

**North Anna Unit 3 Seismic Audits 1 and 2  
Action Item Tracking List**

AI Number from Source	AI/Question Description	Impacted Report	Follow-up Action	Status	Comments
091015S006	<p>The staff requested that GEH justify cases with lower passing frequencies (General). This was identified on slide 6 (33 Hz for Full Column LB)</p> <p>Action 1 Example: For Slide 6, the NRC asked for justification for the 83 percent captured motion energy for the RB/FB full column LB 33 Hz cases to ensure that, had the LB soil column cases been refined such that their passing frequencies were not lower than 50 Hz, the responses from these refined LB cases are still bounded by the BE and UB cases.</p>	CB-FWSC SSSI Report	<p>Refer to similar Item 091015S063.</p> <p>CB-FWSC SSSI report will also be revised to further justify the use of cut-off frequencies &lt; 50 Hz for FWSC-CB SSSI analyses by providing references to figures and tables.</p> <p>Revise CB-FWSC SSSI report to address the issue of missing reference to specific figures.</p>	Closed	Report WG3-U73-ERD-S-0002 Revision 5 provided to the NRC 11/30/2015 (NA3-15-032)
091015S028B	NRC Action #7, Slide 28: FSAR Tables 3A.15-201 through 3A.15-206 should be updated as appropriate to reflect the additional SSI/SSSI analyses performed.	FSAR 3A.15	Revise FSAR Tables 3A.15-201 through 3A.15-206 to add the additional analyses of FWSC cracked model for BE case and SSI and SSSI analyses performed for the FWSC concrete fill soil separation study.	Confirmatory	Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).

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091015S029A	Since the FWSC-CB SSSI effects are impacting the responses, the staff questioned whether there are any other neighboring buildings that could contribute to the SSSI effects of the CB and FWSC in the x-direction (perpendicular to the two buildings). As such, please justify why the potential effect of SSSI on other Category I structures (RB/FB) considering the structures aligned in another direction (e.g., RB/FB-TB) will not be important.	COLA Part 10	Revise ITAAC for Seismic Category II Structures (Turbine Building, Service Building, and Ancillary Diesel Building) and Radwaste Building to be specific regarding adjacent Seismic Category I structures.	Confirmatory	Included in 12/2015 COLA Part 10 markups; NA3-15-037 (12/16/2015).

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091015S032A	Staff requested the Figures showing the NEI check was met by comparing PBSRS with the envelope of surface response spectra obtained from final SSI input time-histories at the surface of the LB, BE, and UB soil columns.	FSAR 3.7.1	Revise FSAR Sections 3.7.1.1.5.1.1 and 3.7.1.1.5.1.2, and Figures 3.7.1-295 through 3.7.1-306 as follows: <ul style="list-style-type: none"> <li>• Take out the smoothed curves in the NEI check figures and replace with figures showing raw ARS.</li> <li>• Provide corresponding discussion in the FSAR text justifying specific dips in in RB/FB and CB ARS. For CB ARS, refer to the sensitivity study performed to justify dip at ~14hz is inconsequential.</li> <li>• Formally document the sensitivity study but it is not necessary to reference the documents in the FSAR or submit the documents to the NRC as they can remain auditable documents.</li> </ul>	Confirmatory	Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).
091015S040B	NRC Action #12, Slides 40 and 60: Staff will review V&V of ACS SASSI for application to North Anna 3 sensitivity analysis. Same as 091015S060B.	FSAR Section 3.7.2 or 3A	Revise FSAR to incorporate conclusions from the RB/FB SSI report, Appendix I.	Confirmatory	Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).

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091015S042B	NRC Action #13, Slide 43: Dominion will revise the FWSC seismic analysis report to include results from two additional sensitivity analyses on FWSC. The report should also reflect additional SSI/SSSI analysis being performed for soil separation.	FWSC Seismic Analysis Report	Revise the FWSC seismic analysis report (WG3-U63-ERD-S-0001) to refer to FWSC concrete block separation study calculations additional SSI/SSSI analysis being performed for soil separation.	Confirmatory	[Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015). [FSAR Appendix 3A.]  Report WG3-U63-ERD-S-0001 Revision 2 submitted to NRC 12/16/2016 (NA3-15-033).  Report SER-DMN-034 posted in Electronic Reading Room for NRC Audit.
091015S063	Discussion on the last paragraph of Page 17 of 602 is not clear without any reference to specific Figures. Please as an example, discuss with reference to specific Figures in the report.	FWSC Seismic Analysis Report, RB/FB Seismic Analysis Report, CB Seismic Analysis Report	RB/FB, FWSC and CB reports revised to include references. (CB-RB/FB SSSI is being revised as noted in Item 091015S006.)	Closed	Report WG3-U71-ERD-S-0001 (RB/FB) Revision 3 provided to the NRC 11/30/2015 (NA3-15-032)  CB and FWSC Seismic Analysis Reports (WG3-U73-ERD-S-001; WG3-U63-ERD-S-0001) submitted 12/16/2015 (NA3-15-033).

