The Detroit Edison Company
One Energy Plaza, Detroit, MI 48226-1279

DTE Energy
Detroit Edison

10 CFR 52.79

October 12, 2012
NRC3-12-0030

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

References:
1) Fermi 3
Docket No. 52-033
2) Letter from Tekia Govan (USNRC) to Peter W. Smith (Detroit Edison), "Request for Additional Information Letter No. 79 Related to Chapters 03.07.02 and 13.03 for the Fermi 3 Combined License Application," dated August 7, 2012
3) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Request for Additional Information Letter No. 79," NRC3-12-0026, dated September 7, 2012
4) Letter from Peter W. Smith (Detroit Edison) to USNRC, "Detroit Edison Company Response to NRC Request for Additional Information Letter No. 77," NRC3-12-0025, dated August 24, 2012

Subject: Detroit Edison Company Interim Response to NRC Request for Additional Information Letter No. 79

In Reference 2, the NRC requested additional information to support the review of certain portions of the Fermi 3 Combined License Application (COLA). The first Request for Additional Information (RAI) in Reference 2, RAI 03.07.02-9, is related to the Fermi 3 site-specific soil-structure interaction (SSI) analyses. The second RAI in Reference 2, RAI 13.03-65, addresses the Fukushima Near-Term Task Force recommendations. The response to RAI 13.03-65 was provided in Reference 3.

In Reference 3, Detroit Edison described the planned approach to respond to RAI 03.07.02-9. In that response, Detroit Edison proposed that a meeting be scheduled in the near future to fully discuss the site-specific SSI analyses. The NRC has scheduled a meeting for November 1, 2012, to discuss Detroit Edison's planned responses to RAIs 03.07.02-9, as well as RAI 01.05-1 (Reference 4), which discusses the newly released Central and Eastern United States (CEUS) Seismic Source Characterization (SSC) model. In Reference 3, Detroit Edison committed to address the impact of the initial RAI 01.05-1 response in conjunction with the site-specific SSI analyses.

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Since Detroit Edison's submittal of the initial description of the planned approach to respond to RAI 03.07.02-9 in Reference 3, a more detailed plan has been developed by Detroit Edison and our contractors. Additionally, a Technical Advisory Board of prominent industry experts was established: Dr. Farhang Ostadan (Bechtel), Dr. A. K. Singh (Sargent & Lundy), and Dr. Wen Tseng (Paul C. Rizzo Associates, Inc.). The Technical Advisory Board conducted a review of the detailed plan that has been developed by Detroit Edison and our contractors during the week of October 1, 2012.

Attachment 1 of this letter provides additional detail regarding the planned response to RAI 03.07.02-9, including a detailed description of the analyses required to fully respond to RAIs 03.07.02-9 and 01.05-1. The approach described in Attachment 1 reflects feedback from the Technical Advisory Board. Detroit Edison's intention is to provide a sufficiently detailed description such that meaningful technical discussions can take place during the November 1, 2012, meeting with the staff.

If you have any questions, or need additional information, please contact me at (313) 235-3341.

I state under penalty of perjury that the foregoing is true and correct. Executed on the12th day of October 2012.

Sincerely,

Peter W. Smith, Director
Nuclear Development – Licensing and Engineering
Detroit Edison Company

Attachment: 1) Interim Response to RAI Letter No. 79 (Question 03.07.02-9)

cc: Adrian Muniz, NRC Fermi 3 Project Manager
Tekia Govan, NRC Fermi 3 Project Manager
Michael Eudy, NRC Fermi 3 Project Manager(w/o attachment)
Bruce Olson, NRC Fermi 3 Environmental Project Manager(w/o attachment)
Fermi 2 Resident Inspector (w/o attachment)
NRC Region III Regional Administrator(w/o attachment)
NRC Region II Regional Administrator (w/o attachment)
Supervisor, Electric Operators, Michigan Public Service Commission (w/o attachment)
Michigan Department of Natural Resources and Environment
Radiological Protection Section(w/o attachment)

