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September 30, 2013

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

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION 221 (5798) AND RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION 247 (6266) (SECTION 3.7.2)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein supplemental information for the response to Request for Additional Information (RAI) 221 (5798) and submits the response to RAI 247 (6266) for the Comanche Peak Nuclear Power Plant Units 3 and 4 Combined License Application. The RAIs address the SSASI subtraction method and soil-structure interaction.

Should you have any questions regarding the supplemental information or 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 September 30, 2013.

Sincerely,

Luminant Generation Company LLC

RD Bird for

Rafael Flores

Attachments: 1. Supplemental Response to Request for Additional Information 221 (5798)
2. Response to Request for Additional Information 247 (6266)

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NRO

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Attachment 1

Supplemental Response to Request for Additional Information 221 (5798)

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 221 (5798)

SRP SECTION: 03.07.02 - Seismic System Analysis

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

DATE OF RAI ISSUE: 6/3/2011

QUESTION NO.: 03.07.02-21

The Defense Nuclear Facilities Safety Board (DNFSB) issued a letter on April 8, 2011 requesting the Department of Energy (DOE) to address technical and software quality assurance issues related to potentially erroneous seismic analyses performed using the SASSI Subtraction method. The April 8, 2011 letter may be found on the DOE Departmental Representative to the DNFSB website: http://www.hss.energy.gov/deprep/.

Chapter 3, Appendix 3NN of the Comanche Peak COL FSAR states that the US-APWR standard plant employs this subtraction method. Very limited information was provided about what method was used for other seismic category I structures at Comanche Peak, Units 3 & 4. To ensure the applicant has adequately met General Design Criteria (GDC) 1 and 2 and Appendix B to Part 50, the staff requests Luminant to provide to following information:

1. Confirm whether the SASSI Subtraction method is used in the analyses of seismic category I standard and site-specific structures.

2. Provide how Luminant addressed the technical and software quality assurance issues raised by DNFSB letter in the version of SASSI which Luminant uses for analyses of all seismic category I structures part of the Comanche Peak Units 3 and 4.

3. If the SASSI Subtraction method is used by Luminant, provide an assessment to establish: a) the seismic analyses performed in support of the Comanche Peak RCOL application does not contain any errors or anomalies as identified in DNFSB letter, b) the quality assurance steps taken to ensure that any future seismic analyses in support of the Comanche Peak application will be free from errors or anomalies as identified in DNFSB letter.

SUPPLEMENTAL INFORMATION S02:

This information replaces the previous responses that were transmitted on August 4, 2011 (ML11220A306) and October 10, 2011 (ML11285A242).

1. The modified subtraction method is used for the site-independent soil-structure interaction (SSI) analyses of the seismic category I standard plant structures [Reactor Building (R/B) complex], and for the site-specific SSI analyses of the standard plant R/B complex and the

other site-specific structures [ultimate heat sink related structures (UHSRS), essential service water pipe tunnel (ESWPT) and power source fuel storage vaults (PSFSVs)]. The use of the modified subtraction method is documented in Section 03.3.3.4 of MUAP-10006, Revision 3, and in FSAR Sections 3KK.2, 3LL.2, 3MM.2, and 3NN.3.

2. The SASSI subtraction method is no longer used by Luminant in the site-specific SSI analyses. All of the site-specific SSI analyses are performed using the improved modified subtraction method. The results of the SASSI analyses performed using the modified subtraction method are validated as described below to ensure that the calculated SSI responses are free from errors or anomalies described in the Defense Nuclear Facilities Safety Board letter.