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091015S065B	NRC Action #15, Slide 65: Dominion is revising CB and FWSC seismic analysis reports to clarify the method of determining the potential uplift and contact ratio of the foundation mat. The staff will review this issue during Audit-1.	FWSC Seismic Analysis Report, FSAR Section 3.7.2 or 3A	<p>Revise the FWSC SSI report to correct the following errors:</p> <ul style="list-style-type: none"> <li>-Section 5.5, Item 1: Change to "The FWSC structure and model..."</li> <li>-Section 5.5, Item 7: Change to "(the FWSC seismic weight...)"</li> </ul> <p>Revise the FSAR to present a summary of the methodology to calculate foundation uplift as presented in the RB/FB, CB and FWSC Seismic Analysis Reports (including any alternative methods for uplift calculation).</p>	Confirmatory	<p>Report WG3-U63-ERD-S-0001, Revision 2, submitted to NRC 12/16/2015 (NA3-15-033).</p> <p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>

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091015S067A	<p>According to the guidance in SRP Acceptance Criteria 3.7.2.II.4, uplift for non-symmetric structures may be more affected by the phasing between the three directions of input motions. The RB/FB building is not a symmetric building. The procedure discussed in Section 5.6, "Base Reactions and Contact Pressures," does not explicitly indicate whether and how the phasing of the input motions is considered in the uplift analysis. Therefore, technical justification should be provided if the effect of different phasing of the input motions is not considered in the calculation of the foundation uplift. If the non-symmetric conditions need to be addressed, then the effect of in-phase and out-of-phase input motions can be considered in the SSI analyses by using plus and minus 1.0 times the magnitude of the input motions. This is especially important as the calculated contact ratio is 84 percent, not much higher than the 80 percent criterion.</p>	<p>RB/FB Seismic Analysis Report, CB Seismic Analysis Report, FSAR Section 3.7.2 or 3A</p>	<p>Revise the RB/FB and CB SSI reports to include the results and methodology used for alternative rigid foundation uplift calculations. Add a summary statement to the FSAR.</p>	<p>Confirmatory</p>	<p>Report WG3-U71-ERD-S-0001, Revision 3 (RB/FB), submitted to NRC 11/30/2015 (NA3-15-032).</p> <p>Report WG3-U73-ERD-S-0001, Revision 2 (CB), submitted to NRC 12/16/2015 (NA3-15-033).</p> <p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>

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091015S067B	<p>NRC Action #16, Slide 67: Dominion is performing uplift calculation for RB/FB to address effect of excitation direction and the RB/FB seismic analysis report will be revised. Staff will review this issue during Audit-1.</p> <p>Item 1 equation in Section 5.6 of RB/FB report S(z) is correct and will not be revised because calculations were performed considering two different directions of the vertical earthquake not the absolute value (please refer to results in Table 5.6-1). Since the RB/FB is not symmetrical, the approach used for the RB/FB differs from the one used for the symmetrical CB and FWSC.</p>	RB/FB Seismic Analysis Report, CB Seismic Analysis Report, FSAR Section 3.7.2 or 3A	Revise the RB/FB and CB SSI reports to include the results and methodology used for alternative rigid foundation uplift calculations. Add a summary statement to the FSAR.	Confirmatory	<p>Report WG3-U71-ERD-S-0001, Revision 3 (RB/FB), submitted to NRC 11/30/2015 (NA3-15-032).</p> <p>Report WG3-U73-ERD-S-0001, Revision 2 (CB), submitted to NRC 12/16/2015 (NA3-15-033).</p> <p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>
091015S074A	Table 6.2-1 shows that the maximum relative displacements for NA3 are larger than those for the standard design at a few locations but have not been identified as exceedance. This contradicts with the conclusion drawn in Section 6.2, "Enveloping Maximum Displacements."	FWSC Seismic Analysis Report	Revise the conclusions in the FWSC SSI report, Section 6.2, to note that there are a few exceedances of the relative displacements and such exceedances will be considered in the NA3 site-specific design evaluation.	Closed	Report WG3-U63-ERD-S-0001, Revision 2, submitted to NRC 12/16/2015 (NA3-15-033).

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091015S107A	Discussion of NEI Check for the CB in FSAR markup on page 3-25 did not include the basis of acceptability (as provided in the response to RAI 03.07.02-11) of defining the CB control motion at the CB basemat instead of the bottom of the concrete fill below the CB basemat. This basis should be included in the FSAR Section 3.7.1.	FSAR 3.7.1, FSAR Section 3.7.2 or 3A	Revise FSAR Section 3.7.1 to describe comparison presented in response to RAI 03.07.02-11 that demonstrates why SSI analysis at CB basemat Elevation 241 ft is acceptable.	Confirmatory	Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).
091015S108A	<p>In FSAR 3.7.1.1.6 markup on page 38 of 623, the site-dependent SSE at-grade response spectra is defined as envelope of the PBSRS for the RB/FB, CB, and the RG 1.60 spectra normalized to 0.1g PGA. The reference site-dependent OBE at-grade response spectra for OBE exceedance check is then defined as one-third of the site-dependent SSE at-grade response spectra. Per the 10 CFR Part 50, Appendix S, no explicit analysis for the OBE is needed if the OBE is defined as one-third of the SSE.</p> <p>The staff further reviewed this issue. For the site-dependent at grade SSE described in FSAR markup Section 3.7.1.1.6 to be acceptable for establishing the reference OBE without an explicit OBE analysis, the individual PBSRS calculated for each of the Category I structures</p>	FSAR 3.7.1	Revise FSAR Sections 3.7.1, 3.7.1.1 and 3.7.1.1.6, associated Tables 3.7.1-216 and 3.7.1-217, and associated Figures 3.7.1-265, 3.7.1-266 and 3.7.1-267 to incorporate clarifier "manifestation" where Site-Dependent SSE at Grade is described.	Confirmatory	Included in 12/2015 FSAR and COLA markups; NA3-15-037 (12/16/2015).



