive to groundwater travel due to the impermeable limestone layer. Therefore, the alternate conceptual models chosen were to transport the liquid radioactive release through the undifferentiated fill/regolith and the shallow bedrock in a straight-line pathway to SCR (as described in FSAR Subsection 2.4.12.3.1). See the response to RAI 2.4.13-5 for a discussion of the horizontal pathway Scenarios 1 through 4, and for the associated hydraulic conductivity, porosity and travel times.

Impact on R-COLA

The FSAR will be updated in a future revision to reflect this response.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

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.: NO.1 REVISION 0

SRP SECTION: 2.4.13

APPLICATION SECTION: 2.4.13

DATE OF RAI ISSUE: 12/02/2008

QUESTION NO. : 2.4.13-7

The accidental release analysis provided in Section 2.4.13 of the FSAR appears to be a comparison to the non-site-specific example analysis described in Section 11.2.3.2 of the US-APWR design certification document (DCD). This comparison does not incorporate enough site-specific hydro geological parameters to satisfy the guidance in DCD action item COL 11.2(3) and SRP 2.4.13, and demonstrate compliance with the groundwater effluent concentration limits provided in 10 CFR Part 20, "Standards for Protection Against Radiation" at potential receptor locations.

Please provide a sufficiently detailed description of an accidental release analysis which incorporates site-specific measured hydrologic parameters important to radionuclide transport and include a discussion of procedures, methods, assumptions, parameters and/or equations which were used in this analysis.

ANSWER NO. :2.4.13-7

The site-specific hydrogeological parameters utilized in the site-specific analysis are provided in FSAR Subsection 2.4.12 and additional information is provided in the responses to RAIs 2.4.13-1 through 2.4-13-6.

The tank failure analysis described in DCD Subsection 11.2.3.2 was performed in accordance with Branch Technical Position (BTP) 11-6. Assumptions used in the DCD BTP 11-6 analysis were provided in the November 6, 2008 letter referenced in the responses above. Assumptions included in the DCD tank failure analysis are: (1) isotopic concentrations less than 1.0×10^{-3} in fraction of concentration limits were excluded; (2) 80% of the contents of each tank considered was released; (3) the tank volume released is diluted by the equivalent volume of SCR, which is 4.4×10^{10} gallons; (4) includes 0.12% fuel defect; and (5) credit is taken for removal effects by demineralizers or other treatment equipment. The computer code model used for the BTP 11-6 analysis was the RATAF computer code for pressurized water reactors that is provided in NUREG-0133. The RATAF code defines the hydrological travel time as the time it takes for the liquid waste of a failed tank to reach the nearest potable water supply or nearest surface water in an unrestricted area. Although the nearest potable water supply and the nearest surface water body are located in the restricted areas of the CPNPP site, the potable water supply wells for the Units 1 and 2 and the SCR, respectively, were considered in this evaluation.

As discussed in the responses to RAIs 2.4-13-5 and 2.4.13-6, the Glen Rose Formation limestone is considered impermeable beneath the CPNPP site and groundwater measured in this limestone is considered "perched." However, in order to evaluate the effects of a postulated accident on the Twin Mountains aquifer, a conservative mathematical model with simplifying assumptions was used to model the dispersion of a liquid release through the Glen Rose Formation limestone as described in Units 1 and 2 FSAR Subsection 2.4.12. The results of this simplified analysis indicate that only one radionuclide, Cs-137, would penetrate the entire 150 feet depth of the Glen Rose Formation limestone to reach the Twin Mountains aquifer and it would take 400 years. Based upon this evaluation, and the results of the geologic and hydrogeologic investigations conducted at the CPNPP site, vertical transport of the liquid radioactive release through the Glen Rose Limestone to the deeper Twin Mountains aquifer is not considerable probable.

The BTP 11-6 tank failure analysis used an equivalent volume of water reported in SCR of 4.4×10^{10} gallons. This same dilution volume was used in the Unit 1 and 2 SRP 2.4.13 and 10 CFR 100.20(c)(3) assessments. Additionally, in the BTP 11-6 tank failure analysis, it was conservatively assumed that the travel time to SCR was 365 days, that there was no retardation or retention by the subsurface strata, and that the groundwater did not dilute the released liquid radioactive waste. Actual hydrological velocity and travel times were calculated based upon site-specific data where it was determined that it would take 720.9 days or approximately 2 years (FSAR Subsection 2.4.12.3) for groundwater to reach SCR. Average interstitial groundwater flow velocities were determined using a form of the Darcy equation as follows (see also FSAR Subsection 2.4.12.3):

$$V = (Kh \times (EH - EL)/L)/\eta \qquad \text{(FSAR Reference 2.4-262)}$$

where:

V = groundwater flow velocity, ft/day

Kh = hydraulic conductivity, ft/day

EH = highest groundwater elevation, ft msl

EL = lowest groundwater elevation, ft msl

L = pathway length, ft

η = formation porosity, unitless

Travel time to the nearest water body is calculated using the following equation:

$$t = L / V$$

where:

t = groundwater travel time, days

V = groundwater flow velocity, ft/day

L = pathway length, ft

In the BTP 11-6 evaluation model, it was determined that the boric acid tank (BAT) contained the largest quantity and concentration of radionuclides that could possibly challenge the 10 CFR 20, Appendix B limits, and that 80% of the contents with a 0.12% fuel defect level would be delivered to the SCR.

The BAT is located in the northeast (NE) corner of the Auxiliary Building where the basemat is at an approximate elevation of 786 ft msl. Site-specific hydrogeological data discussed in Unit 3 and 4 FSAR Subsection 2.4.12 and Unit 1 and 2 FSAR Subsections 2.4.12 and 2.4.13 was used to determine whether the vertical travel path to the Twin Mountains Formation was credible, and to evaluate the horizontal travel time of groundwater in the undifferentiated fill/regolith and shallow bedrock of the Glen Rose Formation. The vertical travel path was eliminated as discussed fully in the response to RAI 2.4.13-6. Because vertical migration through the impermeable limestone is not probable, a straight-line flow pathway from the postulated release point to the SCR was considered the worse-case scenario and was used as the bounding condition for the site. In looking at the site-specific hydrogeological information (porosity, hydraulic conductivity, groundwater gradient and velocity, and equations and assumptions), it was determined that the time for a liquid release from the BAT in the NE corner of the Auxiliary Building to travel horizontally and reach SCR was approximately 2 years (720.9 days) (see the response to RAI 2.4.13-5 for velocity and travel times for groundwater).

DCD Subsection 11.2.3.2 conservatively selected a travel time of 365 days to reach SCR. The site-specific hydrogeologic data shows a travel time of approximately 2 years (720.9 days), while taking no credit for retardation or suspension by subsurface strata or dilution by the groundwater prior to reaching SCR. It is therefore concluded that the limits of 10 CFR 20, Appendix B are met, and the site-specific hydrogeology is bounded by the DCD Subsection 11.2.3.2 tank failure release analysis. The concentrations of Cs-134 and Cs-137 in SCR do not exceed the limits of 10 CFR 20, Appendix B, Table 2, and the requirements of 10 CFR 100 are satisfied.

Impact on R-COLA

The FSAR will be updated in a future revision to reflect this response.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

None.