3. The SSI analyses of seismic category I standard plant structures and site-specific structures are performed using the modified subtraction method, which uses additional interaction nodes at the surface of the excavated volume to improve the ability to capture the effects on the response of the embedded structure due to the propagation of surface seismic waves. Sensitivity studies were performed on the UHSRS, PSFSVs, and ESWPT to verify the accuracy of the results using the modified subtraction method. These studies were performed by comparing results obtained from SASSI analyses using the approximate numerical modified subtraction method with those obtained using the flexible volume method, also known as the direct method, which provides an exact numerical solution of the SSI problem by considering all nodes in the excavated volume as interaction nodes. A comparison of the transfer functions and in-structure response spectra (ISRS) at key locations resulting from the two methods demonstrated that the results using the modified subtraction method appropriately capture the SSI responses. For additional details of the study results, see FSAR Sections 3KK.2, 3LL.2, and 3MM.2, respectively. Figures 3KK-8, 3KK-9, 3LL-20, 3LL-21, and 3MM-6 present typical examples of transfer function and ISRS comparisons of the modified subtraction method versus the flexible volume method at several locations of the UHSRS, ESWPT and PSFSV. The results of the verification study performed for the standard design demonstrate that the use of the modified subtraction method provides appropriate solutions for the site-specific SSI analyses of the embedded R/B complex model described in FSAR Appendix 3NN. The calculations containing the sensitivity and verification studies discussed above are available for NRC audit.

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

FSAR Appendices 3KK, 3LL, 3MM, and 3NN have been revised documenting the use of the modified subtraction method of the SASSI program on the SSI analyses. They will be submitted as part of FSAR Updated Tracking Report Revision 3 currently scheduled for October 14, 2013.

<u>Impact on DCD</u>

None.

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 221 (5798)

SRP SECTION: 03.07.02 - Seismic System Analysis

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

DATE OF RAI ISSUE: 6/3/2011

QUESTION NO.: 03.07.02-22

On May 12, 2011, Mitsubishi Heavy Industries, Ltd. (MHI), submitted a revised completion plan for US-APWR Seismic and Structural Analyses (ML11136A235). This plan identifies that significant changes are being made to the seismic design methodology as described in the US-APWR DCD, Section 3.7, and associated technical reports. The plan also identifies the documentation MHI plans to submit or make available for audit to address US-APWR standard plant seismic design issues. The NRC staff requests the applicant provide an assessment of all changes made (or to be made) to the Comanche Peak COL seismic design given MHI's planned changes to the US-APWR standard plant seismic design methodology.

Provide a technical methodology and approach for reconciliation of the Comanche Peak standard plant model with the updated USAPWR soil-structure interaction (SSI) model and overall seismic design approach. Also, explain changes or variances (if any) to the site-specific structures given the changes in the seismic design methodology, as some of the principles were applied to the non-standard plant structures.

SUPPLEMENTAL INFORMATION S01:

This information replaces the previous Luminant response that was transmitted on August 4, 2011 (ML11220A306). Because this question contains multiple questions/requests, portions are repeated and answered individually as follows.

Request:

"The NRC staff requests the applicant provide an assessment of all changes made (or to be made) to the Comanche Peak COL seismic design given MHI's planned changes to the US-APWR standard plant seismic design methodology."

Answer:

Revision 0 of the Comanche Peak Integrated Seismic Closure Plan transmitted on April 16, 2012 (ML12109A154), and updated on September 21, 2012 (ML12268A413) and May 1, 2013 (ML13123A081), presented an assessment of changes to be made to the Comanche Peak Units 3 and 4 seismic design as a result of changes made to the US-APWR standard plant seismic design.

Request:

"Provide a technical methodology and approach for reconciliation of the Comanche Peak standard plant model with the updated USAPWR soil-structure interaction (SSI) model and overall seismic design approach."

Answer:

To ensure the proper comparability with the standard plant seismic design, the site-specific SSI analyses use the same SASSI methodology, and verified and validated models of the R/B complex, as those used for the US-APWR standard plant design SSI analyses, with modifications necessary only to address site-specific conditions. The details of the reconciliation approach, modeling, and site-specific SSI analysis of the R/B complex are addressed in FSAR Appendix 3NN. The results of the site-specific analyses for in-structure response spectra (ISRS) and earth pressures confirm that site-specific effects are enveloped by the standard design, and therefore validate the site-independent seismic design of the R/B complex for site-specific conditions.

Also, please see Luminant letter TXNB-12039 (ML123380390), which provides a detailed overview of standard and site-specific plant seismic design reconciliation.