Attachment 1
NRC3-12-0030
(10 pages)

Interim Response to RAI Letter No. 79
(eRAI Tracking No. 6605)

RAI Question No. 03.07.02-9

NRC RAI 03.07.02-9

10CFR50, Appendix S requires that evaluation for SSE must take into account soil-structure interaction (SSI) effects. To address RAIs 03.07.02-6, 03.07.02-7, 03.07.02-8, 03.08.05-2, 03.08.05-3, and 03.08.05-4, DTE has performed a site-specific SSI analysis of the Control Building (CB) for the Fermi 3 site conditions using the SASSI2000 code, with the backfill material surrounding the CB as well as the bedrock layers included in the analysis. Report SER-DTF-009, Revision 0 submitted by DTE on June 15, 2012, documents the results of this SSI analysis. The staff has reviewed this report and has some concerns. In order to determine that the Fermi 3 analysis has appropriately taken into account the SSI effects, the applicant is requested to address the following issues, including supplementing the responses to the RAIs identified above as necessary.

NRC RAI 01.05-1

This request for additional information (RAI) specifically addresses Recommendation 2.1, of the Fukushima Near-Term Task Force recommendations contained in SECY-12-0025 as it pertains to the seismic hazard evaluation. This recommendation specifies the use of NUREG-2115, "Central and Eastern United States Seismic Source Characterization for Nuclear Facilities," (CEUS-SSC) in a site probabilistic seismic hazard analysis (PSHA). Consistent with Recommendation 2.1, as well as the need to consider the latest available information in the (PSHA) for the Fermi Unit 3 planned reactor site, the NRC staff requests that Detroit Edison:

a) *Evaluate the potential impacts of the newly released CEUS-SSC model, with potential local and regional refinements as identified in the CEUS-SSC model, on the seismic hazard curves and the site-specific ground motion response spectra (GMRS)/foundation input response spectra (FIRS). For re-calculation of the PSHA, please follow either the cumulative absolute velocity (CAV) filter or minimum magnitude specifications outlined in Attachment 1 to Seismic Enclosure 1 of the March 12, 2012 letter " Request for information pursuant to Title 10 of the Code of Federal Regulations 50.54(f) regarding recommendations 2.1,2.3, and 9.3, of the near-term task force review of insights from the Fukushima Dai-ichi accident." (ML12053A340).*

b) *Modify the site-specific GMRS and FIRS if you determine changes are necessary given the evaluation performed in part a) above.*

In order to minimize delays to the current licensing schedule, we request that you respond within 60-days of receipt of this RAI or provide a schedule for your response within 30-days.

Response

This interim response provides a more detailed description of the analyses planned to fully respond to RAIs 01.05-1 and 03.07.02-9. The response to RAI 01.05-1 was provided in Detroit Edison letter NRC3-12-0025 (ML12243A455), dated August 24, 2012. The initial response to RAI 03.07.02-9 was provided in Detroit Edison letter NRC3-12-0026 (ML12254B017), dated September 7, 2012.

In RAI 03.07.02-9, the NRC identified issues with various aspects of the Fermi 3 site-specific soil-structure interaction (SSI) analyses. The staff's primary concern is provided in Item 1 of the RAI, which discusses modeling deficiencies in the Fermi 3 SSI analyses.

In RAI 01.05-1, the NRC requested that Detroit Edison evaluate the impact of the newly released Central and Eastern United States (CEUS) Seismic Source Characterization (SSC) model. The response to RAI 01.05-1 ultimately calculated the Ground Motion Response Spectra (GMRS) and FIRS for Fermi 3 using the CEUS SSC model. The CEUS FIRS presented in the response to RAI 01.05-1 remain enveloped by the ESBWR Certified Seismic Design Response Spectra (CSDRS), but are greater than the FIRS presented in Subsection 2.5.2 of the Fermi 3 FSAR, Revision 4, which are based on the updated EPRI Seismic Owners Group (SOG) model. Since the FIRS represent the fundamental source of seismic inputs to the Fermi 3 site-specific SSI analyses, Detroit Edison committed to address the impact of the CEUS FIRS in conjunction with the response to RAI 03.07.02-9.