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	<p>(RB/FB, CB, and FWSC) should envelope the site-dependent SSE at-grade response spectra. Therefore, defining the site-dependent SSE at-grade response spectra as envelope of the PBSRS calculated for the RB/FB and CB, and the RG 1.60 spectra normalized to 0.1g PGA may be less conservative for the purpose of defining the site-dependent at-grade OBE level earthquake for plant shutdown. As such, the applicant is requested to provide further justification.</p>				
091015S116B	<p>NRC 8/31 Question 4 regarding July 2015 letter and markups [Basis for Damping Values in FSAR Table 3A.13.2-201]. NRC Action #20, Slide 116: NRC will review damping values comparing with those values with DCD model during the audit. The basis should be included in the FSAR.</p>	FSAR 3A.13	<p>Revise FSAR Section 3A.13.2 as follows: "Table 3A.13.2-201 provides the damping values used for the site-specific SSI analyses. The damping values are based on RG 1.61, DCD Table 3.7-1, and the DCD model."</p>	Confirmatory	<p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>

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091015S117D	Question 5 regarding July 2015 letter and markups [Approach and criteria for enhancing site-specific seismic demand]: were evaluations performed for the SSSI effects on soil bearing pressure, lateral pressure, and stability.	FWSC Stability Analysis Report, RB/FB Stability Analysis Report, CB-Stability Analysis Report, FSAR 3.8, FSAR 3.7	<p>As described below: revise the RB/FB, CB and FWSC technical reports on stability to be consistent with the results of the updated SSI/SSSI reports justifying the consideration of licensing basis demands for stability, and soil bearing and lateral pressure calculations. Revise FSAR sections 3.7 and 3.8 accordingly.</p> <p>CB Stability report Section 3 to be revised as follows (use this as example for RB/FB and FWSC stability reports, as required):</p> <p>“As shown in Appendix B of Reference 2-i, the seismic response analyses of the models representing full (uncracked concrete) stiffness properties of the CB reinforced concrete structure provide conservative seismic load demands for the NA3 rock site with high frequency design motion and bound the effects of concrete cracking as described in Appendix B of Reference 2-i and SSSI as described in Reference 2-k.”</p> <p>Make sure that design basis in FSAR Section 2.5.4 and</p>	Confirmatory	<p>Stability reports WG3-U63-ERD-S-0002 Revision 1 (FWSC), WG3-U71-ERD-S-0003 Revision 1 (RB/FB), and WG3-U73-ERD-S-0003 Revision 2 (CB), were provided to the NRC 10/30/2015 (NA3-15-030)</p> <p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>

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			3.7- 3.8 regarding soil bearing pressures are consistent.		

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091015S123A	<p>The last sentence on Page 31 second paragraph of the CB/FWSC SSSI report (WG3-U73-ERD-S-0002, rev.3) states that the SSSI effects on the FWS roof out-of-plane loads are enveloped by the corresponding load used for standard design. However, this statement does not appear to be consistent with the Table 6.4-1 entries. In Table 6.4-1, the equivalent standard design acceleration is shown as 1.74g while the flexible mode SSSI and NA3 Site-specific equivalent SSSI accelerations of the roof are shown as 3.98g and 2.30g, respectively. Please address this issue.</p>	<p>FSAR Section 3.7.2 or 3A</p>	<p>Revise FSAR to describe changes similar to those described in the bullets below.</p> <ul style="list-style-type: none"> <li>• Last sentence in Section 6.4 of CB-FWSC SSSI report was revised to correctly state that SSSI effects amplify the seismic load demand on FWS roof and that this site-specific demand is larger than the corresponding load considered in the standard design</li> <li>• As shown in Table 6.2-1 of FWSC Seismic Analysis report, results of FWSC-CB SSSI analyses defined enveloping out-of-plane demand on FWS roof used for site-specific evaluation of FWSC structures</li> </ul>	<p>Confirmatory</p>	<p>FSAR 07/2015 Markups: Tables 3A.18.1.3-203 and 3A.18.1.3-204 Site-Specific Enveloping Maximum Accelerations of FWSC SDOF Oscillators.</p> <p>Section 3A.18 revisions included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>

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091015S124A	<p>In the CB and RB/FB SSSI report (WG3-U73-ERD-S-0005), the staff noted (on page 22 of 76) that SSSI of the RB/FB has significant effect on the CB torsional response, and the report discussed how this effect is bounded by the standalone SSI analysis of the CB. The staff also noted (on page 23 of 76) that SSSI of the RB/FB has significant effect on the lateral pressures on the CB west wall facing the RB/FB, and report stated that only significant exceedance that can be observed at the bottom level of the basement has no effects on the CB below-grade wall design. These bases should be reflected in the FSAR markup Section 3A.17.11.</p> <p>In addition, FSAR section 3A.17.11 markup discusses the SSSI effect of the RB/FB on the CB. On page 372 of 623 of the FSAR markup, it is stated that the site-specific SSSI evaluations show that the SSSI between the CB and the RB/FB have small effects on the seismic response of the CB. However, the FSAR does not discuss how these effects are being considered in the site-specific demand and ISRS. The FSAR should include how these effects are being addressed in the site-specific seismic demand</p>	FSAR 3A.17	<p>Revise FSAR Section 3A.17.11 to explain how exceedances are addressed. FSAR changes will be made to address exceedances in CB response due to RB/FB SSSI effects (similar to how Issue Number 006 will be addressed). This will include an explanation on how these exceedances are addressed in site-specific evaluations. The FSAR change will pull together and summarize information from various reports as per the request from the NRC.</p> <p>Refer to Issue 0910GEN01 for providing further information regarding justification of torsional demand exceedances.</p> <p>Refer to issue 092815A1003.</p>	<p>Closed</p> <p>New action item 010616006 is created</p>	<p>Additions to 3A.17.11 included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>

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	evaluation.				

