PMComanchePeakPEm Resource

From: Monarque, Stephen
Sent: Monday, February 27, 2012 10:40 AM
To: John.Conly@luminant.com; Donald.Woodlan@luminant.com; 'cp34-rai-luminant@mnes-us.com'; Eric.Evans@luminant.com; joseph tapia; 'Kazuya Hayashi'; 'Russ Bywater'; MNES RAI mailbox (cp34-rai-luminant@mnes-us.com)
Cc: ComanchePeakCOL Resource; Galvin, Dennis
Subject: Comanche Peak RCOL Chapter 3 - RAI Number 247 -
Attachments: RAI 6266 (RAI 247).docx

The NRC staff has identified that additional information is needed to continue its review of the combined license application. The NRC staff's request for additional information (RAI) is contained in the attachment. Luminant is requested to inform the NRC staff if a conference call is needed.

The response to this RAI is due within 35 calendar days of **February 27, 2012.**

Note: The NRC staff requests that the RAI response include any proposed changes to the FSAR.

thanks,

Stephen Monarque
U. S. Nuclear Regulatory Commission
NRO/DNRL/NMIP
301-415-1544

Hearing Identifier: ComanchePeak_COL_Public
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Created By: Stephen.Monarque@nrc.gov

Recipients:
"ComanchePeakCOL Resource" <ComanchePeakCOL.Resource@nrc.gov>
Tracking Status: None
"Galvin, Dennis" <Dennis.Galvin@nrc.gov>
Tracking Status: None
"John.Conly@luminant.com" <John.Conly@luminant.com>
Tracking Status: None
"Donald.Woodlan@luminant.com" <Donald.Woodlan@luminant.com>
Tracking Status: None
"'cp34-rai-luminant@mnes-us.com'" <cp34-rai-luminant@mnes-us.com>
Tracking Status: None
"Eric.Evans@luminant.com" <Eric.Evans@luminant.com>
Tracking Status: None
"joseph tapia" <joseph_tapia@mnes-us.com>
Tracking Status: None
"'Kazuya Hayashi'" <kazuya_hayashi@mnes-us.com>
Tracking Status: None
"'Russ Bywater'" <russell_bywater@mnes-us.com>
Tracking Status: None
"MNES RAI mailbox (cp34-rai-luminant@mnes-us.com)" <cp34-rai-luminant@mnes-us.com>
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Request for Additional Information (RAI) No. 6266, COLA Revision 2

RAI Letter Number 247

2/27/2012

Comanche Peak Units 3 and 4
Luminant Generation Company, LLC.
Docket No. 52-034 and 52-035
SRP Section: 03.07.02 - Seismic System Analysis
Application Section: FSAR 3.7.2

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

03.07.02-26

This is a follow-up question to RAI Letter Number 226 (5947), Question 3.7.2-23. After reviewing the response to RAI Letter No. 226 (5947), Question 3.7.2-23, dated October 27, 2011, the staff has the following questions regarding the responses to Items 2, 5, 6, 7, 9, 10, and 13:

1. Items 2, 6, and 9 of Question 3.7.2-23 asked the Applicant to state if the soil-structure interaction (SSI) models had sufficient resolution to transmit frequencies up to 50 Hz and to justify the use of cutoff frequencies less than 50 Hz. In response to Item 2, the Applicant stated that seismic issues associated with high-frequency ground motion are not applicable to Comanche Peak Nuclear Power Plant (CPNPP), where the site-specific motion is significantly below the certified seismic design response spectra (CSDRS) and that the CPNPP site is not a high-frequency site so the recommendation to cover frequencies up to 50 Hz is not necessary. The response also states that the Applicant ran select soil cases up to 50 Hz cutoff frequencies, but did not run all cases up to the 50 Regarding the first statement, the Applicant is requested to explain the logic for determining a specific cutoff frequency for the analyses based on the relative magnitudes of the site-specific spectra and the design spectra. The question is being posed because the staff does not understand the justification that the Applicant is using to make a quantitative determination of an appropriate cutoff <u>frequency</u> based on a comparison of spectral <u>magnitudes</u>. Regarding the second statement, although the staff recognizes that the site is not a “high-frequency” site, justification is still required for the determination of an appropriate cutoff frequency for the SSI evaluation. Consequently, the Applicant is requested to provide quantitative justification for determining the required minimum cutoff frequency for the SSI evaluation. Typically, such a determination is made based on the frequency content of the input signal, the dynamic properties of the soil column, and the natural frequencies of the structure and contained equipment. Also, based on the information shown in Table 4 of the response to RAI Letter Number 60 (2879), Question 3.7.2-16, dated November 24, 2009, the Applicant appears to have performed SSI evaluations using cutoff frequencies that are higher than those that can be transmitted by the backfill soil. In order to provide defensible evidence to support any conclusions based on the presence of the backfill soil, the staff expects that any evaluations with backfill

will be performed using soil layer thicknesses that will support transmission of frequencies up to the required minimum cutoff frequency.