The remaining issues remaining for the Fermi 3 site-specific SSI analyses, as described in RAIs 01.05-1 and 03.07.02-9, are summarized as follows:

1. SSI Analysis Methodology and Modeling Issues – the maximum frequency that can be captured with fidelity by the SSI model is significantly less than the minimum frequency of 50 Hz specified in DC/COL-ISG-1.
2. Comparison of Direct Method vs. Subtraction Method – In light of the issue raised in Item 1, reevaluate the comparative study presented in Appendix A of SER-DTF-009, Rev. 0, using an acceptable SSI model, and using the same revised input motions for both cases.
3. Inconsistent Seismic Inputs – SSI analyses have been performed with two sets of seismic inputs; therefore, it is not always clear whether discrepancies between analyses are due to methodology, seismic inputs, or bedrock properties.
4. Effect of Assumed Structural Damping Ratios – In light of the issue raised in Item 1, reevaluate the use of 4% and 7% structural damping.
5. Evaluation of Structure-Soil-Structure Interaction (SSSI) Effects – In light of the issue raised in Item 1, reevaluate the CB SSSI analyses presented in Section 5.2 of SER-DTF-009, Rev. 0, and Appendix C of SER-DTF-009, Rev. 0.
6. CEUS SSC Model – Evaluate the impact of the newly released CEUS SSC model. Modify the site-specific GMRS and FIRS if it is determined that changes are necessary.

Detroit Edison has determined that, in order to resolve the remaining issues detailed in RAIs 03.07.02-9 and 01.05-1, the Fermi 3 site-specific SSI analyses will be re-performed. This is predicated by the need to modify the FIRS to incorporate the impact of the CEUS SSC model as well as the underlying modeling issues outlined in Item 1, above. Additionally, the remainder of the issues can be addressed by revised analyses.

Since Detroit Edison's submittal of the initial description of the planned approach to respond to RAI 03.07.02-9 in Detroit Edison letter NRC3-12-0026, a more detailed plan has been developed by Detroit Edison and our contractors. Additionally, a Technical Advisory Board of prominent industry experts was established: Dr. Farhang Ostadan (Bechtel), Dr. A. K. Singh (Sargent & Lundy), and Dr. Wen Tseng (Paul C. Rizzo Associates, Inc.). The Technical Advisory Board conducted a review of the detailed plan that has been developed by Detroit Edison and our contractors during the week of October 1, 2012.

In order to fully address the seismic evaluation of the Fermi 3 site, several analyses must be performed. The licensing basis cases model partial embedment of the RB/FB and the CB into the Bass Islands Group bedrock without considering engineered granular backfill above the top of the bedrock. Following the licensing basis analyses, sensitivity studies will be performed to ensure that the backfill placed above the top of the bedrock does not adversely impact Seismic

Category I structures, as well as SSSI analyses to show that Seismic Category I structures are not adversely impacted by adjacent Seismic Category I structures. A detailed description of the SSI analyses to be performed is provided below.

Seismic Inputs

In response to RAI 01.05-1, Detroit Edison evaluated the impact of the newly released CEUS SSC model. Due to the need to re-perform site-specific SSI analyses with the FIRS based on the CEUS SSC model, the calculations that were performed in response to RAI 01.05-1 will be re-performed and FSAR Subsection 2.5.2 will be revised to use the CEUS SSC model as the basis for the Fermi 3 probabilistic seismic hazard analysis (PSHA). This will include updating the CEUS SSC model, as necessary, in accordance with Regulatory Guide 1.208. FSAR Subsection 2.5.2 will be revised as follows:

