

Draft issues raised during the Fermi 3 audit April 23 to 27, 2012

RAI Letter 70 Question	Issue	Disposition	Action Item Closure
	SSI analysis (licensing basis analysis; i.e., no backfill)	<p>Provide additional information:</p> <ul style="list-style-type: none">• Structural Model including damping used, which should be consistent with the relative stress level of the structural elements. If SSE damping is used, provide the technical basis for this.• Modeling of floor diaphragms in the structural model, which is not shown in the calculations. This information was shown to the staff but needs to be documented.• Plots of Fourier amplitude/power and cumulative Fourier power spectra for the input in-column motions, in order to identify the relative power of the input between 25 and 50 Hz• Confirm all SSI analyses consider the seismic input in both plus and minus directions• Plots of transfer functions identified as having spikes, with clear representation of computed values and interpolated values, in order to judge numerical accuracy• Clarify why toe bearing pressures reported in GEH Calculation 002 and 006 are the same if the inputs are different (Tables 7-3, 7-4, B-7, and B-8)	<p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p> <p>Response Due May 23, 2012</p> <p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p>

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		<ul style="list-style-type: none"> • Plots of wall pressures for RB and CB • Explain applicability of DCD mesh sensitivity study (for the excavated soil) to the Fermi site-specific conditions, especially if certain analyses only consider frequencies up to 25 Hz. Staff noted brick elements having aspect ratio 1(vertical):4(horizontal); what is the frequency transmission characteristics for such elements? 	<p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p>
03.07.01-3 or 01-4	Validation of Quad4 analysis	Supplemental response to provide response spectra computed at the center node at top of the concrete fill, for various widths of the analysis model, which demonstrate that the chosen width of 600 ft adequately represents the lateral boundary conditions. Also provide a discussion on the envelope function used and its impact on the design margin	Response Due May 23, 2012 Response received. Further staff discussion needed.
03.07.01-5	Disturbance of the material outside the diaphragm wall	NRC to assess if there is a need to evaluate the disturbance of the material outside the diaphragm wall, and evaluate whether it could cause an increase in the PBSRS as well as its potential impact on the SSI analysis	Per NRC staff discussion, no RAI is needed. No actions for DTE. Closed.
03.07.01-6	Variability/uncertainty in geotechnical data for Bass Island Group and Salina F	Supplemental response to explain variability of Bass Island Group data and the uncertainty in the data for Salina F shown in the calculations	Response Due May 23, 2012 Response received. No comments. Closed
03.07.01-8	Minimum horizontal input for SSI	Supplemental response to provide FSAR markup that	Response Due May 23, 2012

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		indicates minimum horizontal input requirements are met by NUREG/CR-0098 spectral shape for rock sites. Markup reviewed during audit is OK.	Response received. No comments. Closed.
03.07.02-5	ITAAC Commitments for Seismic Category II structures	Supplemental response that clearly explains the design intent (i.e., generic DCD Cat. II design to be performed for DCD profiles and DCD seismic input, to address DCD ITAAC commitments), and FSAR markup with indication that all Seismic Category II structures will be founded on bedrock or concrete fill, not on engineered granular backfill, similarly to Seismic Category I structures	NRC Staff followup needed to determine if this is discussed in the FSAR and/or DCD. NRC Staff will discuss during next Open Items call. No further comments. DTE Response Due May 23, 2012.
03.07.02-6	Embedment effects on SSI response	DTE to respond to outstanding RAI. Any analysis based on the subtraction method requires independent validation using the direct method.	Response Due June 15, 2012
03.07.02-7	Direct vs. Subtraction method of SASSI2000	<ul style="list-style-type: none"> • DTE indicated a direct method-vs.-subtraction method validation study will be provided using the CB 3D model with backfill included. The model may have frequency transmission characteristics adequate up to 25 Hz only. • Staff indicated that this validation study needs to provide a comparison of (a) wall pressures on both backfill and bedrock/concrete fill portions, (b) ISRS, and (c) amplified FIRS in adjacent nodes in the soil (used to assess SSSI effects) • Validation study should use updated soil profiles and time histories. Use of 	Response Due June 15, 2012 Response Due June 15, 2012 Response Due June 15, 2012

