UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 22, 2015

Mr. Vito Kaminskas
Site Vice President -Nuclear Generation
DTE Electric Company
Fermi 2 - 280 OBA
6400 North Dixie Highway
Newport, MI 48166

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE FERMI 2 LICENSE RENEWAL APPLICATION – SET 32 (TAC NO. MF4222)

Dear Mr. Kaminskas:

By letter dated April 24, 2014, DTE Electric Company (DTE or the applicant) submitted an application pursuant to Title10 of the *Code of Federal Regulations* Part 54, to renew the operating license NPF-43 for Fermi 2, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information were discussed with Ms. Lynne Goodman, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me at 301-415-3301 or e-mail Daneira.Melendez-Colon@nrc.gov.

Sincerely,

/RA/

Daneira Meléndez-Colón, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosure:
Requests for Additional Information

cc w/encl: ListServ

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Daneira Meléndez-Colón, Project Manager
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Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-341
Enclosure:
Request for Additional Information
cc w/encl: Listserv
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FERMI 2
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION SET 32
(TAC NO. MF4222)

RAI 3.5.2.2.2.2-1a

Background:

The aging management review (AMR) results in License Renewal Application (LRA) Table 3.5.2-3 on page 3.5-87, corresponding to LRA Table 1, item 3.5.1-48, and Generic Aging Lessons Learned (GALL) Report item III.A3.TP-114, applicable to the Fermi 2 main steam pipe tunnel concrete exposed to elevated temperatures exceeding the GALL Report threshold limits, identifies the Structures Monitoring Program as the program to manage the aging effects of reduction in strength and modulus of elasticity due to elevated temperature. This line item in LRA Table 3.5.2-3 indicates that the main steam pipe tunnel component intended functions are: (a) enclosure, protection (EN); (b) missile barrier (MB); and (c) support for Criterion (a)(3) equipment (SRE). Further, Table 3.2-1 in the Updated Final Safety Analysis Report (UFSAR) classifies the main steam tunnel as a seismic Category I structure.

In its response to RAI 3.5.2.2.2.2-1, dated December 26, 2014, the applicant stated that a reduction in strength and modulus of elasticity due to elevated temperatures was not applied in the design calculations of the concrete main steam pipe tunnel. The applicant also stated that the parameter monitored by the Structures Monitoring Program to manage reduction in strength and modulus of elasticity (indicated in the response as "change in material properties") is the condition of the exposed concrete surface. The applicant further stated that failure to meet the acceptance criteria (which include the absence of spalling, cracking, and other physical damage) consistent with the parameters identified in American Concrete Institute (ACI) 349.3R-02 for concrete degradation due to thermal exposure, would result in the condition being documented in the corrective action program for further evaluation.

"Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR) Table 3.5-1, item 48, and the corresponding GALL Report item III.A3.TP-114, address the aging effect of reduction in strength and modulus of elasticity of concrete due to elevated temperature (i.e., exceeding 150°F general; 200°F local) in Group 1–5 concrete structures. SRP-LR Section 3.5.2.2.2.2 states that the GALL Report recommends further evaluation of a plant-specific program if any portion of the safety-related and other concrete structures exceeds specified temperature limits. The GALL Report also states that if significant equipment loads are supported by the concrete at temperatures exceeding 150°F, an evaluation of the ability to withstand the postulated design loads is to be made. However, higher temperatures than those given in the GALL Report may be allowed in the concrete if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. The acceptance criteria for plant-specific programs are described in Appendix A.1 of the SRP-LR.

ENCLOSURE

SRP-LR, Section A.1.2.3.3 states, in part, that the "parameters monitored or inspected" program element "should provide a link between the parameter(s) that will be monitored and how the monitoring of these parameters will ensure adequate aging management." The guidance also states that, for a condition monitoring program, "the parameter monitored or inspected should be capable of detecting the presence and extent of aging effects [i.e., reduction in concrete strength and modulus of elasticity, in this case]." Further, the guidance in SRP-LR, Section A.1.2.3.4 states, in part, that "the discussion for the "detection of aging effects" program element should address how the program element would be capable of detecting or identifying the occurrence of age-related degradation or an aging effect prior to a loss of structure and component (SC)-intended function" under all current licensing basis (CLB) design conditions.