Question/Request:

"Also, explain changes or variances (if any) to the site-specific structures given the changes in the seismic design methodology, as some of the principles were applied to the non-standard plant structures."

Answer:

Methods applied in the standard plant seismic design are also applied to the seismic analyses and design of site-specific structures, with modifications necessary to address only site-specific conditions. For example, operating-basis earthquake (OBE) damping is used in the seismic analyses. Analyzed soil conditions at Comanche Peak are limited to a relatively narrow range specific to the site and not the broader range presented in the US-APWR standard plant design. The evaluation and use of structural stiffness properties such as cracked versus uncracked stiffness is based on best estimates of stresses under the site-specific seismic load conditions. Attributes and inputs used for the seismic design of site-specific structures are presented in detail in revised FSAR Sections 3.7 and 3.8, and Appendices 3KK, 3LL, and 3MM.

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

FSAR Sections 3.7 and 3.8, and Appendices 3KK, 3LL, 3MM, and 3NN have been revised as outlined in the Comanche Peak Integrated Seismic Closure Plan, and will be submitted in FSAR Updated Tracking Report Revision 3 currently scheduled for October 14, 2013.

<u>Impact on DCD</u>

None.

Attachment 2

Response to Request for Additional Information 247 (6266)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 247 (6266)

SRP SECTION: 03.07.02 - Seismic System Analysis

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

DATE OF RAI ISSUE: 2/27/2012

QUESTION NO.: 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.

ANSWER:

This information replaces the previous answers for items 2, 5, 6, 7, 9, 10, and 13 of Question 03.07.02-23 (ML11301A254).

1. The cut-off frequencies of the SASSI analyses for the ultimate heat sink related structures (UHSRS), essential service water pipe tunnel (ESWPT), and power source fuel storage vaults (PSFSVs) are presented in FSAR Tables 3KK-9, 3LL-7, and 3MM-11 and 3MM-12, respectively. The cut-off frequencies of the analyses were determined considering the frequency content of the input motion, the dynamic properties of the soil column, and the natural frequencies of the structures.

    - The frequency content of the input motion is represented by the site-specific foundation input response spectra (FIRS), which are the spectral shape of the certified seismic design response spectra (CSDRS), but scaled to 1/3 of the CSDRS as addressed in FSAR Subsection 3.7.1.1. The zero period acceleration (ZPA) starts at 50 Hz. Almost all of the energy of the input motion is concentrated in the lower frequency ranges and there are no site-specific high-frequency exceedances that would require the cut-off frequencies to be extended beyond the 50 Hz ZPA.

    - The backfill soil column frequencies for the UHSRS, ESWPT, and PSFSVs are identified in FSAR Tables 3KK-3, 3LL-5, and 3MM-4, respectively. The cut-off frequencies exceed the backfill soil column frequencies.

    - The major structural natural frequencies below the rigid range (i.e., below the 50 Hz point of spectral ZPA) are identified in Tables 3KK-2, 3LL-4, and 3MM-3, for the UHSRS, ESWPT, and PSFSV, respectively. The cut-off frequencies exceed the major structural natural frequencies that occur below the rigid range.

- For the UHSRS and PSFSV, some of the analyses of the embedded models for lower bound and best estimate soil profiles have cut-off frequencies below 50 Hz. This was found to be acceptable because the seismic responses above these lower cut-off frequencies were governed by the stiffer upper bound and/or high bound soil profiles, which had cut-off frequencies at or above 50 Hz. Refer to FSAR Figures 3KK-10 and 3MM-11 for typical examples of how the design basis in-structure response spectra (ISRS) in the higher frequency ranges are governed by the upper bound and/or high bound profiles.

The maximum passing frequencies (transmission frequencies) of the analyses are discussed in Item 2 below.