2. Items 5, 7, 10, and 13 of Question 3.7.2-23 asked the Applicant to provide justification that it is acceptable to use soil layers in the SSI evaluation that have maximum passing frequencies less than the cutoff frequency of the analysis. The response stated in Item 5 that although the backfill soils do not pass frequencies as high as the cutoff frequencies used, the analyses did not show abnormal behavior beyond the passing frequencies because the structural input does not rely on these soils to excite the structure and all time-history energy is at low frequencies. Similar responses were provided for Items 7, 10, and 13. The staff does not accept this logic for using passing frequencies that are less than the cutoff frequency. In general the time history energy will decrease with increasing frequency, and the lack of a global structural response at higher frequencies does not imply that higher frequencies can be neglected because they may be important for equipment response. The Applicant is requested use SSI models that have maximum passing frequencies that are greater than or equal to the minimum required cutoff frequency, or else provide studies to show that the not doing so results in accurate or conservative results.

03.07.02-27

This is a follow-up question to RAI Letter Number 226 (5947), Question 3.7.2-24. After reviewing the response to RAI Letter No. 226 (5947), Question 3.7.2-24, dated October 27, 2011, the staff has the following questions regarding the responses to Items 1, 3, 4, 6, 7, 8, and 9.

1. Item 1 of Question 3.7.2-24 asked the Applicant to clarify the input spectra used for the SSI evaluation of the ultimate heat sink related structures (UHSRS). Regarding the response to the ANSYS model input, the Applicant presented Figures 2, 3, and 4 showing the comparison of the SASSI base response spectra to the input response spectra for the ANSYS analysis. The figures show that at some frequencies the input response spectra for the ANSYS analysis falls below the SASSI base spectra, especially for the vertical direction. The Applicant justifies these deficiencies by stating that the results of the response spectra analyses were compared to the results of the SASSI analyses to confirm the adequacy of the seismic demand used for the evaluation of the UHSRS. The staff disagrees with this approach because when the input to the problem is unconservative, there is no assurance that the output will be conservative for all response parameters in all three directions, at all locations, and under all important design configurations. The staff expects that the input response spectra should match or envelop the SASSI base spectra. The staff requests that the Applicant use such input spectra for the evaluation and to describe the matching or enveloping criteria used for the definition of the input response spectra to the ANSYS model. The Applicant is also requested to clarify the spectral damping used in Figures 1, 2, 3, and 4 in the response to Question 3.7.2-24. This request also applies to the response to Item 3 of Question 3.7.2-24.

2. In Item 6 of the response to Question 3.7.2-24, the Applicant provided the requested node numbers from the applicable finite element models, but the staff is unable to complete the review of this response because many of the Figures in Appendices 3KK through 3MM showing the in-structure response spectra (ISRS) do not indicate the node numbers for which the ISRS were generated. The staff requests that the Applicant provide the specific node numbers for all ISRS presented in Appendices 3KK through 3MM.

3. Item 8 of Question 3.7.2-24 asked the Applicant to describe the configuration of essential service water pipe tunnel (ESWPT) Segment 2 that was used for modal analysis supporting the response spectrum evaluation. The response referred the staff to the response to RAI Letter No. 167 (4542), Question 3.8.4-80. In the response to that question the Applicant states that the response spectrum analysis of segment 2 was performed without the side soil. The response also states that, "the accelerations from the response spectrum analysis <u>generally</u> exceed the accelerations from the SASSI analysis except for portions of the (ultimate heat sink) UHS south air-intake missile shield and pipe missile shield, which are supported on this tunnel segment. The differences in accelerations and resulting inertia forces were accounted for by increasing design demands on these components." The Applicant is requested to provide details of where the accelerations from the response spectrum analysis are less than the accelerations from the SASSI analysis and to provide the details of how the design demands were increased in these cases to ensure a conservative design. Also, Figure 13 of the response to Question 3.8.4-80 shows a horizontal design spectrum, but spectral damping is not indicated. Based on a comparison to Figure 3.7-202 of Rev. 2 of the FSAR, the design spectral damping appears to be at 5% rather than the 7% spectral damping shown for the SASSI base slab spectra shown in Figure 13. The Applicant is requested to explain this discrepancy.

4. In Item 9 of Question 3.7.2-24, the Applicant was asked to describe the configuration of the fixed-base model of ESWPT Segment 1 that was used for frequency extraction and modal response of the tunnel segment as shown in Table 3LL-4 of the FSAR. The Applicant responded by stating that the fixed-base model of ESWPT Segment 1 was performed for a mesh size confirmation with a fine and coarse model and that the surrounding soil was not included in the fixed-base verification models. The response then referenced the response to RAI Letter No. 122, Question 3.8.4-40. Section 3LL.3 of the FSAR states that Table 3LL-4 presents the natural frequencies and descriptions of the associated modal responses obtained from the fixed-base ANSYS analysis of the straight portion of the ESWPT (Segment 1 Model) and that these frequencies <u>were compared to the frequencies calculated from the transfer functions for the SASSI model to confirm adequacy of the coarser mesh</u> SASSI model to represent dynamic behavior of the tunnels. The staff requests that the Applicant provide the above mentioned comparisons to the staff for review. Also, the staff notes that in part b of the response to Question 3.8.4-40 states that <u>"Natural frequencies were not calculated from the SASSI transfer functions to confirm adequate model mesh size</u>. For confirmation of adequate mesh size of the ESWPT, a modal analysis was performed in ANSYS for Tunnel 1 with a fine mesh model and with a coarse mesh model that matches the SASSI model mesh." The staff requests that the

Applicant clarify the apparent inconsistency between the two underlined statements and to describe how the mesh size study was performed.