- FSAR Subsection 2.5.2.1, "Seismicity," will be revised to use the NUREG-2115 CEUS SSC model (2012) for evaluation of the seismicity in the site region. The CEUS SSC source catalog is complete through the end of 2008. The catalog will be updated within 200 miles of the Fermi 3 site for the period of January 1, 2009, through September 30, 2012.
- FSAR Subsection 2.5.2.2, "Geologic Structures and Seismic Source Models," will be revised to utilize the NUREG-2115 CEUS SSC model for assessing the site hazard. The seismic sources of the CEUS SSC model will be described.
- FSAR Subsection 2.5.2.3, "Correlation of Earthquake Activity with Seismic Sources," will be revised to utilize the updated CEUS SSC catalog as the basis for comparison of seismicity with seismic sources.
- FSAR Subsection 2.5.2.4, "Probabilistic Seismic Hazard Analysis and Controlling Earthquake," will be revised to use the NUREG-2115 CEUS SSC model, with any needed updates, as the basis for PSHA calculations. The need to update the CEUS SSC model based on the updated source catalog will be evaluated in the following two ways:
    - The number of earthquakes that have occurred in the period of January 1, 2009, through September 30, 2012, after completion of the source catalog for the CEUS SSC model in NUREG-2115, will be checked for consistency with the number predicted by the CEUS SSC model to evaluate the need for any revision to the predicted seismicity rates.
    - The larger earthquakes that have occurred in the CEUS after the end of 2008 (e.g., the August 23, 2011, Mineral, VA, and the November 6, 2011, Oklahoma earthquakes) will be used to evaluate the need to update the maximum magnitude distributions of seismic sources that are important to the hazard at the Fermi 3 site.

  Following any needed revisions to the CEUS SSC model, the updated CEUS SSC model will be used to compute the hard rock hazard at the Fermi 3 site. The hazard will be computed using the EPRI (2004, 2006) ground motion models. The results will be deaggregated to identify the source contributions and to identify the controlling and deaggregation earthquakes. Appropriate response spectra will be developed for these earthquakes for use in site response analyses.
- FSAR Subsection 2.5.2.5, "Seismic Wave Transmission Characteristics of the Site," will be revised to change the location of the GMRS from the top of the glacial till to the top of the Bass Islands Group bedrock. This change is made because the glacial till beneath and adjacent to the RB/FB and CB, and beneath the FWSC will be excavated to expose

the top of Bass Islands Group bedrock, as discussed in FSAR Subsection 2.5.4. The top of the Bass Islands Group bedrock (Elevation 552 feet [NAVD88]) also represents the top of the licensing basis SSI profile, which does not include the glacial till or engineered granular backfill above the in-situ bedrock. The amplification functions for the GMRS will be developed by randomizing the dynamic properties as previously documented in FSAR Subsection 2.5.2.5.

- FSAR Subsection 2.5.2.6, "Ground Motion Response Spectra," will be revised to develop the GMRS at the top of the Bass Islands Group bedrock. The hazard consistent surface spectra will be developed using Approach 2B of NUREG/CR-6728 as was done previously. Because of the modification to the application of the CAV filter specified in the 10 CFR 50.54(f) Letter issued March 12, 2012, there is a small reduction in hazard computed with CAV as compared to the hazard computed without CAV. Therefore, the hazard at the GMRS elevation will be computed without the CAV filter using a minimum magnitude of moment magnitude **M** 5.0.