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091015S125	<p>In the CB and RB/FB SSSI report (WG3-U73-ERD-S-0005), the report (on Page 21 of 76) identified that the vertical ISRS response considering the SSSI effect could exceed by 5 percent at a frequency of 25 Hz and by 25 percent at 50 Hz. The report also stated that these exceedances can be neglected because they are either bounded by the standard design or occur at high frequencies where they could be offset if the effect of incoherency of the ground motion is considered. The staff agrees with the basis that potential exceedances would be addressed when bounded by the standard design. However, the staff needs additional technical justification for using the effect of incoherence in offsetting the SSSI effect. In addition this justification should be included in the FSAR. Alternatively, the applicant can incorporate these exceedances in the site-specific design basis ISRS as appropriate.</p>	<p>FSAR Section 3.7.2 or 3A, FSAR 3A.17</p>	<p>Revise the FSAR (CCR package NA3-15-7012) for already revised CB-RB/FB SSSI Report and the CB Seismic Analysis Report that address exceedances. Incoherency will not be used as justification.</p> <p>Revise FSAR 3A.17.11, to note that ISRS exceedances due to RB/FB SSSI effects are included in CB site-specific ISRS.</p> <p>Similar to above (091015S124B).</p> <p>Refer to issue 092815A1003.</p>	<p>Confirmatory</p>	<p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p>

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091015S126	<p>The access tunnel between the RB/FB and CB has been modeled for the SSSI analysis between the CB and RB/FB. Page 14 of 76 of the CB-RB/FB SSSI report (WG3-U73-ERD-S-0005) describes that there are seismic gaps between the access tunnel and the adjacent buildings. FSAR section 3.7.2.8 markup does not identify the seismic gap requirement between the access tunnel and the adjacent Category I buildings. It also appears that the detailed site-specific design of the access tunnel is not complete. Per DCD Revision 10, Page 3.7-28, this tunnel is classified as seismic Category II. However, no site-specific ITAAC has been provided for this tunnel. As such, the NRC inquired as to how the design commitments for this tunnel are to be tracked.</p>	COLA Part 10	Add ITAAC to COLA for design of SC II Access Tunnel.	Confirmatory	Included in 12/2015 COLA Part 10 markups; NA3-15-037 (12/16/2015).



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0910GEN01	For the stability, soil bearing pressure, and lateral soil wall pressure evaluations of the plant structures, where the enveloping of the sensitivity analysis cases with the results of the site specific design basis was not considered, Dominion should have available the technical basis for not enveloping or not scaling the results accordingly. The sensitivity analysis cases refer to both the cracked vs uncracked cases and SSSI vs SSI cases.	CB-FWSC SSSI Report, CB-RB/FB SSSI Analysis Report	Revise the RB/FB – CB SSSI Report and the CB-FWSC SSSI Report, Section 5.5 to make it clear that the calculated and accidental torsional loads plus the shear are bounded by licensing basis analysis (explain how the numbers in Table 5.5-3 were calculated).	Closed	Reports WG3-U73-ERD-S-0002 Revision 5, and WG3-ERD-S-0001 submitted to NRC 11/30/2015 (NA3-15-032)
0910GEN02	<p>NRC will include spent fuel pool rack review in the audit plan for Audit-1.</p> <p>Review of analysis from beginning to end for the racks, including the design changes.</p> <p>SER-DMN-019, Revision 0</p> <p>RB/FB Seismic Analyses Bounding Results and In-Structure Response Spectra</p> <p>DCD Report: NEDO-33373-A</p>	North Anna 3 Fuel Rack Seismic Analysis	<p>Dominion agreed to the following actions related to the fuel storage racks, PCCS condenser, and fuel stored in racks site-specific seismic analyses. The NRC will confirm these actions through the electronic reading room or in Audit 2:</p> <p>-Describe in the fuel rack NA3 report, or in a referenced report, the demonstration of the adequacy of the acceleration time histories. [updated 11/16/15]</p> <p>-Obtain plots of the response spectra of the acceleration time histories for comparison to the response spectra</p>	Open with <del>NRC</del> <del>Dominion</del>	<p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p> <p>Report Status 01/04/2016:</p> <p>•002N8467, Revision 2 (Fuel Racks) and 002N8530, Revision 2 (PCCS Condenser) submitted to NRC via e-mail 12/14/2015 <u>(also submitted in letter dated 1/14/2016)</u></p> <p>•003N0526, Revision 0 (spent fuel stored in fuel racks) <u>being prepared for submittal</u></p>

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	Revision 5		<p>determined for NA3 fuel rack seismic analysis report (plots can be included in supporting documents – i.e., ENSA document – and not in the NA3 fuel rack report).</p> <p>-Complete and document the NA3 seismic analysis report for the fuel stored in the racks and demonstrate structural adequacy.</p> <p>-Update the NA3 seismic analysis technical reports for fuel racks and PCCS condenser.</p> <p>-Revise FSAR for the fuel racks and PCCS condenser summarizing the evaluations performed and include the correct report revision number.</p>		<p><a href="#">submitted to NRC (letter date 1/14/2016; NA3-16-001)</a></p> <p>NRC to check spectral matching supporting document in audit 2</p>
092815A1002	Revise COLA Part 10 as necessary to include the 220' elevation for the FWSC SSI Input Response Spectra in the definition of the SSE. Other parts of the COLA (e.g., Part 7) also will be reviewed to determine if other changes need to be made.	COLA Part 10, COLA Part 7	Revise COLA Part 10 as necessary to include the 220' elevation for the FWSC SSI Input Response Spectra in the definition of the SSE. Other parts of the COLA (e.g., Part 7) also will be reviewed to determine if other changes need to be made.	Confirmatory	Included in 12/2015 COLA Parts 7 and 10 markups; NA3-15-037 (12/16/2015).