2. The maximum passing frequencies that can be transmitted through the models used for the SASSI analyses for the UHSRS, ESWPT, and PSFSVs are presented in FSAR Tables 3KK-9, 3LL-8 and 3LL-9, and 3MM-11 and 3MM-12, respectively. Based on the criteria that the smallest wave length the model can transmit is five times the soil layer or element size, these passing frequencies are calculated as $V_s/5d$ as described in FSAR Subsection 3.7.2.4.5, where V_s is the soil shear wave velocity and d is the soil layer thickness.

   The analyses of UHSRS and PSFSV embedded models for lower bound and best estimate soil profiles utilized values of the cut-off frequencies that are approximately 20 percent higher than the passing frequency of some of the layers in the backfill soil models. Similarly, in the SSI analyses of the ESWPT, the passing frequency of some of the layers in the lower bound profile is above 45 Hz, but below the cut-off frequency of 50 Hz. To verify the accuracy of the SASSI analyses results that used cut-off frequencies higher than the passing frequencies, verification studies were performed on UHSRS and PSFSV embedded models as described in FSAR Sections 3KK.2 and 3MM.2, respectively. The studies compared ISRS obtained from SASSI analyses with a cut-off frequency of $V_s/5d$ versus ISRS obtained from analyses with a cut-off frequency closer to $V_s/4d$. These studies also compared the lower bound or best estimate ISRS to the ISRS obtained from SASSI analyses of upper or high bound profiles, which govern the design basis ISRS at higher frequencies. The results of these verification studies demonstrated that the SASSI analyses, performed with cut-off frequencies 20 percent higher than one-fifth wave length passing frequency, produced results that do not impair the accuracy of design basis ISRS. Figures 1 and 2 provide typical examples of the verification studies results.

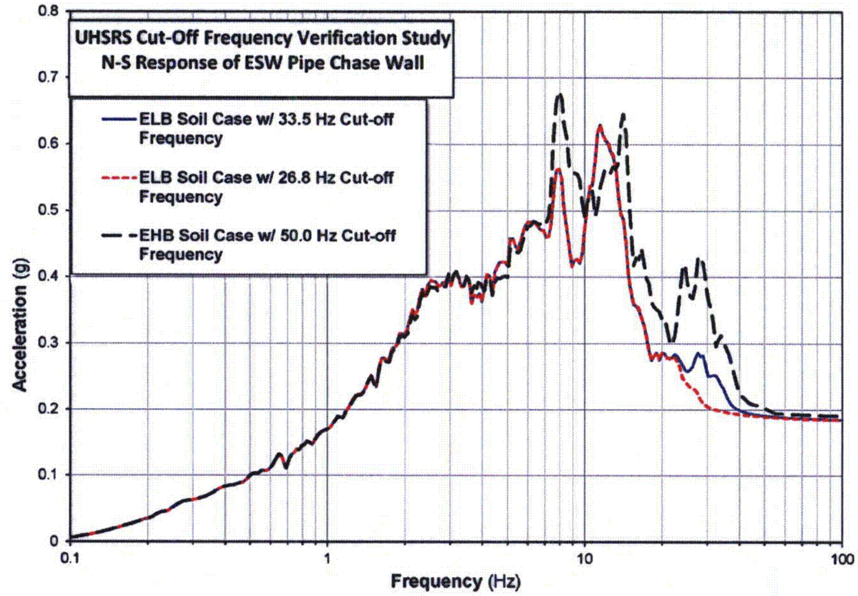

Figure 1 - 5% Damping ISRS Comparison for UHSRS Cut-off Frequency Verification Study