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		<p>BE soil profile is adequate.</p> <ul style="list-style-type: none"> • In all cases, the effect of the backfill and the SSSI effects need to be differentiated in order to address RAIs 03.07.02-6, 03.07.02-8, and 03.08.05-4. • Since only the CB is being used for validation, staff needs to review the computed transfer functions obtained using the direct and subtraction methods with the backfill, to assess potential impact on the RB analysis, which is not part of the validation study • Staff indicated an acceptable alternative to using the subtraction method would be to perform a 2D slice-type analysis in either the time or frequency domain. • Staff will issue new RAI to specifically request the validation study for the SSI analysis using the subtraction method with backfill 	<p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p> <p>New RAI will not be issued.</p>
03.07.02-8	SSSI effects between RB/FB and CB, and between CB and FWSC	DTE to respond to outstanding RAI. Any analysis based on the subtraction method requires independent validation using the direct method. For the RB acting on the CB, staff indicated the kinematic approach proposed by GEH may not capture inertial effects on wall pressures.	Response Due June 15, 2012
03.08.05-1	ACI 349-01 vs 06	Supplemental response to provide FSAR markup that indicates that ACI 349-01 will be used, consistent with ESBWR DCD.	Response Due May 23, 2012. Response received. No comments. Closed.

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03.08.05-2	Sliding factor of safety for FWSC	Supplemental response to provide FSAR markup that clarifies that the stated factor of safety of 15 is actually an upper bound; to ensure the minimum factor of safety is at least 1.1, a minimum 10% design margin needs to be specified for the design of shear friction reinforcement.	Response Due May 23, 2012. Response received. No comments. Closed.
03.08.05-3	SSSI effects and pressures transferred to concrete fill between RB/FB and CB	RAI response reviewed by NRC and not accepted; RAI to be subsumed under 03.08.05-4.	Response Due June 15, 2012 as part of response for 03.08.05-4.
03.08.05-4	Information regarding lateral pressures (backfill and bedrock)	<ul style="list-style-type: none"> • Part (a) was reviewed and there are no further issues; Part (b) was reviewed and not accepted; Parts (c) and (d) are dependent on the SSI and SSSI analyses which are outstanding. • DTE to provide response to RAI to address staff's concerns regarding lateral wall pressures on both backfill and bedrock/concrete fill portions; in particular, whether the design of embedded sidewalls is adequate to resist the large lateral pressures expected at the top of rock elevation for the licensing basis SSI analysis (i.e., no backfill) • The RAI response should include plots of wall pressures for RB and CB for the licensing basis SSI analysis (i.e., no backfill) and for the SSI analyses that include backfill and SSSI. • Any analysis based on the subtraction method 	<p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p> <p>Response Due June 15, 2012</p>

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		requires independent validation using the direct method.	Response Due June 15, 2012
03.08.05-5	Concrete fill under FWSC and surrounding other Cat I and II structures	<p>Supplemental response to provide FSAR markup that indicates the following:</p> <ul style="list-style-type: none"> • Specific measures that will be implemented to control thermal cracking. Markup reviewed during audit is OK. • Past precedent where unreinforced concrete fill has been used under similar conditions of f'c (i.e., high cement content, low water/cement ratio) • Specific criteria to be used during detailed design to determine whether thermal reinforcement needs to be provided • Clarification of which edition of ACI 207R is being referenced • Reference to other applicable standards for mass concrete construction (e.g., ACI 207.1R, 207.4, 211.1) • Explanation that voids under concrete fill are not a concern because of the chemical composition/geological characteristics of the dolomite bedrock and groundwater, and also because of actual conditions observed on the bedrock surface 	<p>Response Due May 23, 2012 for all 03.08.05-5 bulleted items.</p> <p>Response received. Staff reviewing response.</p>