Section 4.1.6 of Electric Power Research Institute (EPRI) Report TR-103842, "Class 1 Structures License Renewal Industry Report," Revision 1, includes, among others, an assessment of the age-related degradation mechanism of concrete under elevated temperatures and its significance to license renewal. EPRI Report TR-103842 states, in part: "As a result of long term exposure to high temperatures ([greater than] 300°F), surface scaling and cracking may be exhibited. Otherwise, there is no visible physical manifestation of concrete degradation due to exposure to elevated temperatures." This report also states that the compressive strength, tensile strength, and modulus of elasticity of concrete are reduced to different extents when it is subjected to prolonged exposure to elevated temperatures and that the data cited therein suggests that reductions in excess of 10 percent begin to occur in the range of 180 to 200°F. This industry report and the areas of technical agreement were part of the technical basis for the SRP-LR and GALL Report provisions for aging effects of reduction of concrete strength and modulus of elasticity due to elevated temperatures. The staff notes that SRP-LR Section 3.5.2.2.1.2, which addresses reduction of strength and modulus of elasticity due to elevated temperature for containments, states that the implementation of American Society of Mechanical Engineers (ASME) Code Section XI, Subsection IWL, visual inspection would not be able to identify this aging effect. The same limitation applies to the ability of visual inspections implemented under the Structures Monitoring Program to identify the above stated aging effects of long term exposure to elevated temperature.

Issue:

The staff identified the following concerns and needs additional information to evaluate the adequacy of the applicant's plant-specific program aspect to manage the aging effects of "reduction of concrete strength and modulus due to elevated temperature" for the concrete main steam pipe tunnel in the turbine building.

1. It is not clear how the applicant's Structures Monitoring Program will be capable of detecting the presence and extent of the aging effects of reduction in concrete strength and modulus of elasticity (change in material properties), due to long-term exposure to elevated temperature exceeding GALL Report limits, by visual inspection of the condition of the exposed concrete surface (parameters monitored); noting that there may be no visible physical manifestation (e.g., spalling, scaling, cracking) indicative of reduction of concrete strength and modulus of elasticity under prolonged exposure to elevated temperatures below 300°F (reference EPRI TR-103842, and SRP-LR Section 3.5.2.2.2.2).

2. The Structures Monitoring Program described in LRA Sections A.1.42 and B.1.42, and audited by the staff, does not appear to address the plant-specific program aspect related to “reduction in concrete strength and modulus due to elevated temperature” aging effect, for which visible symptoms are not likely to manifest at temperatures below 300°F.

3. The LRA component intended functions for the concrete main steam pipe tunnel appears to indicate that the structure supports equipment loads. The applicant claims consistency with the GALL Report but the response to RAI 3.5.2.2.2.2-1 does not address the GALL Report item III.A3.TP-114 recommendation that if significant equipment loads are supported by the concrete at temperatures exceeding 150°F, an evaluation of the ability to withstand the postulated design loads is to be made.

Request:

Considering the staff concerns identified in the “Issue” section and the elevated temperature, above GALL Report limits, experienced by the main steam pipe tunnel concrete in the turbine building, provide information with technical basis to:

1. Demonstrate the adequacy of the parameters proposed to be monitored or inspected by the plant-specific aspect of the Structures Monitoring Program to detect, quantify extent, and manage the aging effects of “reduction of concrete strength and modulus due to elevated temperature” of the main steam pipe tunnel concrete;

2. Clearly establish the link between the parameters proposed to be monitored and how monitoring these parameters will ensure adequate aging management of the “reduction of concrete strength and modulus due to elevated temperature,” prior to loss of intended functions of the main steam pipe tunnel concrete, such that CLB design conditions will be maintained during the period of extended operation;

3. Address GALL Report item III.A3.TP-114 recommendation that if significant equipment loads are supported by the concrete at temperatures exceeding 150°F, an evaluation of the ability to withstand the postulated design loads is to be made;

4. Ensure consistency of applicable LRA program elements, UFSAR supplement, and/or AMR Tables, as appropriate, with the response to the requests above.