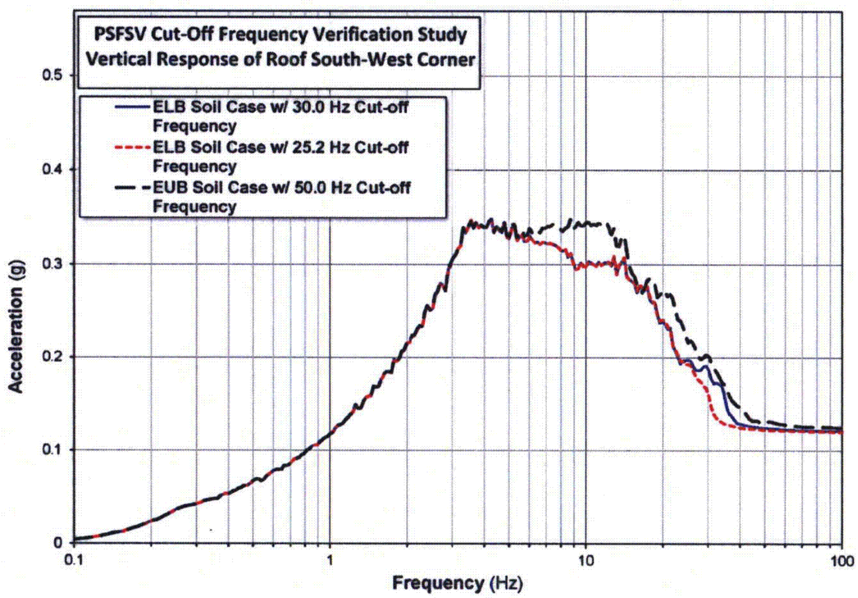

Figure 2 - 5% Damping ISRS Comparison for PSFSV Cut-off Frequency Verification Study

Impact on R-COLA

The revised FSAR sections and appendices will be submitted in FSAR Updated Tracking Report Revision 3 currently scheduled for October 14, 2013.

Impact on DCD

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 247 (6266)

SRP SECTION: 03.07.02 - Seismic System Analysis

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

DATE OF RAI ISSUE: 2/27/2012

QUESTION NO.: 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 generally 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 were compared to the frequencies calculated from the transfer functions for the SASSI model to confirm adequacy of the coarser mesh 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 "Natural frequencies were not calculated from the SASSI transfer functions to confirm adequate model mesh size. 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.

ANSWER:

This information revises and replaces the previous answers for Items 1, 3, 4, 6, 7, 8, and 9 of Question 03.07.02-24 (ML11301A254).

1. Response spectra analysis, including response spectra analysis of the structure on soil springs, is no longer used to perform the seismic analysis and design of the UHSRS. Results from the SSI analyses performed on the revised model of the UHSRS using the computer program SASSI were used to develop the seismic loads for the structural

design as described in revised FSAR Appendix 3KK. Equivalent static loads derived from the maximum accelerations results of the SSI analyses are applied to the structural model resting on finite element (FE) "superelements" as described in revised FSAR Subsection 3.8.4.4.4.2. Stiffness properties assigned to the superelements represent the lower bound and upper bound stiffness properties of the supporting limestone strata. The input motions for the SSI analyses are ground motion time histories as described in revised FSAR Subsection 3.7.1.1, which addresses the appropriateness of the site-specific FIRS and the compatible design ground motion time histories. A comparison of the response spectra used for response spectra analysis versus the FIRS associated with the SSI input motion time histories is no longer applicable.

2. Groups of nodes are used to generate the ISRS shown in Appendices 3KK through 3MM for the different structure components. The groups of nodes are selected to represent the key locations, including edges and centers, of the structure's components (i.e., walls, slabs, roof, and basemat). The number of nodes and locations are selected to provide design-basis ISRS that envelope the responses at different locations within the component. Examples of node groups used in the generation of ISRS are presented below in Table 1, Figure 1, Figure 2, and Figure 3, for the ESWPT, PSFSV, and UHSRS, respectively. A complete list of node numbers used for generation of ISRS is not presented herein. The calculations containing the complete list of nodes and the breakdowns of node groups used in generation of ISRS are available for NRC audit.