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092815A1003	09/29/2015: Revise FSAR to describe the methodology used to address exceedances in sensitivity studies, including acceptance criteria. These sensitivity studies refer to stiffness variations, SSSI analyses, and soil separation. Also describe use of scaling if SSSI analyses of FWSC-CB and CB-RB/FB yield results that exceed ISRS from FWSC and CB SSI analyses, and describe use of scaling if SSSI analyses of FWSC-CB yield results that exceed load demands from FWSC SSI analyses.	FWSC Seismic Analysis Report, FSAR Section 3.7.2 or 3A	<p>Revise the FSAR as described in the issue description. Revise the FWSC seismic analysis report (WG3-U63-ERD-S-0001) to further clarify the approach for enhancing ISRS for effects of cracking (Appendix B, Section B.5). As required, revise other technical reports to reflect the methodology in the issue description.</p> <p>Note: The following issues were closed to this issue:</p> <p>091015S075A, 091015S117A, 091015S117B, 091015S117C, 091015S124A, 091015S124B, and 091015S125.</p>	Confirmatory	<p>Included in 12/2015 FSAR markups; NA3-15-037 (12/16/2015).</p> <p>Revised FWSC, CB, and RB/FB Seismic Analysis Reports submitted to NRC:</p> <ul style="list-style-type: none"> <li>•WG3-U63-ERD-S-0001, Revision 2 (FWSC) and WG3-U73-ERD-S-0001, Revision 2 (CB); NA3-15-033 (12/16/2015)</li> <li>•WG3-U71-ERD-S-0001, Revision 3 (RB/FB); NA3-15-032 (11/30/2015)</li> </ul>

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092815A1004	<p>Technical Report SER-DMN-034: Shear capacity of concrete fill under FWSC:</p> <p>NRC requested technical basis for using ACI-207.1R-18 versus ACI-318.</p>	SER-DMN-034 (Effects of Soil Separation of FWSC)	<p>Revise SER-DMN-034 to provide a further explanation regarding the code governing the design and construction of concrete fill (has to be done as part of audit 2).</p> <p>Change the SER-DMN-034 report title to add "and effects of separation between concrete fill and surrounding soil."</p> <p>10/29/15 – add report SER-DMN-034 to the reading room for NRC review once the revision is completed.</p> <p>(1/20/16 call) Submit a response to RAI 2.5.4-26 regarding FWSC concrete fill.</p>	Open with NRC	<p>Report posted in reading room.</p> <p>(2/2/2016) NRC is mostly closed, except for RGS ITAAC RAI</p>

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092815A1005	Technical Report SER-DMN-034: Soil Separation: NRC requested additional explanation and basis to describe exceedances in FWSC responses due to separation between the concrete fill and the surrounding soil. NRC also asked how these will be documented.	FWSC Seismic Analysis Report, SER-DMN-034 (Effects of Soil Separation of FWSC)	<p>Revise SER-DMN-034 to state that the exceedances due to concrete fill soil separation will be addressed (including ISRS and other seismic demands). Provide the criteria and approach for enhancing the ISRS to bound exceedances due to soil separation following the approach described in Appendix B of FWSC SSI report (WG3-U63-ERD-S-0001). Also include the conclusions of the FWSC soil separation study and provide reference to SER-DMN-034 in WG3-U63-ERD-S-0001.</p> <p>10/29/15 – add report SER-DMN-034 to the reading room for NRC review once the revision is completed.</p>	Open with NRC	<p>Report posted in reading room. [Audit 2 item.]</p> <p>NRC will close in Audit 2.</p>

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092815A1006	CB-FWSC SSSI Report and CB-RB/FB SSSI Report editorial changes.	CB-FWSC SSSI Report	<p>Revise the CB-FWSC SSSI Report:</p> <ul style="list-style-type: none"> <li>-On page 18, 2nd to last paragraph (starting with “the max aspect ratio”), add a reference to App. C to end of last sentence.</li> <li>-On Page 16, in last paragraph of Section 4.2, add a reference to Figures 6.3-1 through 6.3-12.</li> <li>-Provide explanation and basis in Conclusion Section to describe exceedances describe in Section 5.6.</li> </ul> <p>Page 32 of the CB-FWSC SSSI Report states that the site-specific design of the CB design envelops the SSSI effects of the FWSC on the CB seismic response. However, there are some exceedances of SSSI effects such as EW/Vertical accelerations in Figure 5.2-1 and Torsion in Figure 5.2-2. Revise the FSAR to address these inconsistencies</p>	Closed	Report WG3-U73-ERD-S-0002, Revision 5, submitted to NRC 11/30/2015 (NA3-15-032)

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092815A1007	For Report SER-DMN-032: Expand the scope of document to state that all SSSI and sensitivity effects are captured. The NRC will review this in Audit 2.	SER-DMN-032 (NA3 Seismic SSI Analyses Results for CB and FWSC Structural Evaluation)	Revise SER-DMN-032 to expand the scope of document to state that all SSSI and sensitivity effects are captured. The NRC will review this in Audit 2.	Open with Dominion	[Audit 2]
1202150001	Revised site-specific stick models which include the additional oscillators under cracked condition should be included in the FSAR for the RB/FB, CB, and FWSC. [NRC call on 12/2/15]	NA	Revise FSAR Section 3A.17.9 to describe and include figures that show the additional SDOF oscillators used in the seismic analysis stick models for sensitivity studies to adequately capture the out-of-plane vibration of flexible walls and slabs in the RB/FB, CB, and FWSC up to 50 Hz under cracked concrete conditions. The properties of additional oscillators and figures that show these stick models are in report SER-DMN-014.	Open with Dominion	Audit 2 item
1202150002	NRC requested that the FSAR be updated to include comparisons of the DCD demands with the NA3 site-specific demands, which represent the envelope of the base cases and the sensitivity analyses and will be used in the NA3 site-specific design evaluation. The comparisons should clearly identify the exceedances. The level of details and the format of the presentation should be consistent	NA	The FSAR will be updated per the roadmap provided to the NRC via e-mail 01/04/2016 and discussed in teleconference 01/06/2016.	Open with Dominion	Audit 2 item