FSAR Subsection 3.7.1 will also be revised to incorporate the impact of the updated CEUS SSC model on the Fermi 3 outcrop FIRS. The Fermi 3 outcrop FIRS will be consistent with the licensing basis profile used for the licensing basis SSI analyses. These revisions will include the following:

- The RB/FB and CB Fermi 3 outcrop FIRS will be developed based on amplification functions consistent with the site response analysis completed to develop the GMRS at the top of the Bass Islands Group bedrock, which is consistent with the licensing basis SSI analyses profile.
- The Fermi 3 outcrop FIRS for the RB/FB and CB will be compared to the ESBWR CSDRS shown on Figures 2.0-1 and 2.0-2 in the ESBWR DCD. The ESBWR DCD evaluated the RB/FB and CB with and without embedment, which represents two of the three cases described in Section 5.1 of DC/COL-ISG-017. The comparison of the ESBWR CSDRS to the Fermi 3 outcrop FIRS for the RB/FB and CB is considered appropriate, since the Fermi 3 outcrop FIRS are consistent with the licensing basis profile and represents an intermediate case with partial embedment.
- The Fermi 3 outcrop FIRS for the FWSC will be developed based on amplification functions consistent with the licensing basis profile with fill concrete placed above the top of in situ bedrock and below the FWSC foundation level. This analysis will incorporate the fill concrete properties and the two-dimensional effect of the fill concrete beneath the FWSC presented in the responses to RAI 03.07.01-3 and RAI 03.07.01-4. The magnitude of the two-dimensional effect will be checked by comparing the RAI response results to the results of additional calculations performed using input time histories based on the seismic hazard results computed using the updated CEUS SSC model. The FWSC FIRS will be compared to 1.35 times the ESBWR CSDRS shown on Figures 2.0-1 and 2.0-2 in the ESBWR DCD.
- Lower Bound (LB), Best Estimate (BE), and Upper Bound (UB) deterministic SSI profiles for the RB/FB and CB will be developed as documented in FSAR Subsection 3.7.1.1.4.4.3 based on statistics of the iterated subsurface properties for the randomized licensing basis profiles used to develop the amplification functions for the GMRS and Fermi 3 outcrop FIRS, and the minimum coefficient of variation (COV) requirement of SRP Section 3.7.2. The LB, BE, and UB deterministic SSI profiles will account for the effects of the potential variability in the properties of the soils and bedrock at the Fermi 3 site.
- Acceleration time histories will be developed for the RB/FB and CB based on the Fermi 3 outcrop FIRS consistent with the licensing basis profile. The acceleration time

histories will be based on the current seed time history in FSAR Subsection 3.7.1.1.5 (1999 Chi-Chi, Taiwan, Earthquake, KAU078 Station) matched to the Fermi 3 outcrop FIRS compatible with the licensing basis profile using the requirements of Option 1, Approach 2, outlined in SRP Section 3.7.1. Additionally, the power spectral density (PSD) of the acceleration time histories will be checked to ensure they envelop 80 percent of the appropriate target PSD described in SRP Section 3.7.1, Appendix B.

- The matched acceleration time histories for the RB/FB and CB that are compatible with the Fermi 3 outcrop FIRS for the licensing basis profile will be convolved from the foundation level of the RB/FB and CB to the GMRS level at the top of the Bass Islands Group bedrock to confirm that the SSI response spectra from the LB, BE, and UB soil profiles envelop the GMRS, which is the performance-based surface response spectra for the licensing basis profile. This approach is in accordance with the guidance in Section 5.2.1 of DC/COL-ISG-017 for an embedded case. The spectral amplitude of the matched acceleration time histories will be increased as needed to fully envelop the GMRS.
- The in-column acceleration time histories for input to the SSI analyses will be generated using the acceleration time histories matched to the Fermi 3 outcrop FIRS using the appropriate licensing basis deterministic SSI profiles (i.e., LB, BE, or BE) without further iteration of the subsurface properties. This is in accordance with the guidance in Section 5.2.3 of DC/COL-ISG-017.