Component	Node #	Coordinates			Component	Node #	Coordinates		
		X	Y	Z			X	Y	Z
	08304	-11.5	0	10.08		08312	11.5	0	10.08
	08439	-11.5	54.375	10.08		08447	11.5	54.375	10.08
	08574	-11.5	108.75	10.08		08582	11.5	108.75	10.08
	08709	-11.5	163.12	10.08		08717	11.5	163.13	10.08
	08844	-11.5	217.5	10.08		08852	11.5	217.5	10.08
	08853	-11.5	0	12.998		08855	11.5	0	12.998
	08898	-11.5	54.375	12.998		08900	11.5	54.375	12.998
	08943	-11.5	108.75	12.998		08945	11.5	108.75	12.998
	08988	-11.5	163.12	12.998		08990	11.5	163.13	12.998
	09033	-11.5	217.5	12.998		09035	11.5	217.5	12.998
	09036	-11.5	0	15.415		09038	11.5	0	15.415
Exterior Walls	09081	-11.5	54.375	15.415	Exterior Walls (Cont')	09083	11.5	54.375	15.415
	09126	-11.5	108.75	15.415		09128	11.5	108.75	15.415
	09171	-11.5	163.12	15.415		09173	11.5	163.13	15.415
	09216	-11.5	217.5	15.415		09218	11.5	217.5	15.415
	09219	-11.5	0	18.083		09221	11.5	0	18.083
	09264	-11.5	54.375	18.083		09266	11.5	54.375	18.083
	09309	-11.5	108.75	18.083		09311	11.5	108.75	18.083
	09354	-11.5	163.12	18.083		09356	11.5	163.13	18.083
	09399	-11.5	217.5	18.083		09401	11.5	217.5	18.083
	09402	-11.5	0	20.75		09410	11.5	0	20.75
	09537	-11.5	54.375	20.75		09545	11.5	54.375	20.75
	09672	-11.5	108.75	20.75		09680	11.5	108.75	20.75
	09807	-11.5	163.12	20.75		09815	11.5	163.13	20.75
	09942	-11.5	217.5	20.75		09950	11.5	217.5	20.75

Table 1 - List of Nodes Used for Generation of ISRS for ESWPT Segment 1aN Exterior Walls

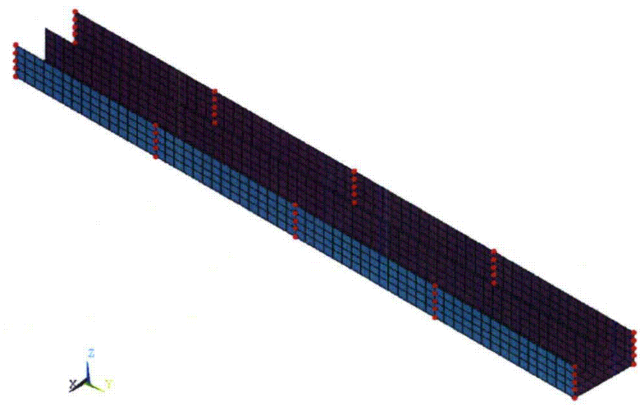

Figure 1 - Node Group Used for Generation of ISRS for ESWPT Segment 1aN Exterior Walls