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	with those for the DCD demands. [NRC call on 12/2/15]				
010616001	To consider ISRS exceedances in the FSAR markup, the 10 percent criterion is applied to the concrete cracking analyses, SSSI analyses, and soil separation analyses. The technical explanation for the case of concrete cracking is acceptable. The technical explanation for soil separation for FWSC is also acceptable. However, the FSAR markup does not provide a technical justification on why the SSSI effect on CB can use the 10 percent criterion. The staff thinks that the SSSI cases are more realistic than the SSI case and any exceedance from the SSSI analyses should be considered. In fact, the SSSI effect on FWSC is considered in full (and governs). [NRC email from M. Eudy 01/06/16]	WG3-U73-ERD-S-0002  WG3-U73-ERD-S-0005	Revise the criteria in CB-FWSC and CB-RB/FB SSSI reports and bounding reports to specify that any exceedance of ISRS up to 50Hz is to be considered as significant by site-specific design.  Revise FSAR 3A.17.11 (and any related section) to remove the discussion on applying a 10 percent criterion for considering exceedances due to SSSI effects.	Open with Dominion	
010616002	References should be updated to use the current revisions. For example, the FWSC stability report still refers to Revision 0 of the SER-DMN-034 (not the current Revision 2). [NRC email from M. Eudy 01/06/16]	Determine which reports are impacted.	Reconcile the list of references in the seismic demand (Phase 1) reports and determine if any report revisions are necessary.	Open with Dominion	



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010616003	In the FSAR markup and WG3-U73-ERD-S-0001R2 (CB SSI analysis), the short duration of 0.015 s should be replaced with a better estimate of 0.02 s because there are 4 points outside of the 80 percent contact ratio domain. It is also recommended to include the 73 percent contact ratio in the FSAR for the additional SSI analysis using rigid beams to properly consider the interior wall stiffness. This contact ratio value combined with the short duration gives the staff more confidence in the validity of the linear SSI calculation. [NRC email from M. Eudy 01/06/16]	<del>WG3-U73-ERD-S-0001</del> <u>FSAR 3A</u>	Revise the CB SSI analysis <del>report in the FSAR Section 3A.17.13.5</del> to correct the duration of uplift from 0.015 sec to 0.02 sec; <del>and Revise FSAR Section 3A.17.13.5</del> to include a description of the results of the additional uplift evaluation (the 73 percent contact ratio) and justifications.	Open with Dominion	
010616004	SER-DMN-034 (Revision 2) Tables 6.1-1 and 6.1-2 provide seismic shear forces and stresses in FWSC concrete fill for fully-bonded and soil-separated models, respectively. Please explain how the maximum seismic shear forces and stresses in these tables are developed. [NRC email from M. Eudy 01/06/16]	SER-DMN-034	Section 4.4 of the report describes the methodology used for calculations of the shear stress and force demands.	Closed	
010616005	In the second paragraph on page 352 of the FSAR markup, ACS SASSI is described as used for the SSSI analyses. The staff has the impression that ACS SASSI is only used for the sensitivity study of RB/FB to consider concrete	NA	Revise FSAR Section 3A.17.11 to remove "and ACS SASSI" from the list of computer programs used for the site-specific SSSI analyses.	Open with Dominion	

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	cracking; therefore, please confirm the accuracy of that statement. [NRC email from M. Eudy 01/06/16]				
010616006	As part of Action Item 091015S124A, the SSSI of the RB/FB has significant effect on the lateral pressures on the CB west wall facing the RB/FB, and report stated that the only significant exceedance that can be observed at the bottom level of the basement has no effects on the CB below-grade wall design. The staff could not find a description of the basis in the FSAR markup for the SSSI effect of RB/FB on the CB lateral pressures. [NRC email from M. Eudy 01/06/16]		Revise FSAR Section 3A.17.11 to include information provided in the CB-RB/FB report that indicates there are no SSSI effects on the CB below-grade wall design.	Open with Dominion	
<a href="#">01151600A</a>	<a href="#">FSAR Section 3.8.1 does not identify any departures, whereas, Sections 3.8.2, 3.8.3, 3.8.4, and 3.8.5 identify NAPS DEP 3.7-1. This departure relates to the NA3 site-specific ground response spectra for seismic structural loads and floor response spectra.</a>	<a href="#">FSAR Section 3.8</a>	<a href="#">Revise the FSAR Section 3.8.1 to add introductory text that recognizes the site-specific analyses and reports in Appendix 3G.</a>  <a href="#">Other related FSAR changes to Section 3.8 will be made per item 01151600C.</a>	<a href="#">Open with Dominion</a>  <a href="#">Audit 2</a>	<a href="#">Discussed on telecon 2/3/2016</a>

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01151600B	<p>In FSAR 3.8.2, corresponding to NAPS DEP 3.7-1, the only change is to replace a paragraph in the DCD with a new paragraph which states:</p> <p><u>“A finite-element analysis model supplemented with hand calculation is used to determine the stresses in the different components of the PCCS condenser and supports. Details of this analysis, including relevant drawings and results, can be found in DCD Reference 3.8-1, and details of the site specific analysis, which uses the same approach as the DCD but with Unit 3 seismic loads, can be found in Reference 3.8-201.”</u></p> <p><u>This reference is the PCCS condenser seismic analysis report. Why aren't comparable departures also given to all structures and structural components in this FSAR Section 3.8.2 and the other FSAR sections?</u></p>	NA	<p><u>No follow-up action required. The change in Section 3.8.2.4.1.5 is necessary for the PCCS condenser to modify the information regarding the site-specific finite element analysis and add the site-specific report to the references to supplement DCD Reference 3.8-1. No similar changes are required for the other components in the 3.8 sections.</u></p>	Closed	<p><u>Discussed on telecon 2/3/2016</u></p>
01151600C	<p><u>In FSAR Section 3.8.4, corresponding to NAPS DEP 3.7-1, the statement is made that “Unit 3 site-specific structural evaluations for the RB/FB, CB, and FWSC are described in Sections 3G.7 through 3G.10.” This statement is important and needed because it ties DCD</u></p>	FSAR 3.8	<p><u>FSAR Section 3.8 will be changed to include references to the new site-specific sections in Appendix 3G in instances where the DCD Section 3.8 refers to Appendix 3G.</u></p>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	<p><u>Discussed on telecon 2/3/2016</u></p>