The acceleration time histories used for the confirmatory SSI and SSSI analyses, which includes engineered granular backfill above the top of bedrock, will be the acceleration time histories matched to the RB/FB and CB Fermi 3 outcrop FIRS developed above for the licensing basis profile. Use of the acceleration time histories matched to the RB/FB and CB Fermi 3 outcrop FIRS for the licensing basis profile provides consistent input time histories and allows direct evaluation of the effect of the backfill on the licensing basis SSI analyses. Therefore, no additional enhancement of the input time histories will be incorporated for the confirmatory SSI and SSSI analyses. The presence of engineered granular backfill above the in-situ bedrock will be incorporated into the confirmatory SSI and SSSI analyses by including the engineered granular backfill in the additional deterministic SSI profiles. The following will be completed to generate the inputs for the confirmatory SSI and SSSI analyses that include engineered granular backfill above the top of bedrock:

- LB, BE, and UB deterministic profiles will be developed based on the statistics of the iterated subsurface properties for randomized full soil column profiles that include the engineered granular backfill from the top of the bedrock to the finished ground level grade and the minimum COV requirements of SRP Section 3.7.2. The randomized full soil column profiles will be based on the engineered granular backfill properties presented in FSAR Tables 3.7.1-201, 3.7.1-202, and 3.7.1-203. The additional LB, BE, and UB deterministic SSI profiles for the full soil column that includes the engineered granular backfill accounts for the effects of the potential variability in the properties of the soils and bedrock at the site.
- The acceleration time histories matched to the RB/FB and CB FIRS for the licensing basis profile will be used for the confirmatory SSI analyses. The corresponding in-column acceleration time histories will be generated from these time histories using the appropriate deterministic full soil column profile (LB, BE, or UB) developed for the confirmatory SSI and SSSI analyses without further iteration of the subsurface properties.

Licensing Basis Analyses

The Fermi 3 licensing basis SSI analyses cases model partial embedment of the RB/FB and the CB into the Bass Islands Group bedrock. The engineered granular backfill above the top of the Bass Islands Group bedrock is not included in the model.

The FWSC is treated as a surface founded structure in the Referenced DCD, Subsection 3.7.1.1, as there are no embedded walls for the FWSC. Therefore, the Referenced DCD backfill requirements surrounding Seismic Category I structures are not applicable to the FWSC. The FWSC is founded on fill concrete which meets the Referenced DCD requirements specified for backfill underneath Seismic Category I structures. Therefore, there is no licensing basis SSI analysis performed for the FWSC. The impact of the FWSC and its fill concrete foundation on other Seismic Category I structures will be discussed in the SSSI analyses section.

The licensing basis analyses for the RB/FB and CB will be performed for each of the three strain compatible dynamic subsurface material profiles: LB, BE, and UB, which are developed as described in the Seismic Inputs section presented above. Additionally, in order to address Part 4 of RAI 03.07.02-9, the licensing basis analyses will be performed with OBE structural damping (4% for reinforced concrete), unless the use of SSE structural damping (7% for reinforced concrete) is justified by stress demand, according to guidance in Regulatory Guide 1.61.

In order to address Part 1 of RAI 03.07.02-9, the finite element mesh will be refined sufficiently to pass frequencies up to 50 Hz, in accordance with Interim Staff Guidance DC/COL-ISG-1. The software used to perform the Fermi 3 site-specific SSI analyses to date, SASSI2000, has a limit of 10,000 interaction nodes. This limitation, coupled with recent issues identified with the subtraction method (SM) of SASSI2000, necessitates the use of SASSI2010, an updated version of the SASSI software. Because SASSI2010 allows up to 20,000 interaction nodes, its use will significantly increase the ability of the Fermi 3 site-specific SSI analyses to capture frequencies of up to 50 Hz. SASSI2010 will be verified and validated (V&V) with a set of SASSI V&V problems that have been previously reviewed by the staff on another COLA project.

The interaction nodes required to model the licensing basis cases with the DM are less than 20,000 for each case; therefore, the licensing basis cases will be performed with the DM of SASSI2010.

The results of the licensing basis analyses will be compared with the applicable DCD values for each parameter, including stability evaluation, response spectra, accelerations, and wall pressures at key locations.