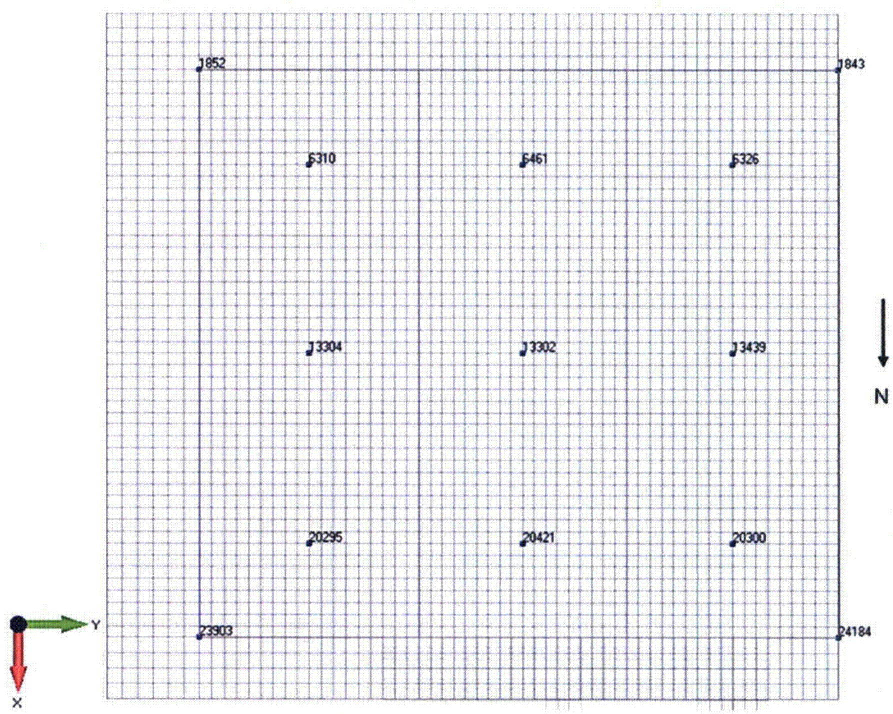

Figure 2 - Node Group Used for Generation of ISRS for PSFSV Basemat

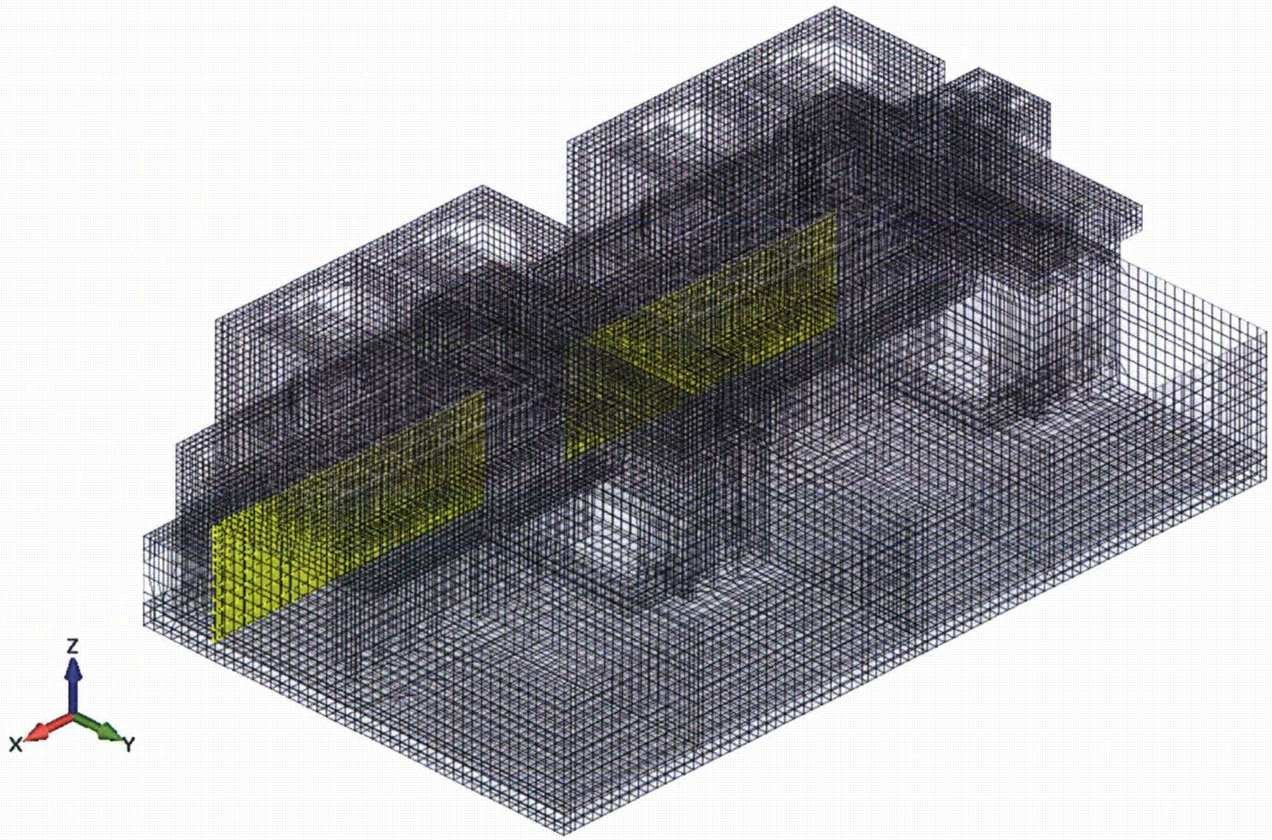

Figure 3 (Sheet 1 of 2) - Node Group Used for Generation of ISRS for UHSRS Cooling Tower Support Structure South Exterior Wall below Air Intake