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	<p><u>3.8.4 to the detailed description in Appendix 3G. Explain why the other FSAR sections do not also include this statement.</u></p>				
01151600D	<p>In FSAR Section 3.8.4, a new paragraph is added regarding the structural acceptance criteria. It states:</p> <p><u>“The structural acceptance criteria for the site-specific structural evaluations of the RB, CB, FB, and FWSC, which are described in Sections 3G.7 through 3G.10, are the same as the acceptance criteria for the standard design provided in this section, with the exception that the Unit 3 structural evaluations of the non-containment RB and FB structures may use the acceptance criteria of either: 1) the ASME BPVC, Section II, Division 2, Subsection CC, “Code for Concrete Containments,” or 2) the ACI 349-01, rather than apply the more limiting of these two criteria as described in DCD Sections 3.8.4.5.1 and 3.8.4.5.3. This is an acceptable alternative to the standard design approach because the RB and FB are not part of the containment pressure boundary and applying the more limiting ASME BPVC criteria is</u></p>	<p><u>RB/FB, CB and FWSC structural reports, as necessary</u></p> <p><u>COLA Part 7</u></p> <p><u>COLA FSAR 3.8.4.5</u></p>	<p><u>NA3 FSAR reinforced concrete section analyses will be performed consistent with the DCD methodology using SSDP-2D for all Seismic Category I structures</u></p> <p><u>NA3 structural evaluations will apply the acceptance criteria consistent with the DCD:</u></p> <ul style="list-style-type: none"> <li><u>- For overstress conditions identified now and through detailed design, an alternate stress check using a P-M diagram will be performed to show the member meets the more limiting of the 2004 ASME and the ACI 349-01 criteria</u></li> <li><u>- Structural evaluation reports will include the P-M diagram for these alternate stress checks, demonstrating that the acceptance criteria are met</u></li> </ul> <p><u>(a) Technical reports will be revised, as necessary (Fuel</u></p>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	<p><u>Discussed on telecon 2/3/2016</u></p>

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	<p><u>not required.”</u></p> <p><u>Justification would be needed for this change because, the reason the more limiting criterion was placed in the DCD is that the containment is integrally connected to the RB (unlike other containments) and thus, the RB provides support and interacts with the containment. During design certification, the applicant specified this criterion to address this issue. While the revised criterion seems reasonable for structural members sufficiently distant from the RB / containment interface (e.g., FB where an overstressed condition was identified), justification would be needed to completely revise the criterion as defined above.</u></p>		<p><u>Building Structural Design Report)</u></p> <p><u>(b) COLA revisions will be determined:</u>  <u>-Part 7, Departures Report, will be revised to include the proposed approach</u>  <u>-FSAR Section 3.8.4.5 will be revised to clarify the approach for demonstrating that the standard design acceptance criteria are met</u>  <u>-FSAR will be reviewed to determine if any other sections need to be revised</u>  <u>- FSAR markups will be provided to NRC</u></p> <p><u>(c) Response to RAI 03.07.02-17 will be revised</u></p>		
<p><u>020116001</u></p>	<p><u>The RCCV report (WG3-T11-DRD-S-0001) indicates that the method using “thermal ratios” evaluated by 3D nonlinear analyses applied in the standard design is not used for NA3. The effects of concrete cracking due to the thermal load are considered by reducing the thermal stress in SSDP-2D.</u></p> <p><u>1. Is this change in the method of calculating thermal stresses considered a departure from the method used in the standard</u></p>	<p><u>TBD</u></p>	<p><u>Actions under development, to be discussed in NRC teleconference 02/17/2016.</u></p>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	

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	<p><u>design?</u></p> <ul style="list-style-type: none"> <li>• <u>The applicant is requested to explain why this change is acceptable and does not result in the less conservative results.</u></li> <li>• <u>During Audit 2, the staff requests that Dominion provide a detailed presentation of the DCD method and the NA 3 method for site-specific evaluation of the thermal effect in combination with other applicable loads.</u></li> </ul> <p><u>2. Also, are the design thermal loads considered same as the DCD thermal loads? [NRC email from M. Eudy 02/01/16]</u></p>				
020116002	<p><u>The local models were developed for GDCS pool stress analysis (Figs 4.17 through 19 of WG3-T12-ERD-S-0001 - Internal structure design report) and seismic loads are evaluated using spectral analysis.</u></p> <p><u>1. Are these models the same as the DCD model?</u></p> <p><u>2. Please describe the spectral analysis method and explain any differences between the DCD and site-specific model in this regard. Is</u></p>	TBD	<u>Actions under development, to be discussed in NRC teleconference 02/17/2016.</u>	<u>Open with Dominion</u>  <u>Audit 2</u>	

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	<p><u>this method discussed in the FSAR?</u></p> <p><u>3. Is the lateral seismic pressure load on the pool walls due to vertical compression of the pool water due to vertical component of the earthquake included in the evaluation?</u></p> <p><u>[NRC email from M. Eudy 02/01/16]</u></p>				
020116003	<p><u>1. On Page 5 of 002N8530 Revision 2, please clarify the sentence “all spectra for the fuel racks are taken at 3 percent damping consistent with Reference 1,” since the report is related to PCCS.</u></p> <p><u>2. Page 4 of this report indicates that the analysis is performed using the first 10 modes of the model up to 45.3 Hz. However, the input appears to have some energy content beyond this cut-off frequency. Please justify.</u></p> <p><u>[NRC email from M. Eudy 02/01/16]</u></p>	TBD	<p><u>Actions under development, to be discussed in NRC teleconference 02/17/2016.</u></p>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	
020116004	<p><u>1. Per DE-ES-0089R0 (Drywell Head Report) Table 2-2, the design stress for flange bolt is 198 MPa vs the allowable limit of 198 MPa. While the allowable stress limit is not exceeded, it appears that there is very little design margin for any</u></p>	TBD	<p><u>Actions under development, to be discussed in NRC teleconference 02/17/2016.</u></p>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	