Confirmatory Analyses

Detroit Edison intends to backfill the excavated volume surrounding Seismic Category I structures, as shown on FSAR Figures 2.5.4-202 and 2.5.4-203; however, backfill above the top of bedrock is not credited as performing any safety-related function. Confirmatory analyses are performed with the backfill present above the top of the Bass Islands Group bedrock to demonstrate that the backfill above the top of bedrock does not adversely impact Seismic Category I structures. Similar to the licensing basis analyses, the confirmatory analyses will be performed with OBE structural damping unless the use of SSE structural damping is justified by stress demand, according to guidance in Regulatory Guide 1.61.

Due to the low shear wave velocity (V_S) of the backfill above the top of bedrock and the SASSI requirement that the maximum mesh dimension in any direction be no more than 20 percent of the shear wave length of the subsurface material at the highest frequency of interest, the confirmatory analyses using the DM will contain many more interaction nodes than the licensing basis analyses. Even considering the expanded capacity of SASSI2010, these analyses exceed the 20,000 interaction node limit in many cases. Table 1 provides the approximate number of interaction nodes necessary to model the confirmatory cases with the DM up to 50 Hz.

Table 1 - Approximate Number of Interaction Nodes Necessary to Model Confirmatory Cases to 50 Hz (DM)

Soil Profile	Interaction Nodes	
	CB	RB/FB
UB	11,400	54,900
BE	21,600	104,000
LB	50,000	241,000

Except for the CB UB case, it is not feasible to perform DM SASSI analyses of the confirmatory cases and still maintain the ability to capture frequencies up to 50 Hz. As such, Detroit Edison is proposing the following confirmatory cases for the CB and RB/FB.

The CB UB case can be analyzed with the DM and maintain the ability to capture frequencies up to 50 Hz. Detroit Edison plans to analyze only the UB case for the CB confirmatory cases, as the UB case is more sensitive to the high frequency response. The relative change in the soil pressures for the UB SSI profiles, which are of particular interest in the confirmatory cases, will be captured by comparison of the licensing basis and confirmatory CB SSI cases.

The RB/FB UB case requires approximately 54,900 interaction nodes in order to be analyzed with the DM and maintain the ability to capture frequencies up to 50 Hz. Because of the relatively large energy in the high frequencies of the site-specific seismic inputs, as shown in the supplemental response to RAI 03.07.01-6, provided in Detroit Edison letter NRC3-12-0016 (ML12144A322), dated May 22, 2012, it is appropriate to capture frequencies up to 50 Hz. In order to maintain the ability to capture frequencies up to 50 Hz, Detroit Edison will utilize the Modified Subtraction Method (MSM). The MSM uses more interaction nodes than the SM; and, when strategically placed, these additional interaction nodes cause potential "subtraction errors" to shift to higher frequencies. Sufficient additional interaction nodes will be used such that subtraction errors do not occur in the frequency range being analyzed.

To confirm that the MSM gives comparable results to the DM, the MSM and DM will be benchmarked for the RB/FB. MSM benchmarking will be done with a representative structure, with similar soil properties, input motions, width/depth ratios, embedment depths, and structural weights. Due to the aforementioned interaction node limit, and the interaction nodes required for the RB/FB DM analysis as shown in Table 1, the full RB/FB structure cannot be benchmarked with the DM. As such, a DM quarter model of the RB/FB will be used for the RB/FB MSM-to-DM benchmarking, which will allow frequencies up to 50 Hz to be captured. The results of the quarter model RB/FB DM UB analysis will be compared to results of the quarter model RB/FB MSM UB analysis in order to confirm the acceptability of the MSM for the RB/FB model. Benchmarking criteria include reasonable similarity in transfer functions, forces and moments, and response spectra between analysis methods.