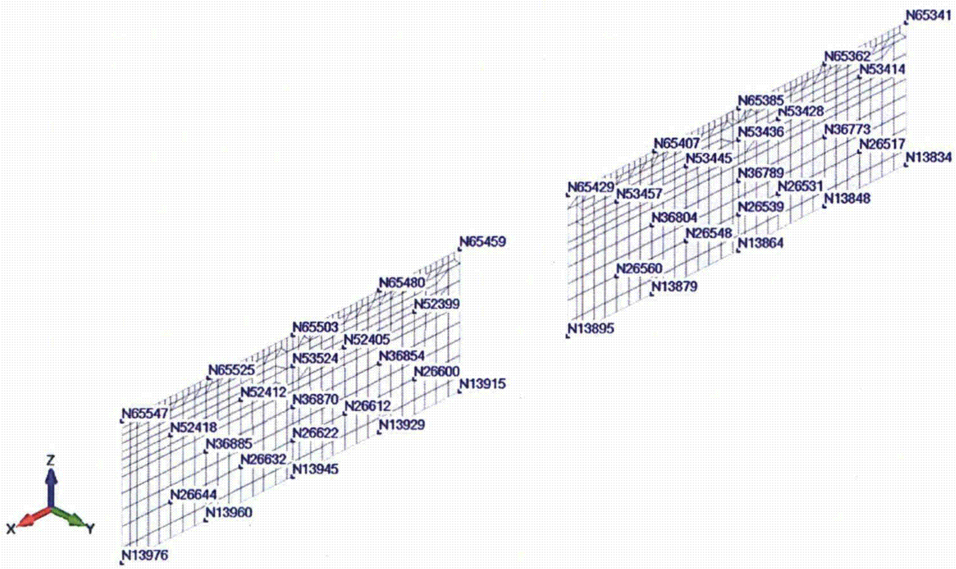

Figure 3 (Sheet 2 of 2) - Node Group Used for Generation of ISRS for UHSRS Cooling Tower Support Structure South Exterior Wall Below Air Intake

3. Response spectra analysis is no longer used to perform the seismic analysis and design of the essential service water pipe tunnel (ESWPT). The results for maximum nodal accelerations obtained from SSI analyses performed on the revised ESWPT models using the computer program SASSI are used as the basis for development of equivalent static loads for the design, as described in revised FSAR Appendix 3LL. The input motions for the SSI analyses are ground motion time histories as described in revised FSAR Subsection 3.7.1.1, which addresses the appropriateness of the site-specific FIRS and the compatible design ground motion time histories.

4. Revised FSAR Section 3LL.2 contains a description of the model verification for the ESWPT structural model, which is created in ANSYS and analyzed for SSI using SASSI. The FE mesh of the dynamic models used for the SSI analyses is identical to the mesh of the models used for structural design of the ESWPT. As discussed in revised Section 3LL.2, the translation of the ESWPT structural models from ANSYS to SASSI is confirmed by comparing the results from the modal analysis of the fixed-base structure in ANSYS and the SASSI analysis of the model resting on the surface of a half-space with high stiffness. Transfer functions were computed at various node locations throughout the SASSI models and structural frequencies obtained from the peaks of these transfer functions were compared to the structural frequencies obtained from the ANSYS modal analysis. Revised Table 3LL-4 contains a comparison of the frequencies obtained from modal analysis in ANSYS versus the frequencies obtained from the SASSI transfer functions.

Impact on R-COLA

The revised FSAR sections and appendices will be submitted in FSAR Updated Tracking Report Revision 3 currently scheduled for October 14, 2013.

Impact on DCD

None.