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	<p><u>uncertainties in the calculation.</u></p> <p><u>2. Please identify the conservatisms in the analysis that provide assurance that the design bolt stress will not exceed the allowable limit.</u></p> <p><u>– Note that DCD Figure 3G.1-51 shows the standard plant bolt stress as 166 MPa. However, the site-specific bolt stress is 198 MPa.</u></p> <p><u>– The FSAR should reflect this change.</u></p> <p><u>[NRC email from M. Eudy 02/01/16]</u></p>				
020116005	<p><u>The staff requests that Dominion provide during Audit 2 a brief presentation on how the site-specific seismic demand (shear force, overturning moments, torsional loads, vertical acceleration) obtained from the lumped mass model was specified in the static NASTRAN model. [NRC email from M. Eudy 02/01/16]</u></p>	TBD	<p><u>Actions under development, to be discussed in NRC teleconference 02/17/2016.</u></p>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	
020916001	<p><u>ITAACs (FSAR Tier 1, Sections 2.4.20, 2.4.21, and 2.4.22) for Category I underground tunnels, Category II Access tunnel, and the Radwaste tunnel indicate that these buried Category I and II structures are designed and constructed to</u></p>	TBD	<p><u>Actions under development</u></p>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	



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	<p><u>accommodate the dynamic, static, and thermal load conditions associated with various loads and load combinations identified in the FSAR Tier 2, Section 3.7.3.13. Note that DCD Tier 2, Section 3.7.3 13 seventh bullet appears to describe the various loads that are considered for the design.</u></p> <p><u>However, it does not include any potential environmental loads such as tornadoes, missiles, external floods, etc. The applicant is requested to explain how these loads, as applicable, to the underground Category I and II structures will be considered in the design. [NRC email from M. Eudy 02/09/16]</u></p>				
<u>020916002</u>	<p><u>Section 9.1.2.4 of DCD indicates that the spent fuel pool and buffer pool are reinforced concrete structures with a stainless steel liner. The storage racks and pool liners are designed to meet seismic Category I requirements. Pool liner and anchorage are designed to the same loads and load combinations as the pool concrete structure in accordance with Table 3.815, except that load factors for all cases are equal to 1.0, and the acceptance criteria follow ASME</u></p>	<u>TBD</u>	<u>Actions under development</u>	<u>Open with Dominion</u>  <u>Audit 2</u>	

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	<p><u>Section III, Division 2, CC3700.</u></p> <p><u>However, the FSAR markup (Section 3.8 or 9.0) does not include a site-specific assessment of the fuel/buffer pool liners and the associated anchorages due to site-specific seismic demand including the local effect of the reactions of the storage racks on the pool liners. The applicant is requested to address this issue. [NRC email from M. Eudy 02/09/16]</u></p>				
020916003	<p><u>Report 002N8467 indicates that NA3 bounding response spectra (RS) at Node 2 (of SER-DMN-019, Revision 0) was used as input for site-specific assessment of the SFP rack in the FB. The staff needs confirmation and additional information with regard to the following items:</u></p> <ul style="list-style-type: none"> <li><u>• Confirm that RS at Node 2 conservatively represents the spectra at the base of the SFP in the FB not at the center of RB/FB base mat (i.e., it includes the effect of basemat rocking and torsional effect).</u></li> <li><u>• Confirm that input RS is an envelope that considers the effect of stiffness variation and SSSI effect.</u></li> </ul>	TBD	Actions under development	Open with Dominion  Audit 2	

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	<ul style="list-style-type: none"> <li>• <u>Confirm that the synthesized time histories used for transient analyses envelop the RS and they are statistically independent as recommended in SRP Section 3.7.1.</u></li> <li>• <u>Confirm that friction factor used for FSR in the FB for the nonlinear analysis is consistent with the DCD values.</u></li> <li>• <u>The report indicates that Table 1 summarizes forces for the FSR obtained from the SSE time history analysis. Please provide a comparison of the forces provided in Table 1 of SERDMN019, Revision 0 based on the site-specific response spectrum approach and time history approach and explain any significant differences.</u></li> <li>• <u>Clarify whether the stress summary comparison provided in Tables 2 and 3 is based on the RS or time history approach?</u></li> </ul> <p><u>[NRC email from M. Eudy 02/09/16]</u></p>				
<u>020916004</u>	<p><u>Report 002N8467 indicates that both RSA and transient dynamic analyses (using synthetic time histories) were used for site-specific assessment of the FSRs. Concerning these RSA and transient analyses, the applicant is</u></p>	<u>TBD</u>	<u>Actions under development</u>	<p><u>Open with Dominion</u></p> <p><u>Audit 2</u></p>	

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	<p><u>requested to provide a presentation discussing the two methods of dynamic analyses and how the results of these analyses are used in the site-specific assessment of the FSRs. Are the site-specific methods the same as the DCD approach?</u></p> <p><u>[NRC email from M. Eudy 02/09/16]</u></p>				
020916005	<p><u>Report 002N8467 in Page 20 indicates that the time histories for evaluation of deep pit FSR were generated from the response spectra for the new FSR in the buffer pool. The report also stated that this is conservative because the new FSR are located above the buffer pool. As such, the staff requests that the applicant provide a figure which presents comparisons of response spectra at these two locations to ensure that the spectra at the location of the new FSR envelopes the spectra at the deep pit location.</u></p> <p><u>[NRC email from M. Eudy 02/09/16]</u></p>	TBD	<u>Actions under development</u>	<u>Open with Dominion</u>  <u>Audit 2</u>	

NOTES:

1. Remaining RAI responses were included in 12/16/2015 submittal NA3-15-037.
2. All action items are related to Audit 1 (Phase 1, seismic demand) unless otherwise specified as Audit 2.