Upon completion of the RB/FB MSM-to-DM benchmarking, Detroit Edison is proposing an NRC audit of the calculations. The audit will allow for identification of any issues and confirmation of successful benchmarking prior to continuing the analyses. Following successful benchmarking of the MSM for the RB/FB, the full RB/FB model will be analyzed with the MSM. Even with the MSM, the interaction node limit makes it such that only the UB case (13,000 interaction nodes) can be analyzed while maintaining the ability to pass frequencies up to 50 Hz. Similar to the CB, the RB/FB UB case is more sensitive to the high frequency response. The relative change in the soil pressures for the UB SSI profiles will be captured by comparison of the licensing basis and confirmatory RB/FB SSI cases.

The results of the confirmatory analyses will be compared with the applicable DCD values for each parameter, including response spectra, accelerations, and wall pressures at key locations. The results of the confirmatory analyses will also be compared to the licensing basis cases in order to isolate the effect of the engineered granular backfill.

Structure-Soil-Structure Interaction (SSSI) Analyses

The impacts of SSSI will be analyzed using the same methodology presented in reports SER-DTF-008 and SER-DTF-009, except that the updated FIRS based on the CEUS SSC model will be used and the finite element mesh will be refined to capture frequencies of at least 50 Hz in the analyses. The following cases will be analyzed:

- The impact of the RB/FB on the CB. Previous sensitivity studies have shown that the impact of the CB on the RB/FB is negligible compared to the impact of the RB/FB on the CB.
- The impact of the FWSC (and its fill concrete foundation) on the CB.

In order to evaluate the impact of the RB/FB on the CB, the methodology used to respond to RAI 03.07.02-8, provided in Detroit Edison letter NRC3-12-0019 (ML12173A407), dated June 15, 2012, will be used.

To evaluate the effect of the RB/FB on the CB, the following steps will be performed:

- Perform the RB/FB UB MSM SSI analysis to obtain the in-column response at the bottom of the CB basemat foundation.
- Perform the CB UB DM SSI analysis using the response obtained from the bottom of the CB basemat foundation from the RB/FB UB MSM analysis.
- Calculate the maximum relative displacement between the CB and RB/FB from these analyses.

Since the maximum relative displacement is expected to be negligible, results from the RB/FB SSSI analyses, including response spectra and wall pressures at key locations, will be compared with the applicable DCD values for each parameter. The results of the CB SSSI analyses will also be compared to the CB confirmatory analysis in order to isolate the SSSI effect.

To evaluate the effect of the FWSC and its fill concrete foundation on the CB, the CB and FWSC will both be included in a single SASSI model. Because of the size of the combined CB and FWSC model, it is expected that the FWSC will need to be modeled with the MSM in order to maintain the ability to capture frequencies up to at least 50 Hz. If the use of the MSM is necessary for the FWSC, the MSM will be benchmarked against the DM for the FWSC. Since

the FWSC is much smaller than the RB/FB, the use of quarter models is not expected to be necessary for the FWSC.

The same acceleration time histories that are used for the CB in the licensing basis and confirmatory analysis cases will be used. The results from the FWSC and CB SSSI analyses will be compared with the applicable DCD values for wall pressures at key locations.

Schedule

A detailed schedule for completion of the site-specific SSI analyses described in this response is under development; however, Detroit Edison anticipates that the response to RAI 03.07.02-9 will be submitted by September 2013, as described in the initial description of the planned response to RAI 03.07.02-9 in Detroit Edison Letter NRC3-12-0026. Detroit Edison continues to explore options to improve this schedule.

Additionally, Detroit Edison anticipates completing the analyses required to evaluate the impact of the CEUS SSC model in the first quarter of 2013. Markups to incorporate these changes into FSAR Subsection 2.5.2 will be provided at that time.

As described in the Confirmatory Analyses section, Detroit Edison is proposing an NRC audit of the DM-to-MSM quarter model RB/FB benchmarking analyses following their completion. The audit will allow for identification of any issues and confirmation of successful benchmarking prior to continuing the analyses. Detroit Edison currently anticipates the benchmarking analyses to be completed in the second quarter of 2013.

Detroit Edison intends to discuss further schedule refinements during the November 1, 2012, meeting with the staff.

Proposed COLA Revision

None.