RAI 3.5.2.2.2.1-3a

Background:

In its response to RAI 3.5.2.2.2.1-3, dated January 26, 2015, the applicant stated that the mineral deposits associated with the in-leakage documented in the Condition Assessment Resolution Documents (CARDs) discussed as part of the applicant’s response have been generally characterized as efflorescence. The applicant also stated that testing and evaluation will be performed prior to the period of extended operation to confirm that these deposits are not

the result of leaching of calcium hydroxide and carbonation that could impact the intended function(s) of the concrete structures. Further, the applicant stated that similar testing will be performed on samples of future observances of the same nature in accessible concrete areas to determine whether these concrete elements are experiencing leaching of calcium hydroxide and carbonation, and to perform further evaluation, based on the test results, to determine whether the observed condition has any impact on the intended function(s) of the concrete elements.

In addition, the applicant stated that a similar corrective action plan will be developed for testing and evaluation of concrete elements in inaccessible concrete areas if observed conditions in accessible areas are found to impact the intended functions of the concrete elements in question. These actions were provided with the applicant's response as enhancements (Commitments No. 34m and 34n) to the LRA Structures Monitoring Program.

LRA Table 3.5.1, item 3.5.1-47, identifies exterior above-grade and below-grade inaccessible concrete areas and foundation for Groups 1-5 and 7-9 structures exposed to flowing water as not applicable to Fermi 2 structures. Similarly, LRA Table 3.5.1, item 3.5.1-63, identifies exterior above-grade and below-grade accessible concrete areas and foundation for Groups 1-5 and 7-9 structures exposed to flowing water as not applicable to Fermi 2 structures. The general rationale provided by the applicant for the line items described above is that these groups of concrete structures at Fermi 2 are not subject to the flowing water environment necessary for the aging effects to occur and leaching has not been observed on accessible concrete areas.

The GALL Report recommends AMP XI.S6, "Structures Monitoring," to manage increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation for exterior above-grade and below-grade accessible concrete areas and foundation for Groups 1-5 and 7-9 structures exposed to "water flowing" environment. The GALL Report defines the "water flowing" environment as "water that is refreshed; thus, it has a greater impact on leaching and can include rainwater, raw water, ground water, or water flowing under a foundation."

Issue:

The response to item 3 of RAI 3.5.2.2.2.1-3 includes enhancements (Commitments No. 34m and 34n) to the Structures Monitoring Program to manage the potential aging effect of increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation for inaccessible areas based on testing and evaluation of observed conditions of in-leakage (water, mineral deposits) in accessible areas for the same aging effect/mechanism. However, the applicant continues to indicate in LRA Table 3.5.1, items 3.5.1-47 and 3.5.1-63, are "not applicable," and there are no LRA Table 2 line items provided to correspond to this material-environment-aging effect program combination. Therefore, the enhancements to the LRA Structures Monitoring Program appear to be inconsistent or in conflict with the indicated non-applicability of the LRA Table 3.5.1 items associated with this aging effect for accessible and inaccessible areas (i.e., LRA Table 3.5.1, line items 3.5.1-47 and 3.5.1-63) and that no associated Table 2 line items have been identified to indicate the structural components for which the aging effect will be managed by the plant-specific enhancements. The staff notes that the non-applicability discussion related to the flowing water environment necessary for this aging effect to occur in LRA Table 3.5.1, items 3.5.1-47 and 3.5.1-63, and LRA

Section 3.5.2.2.2.1, item 4, is also inconsistent with the broader definition of "water flowing" environment in the GALL Report.

Request:

Considering the staff concerns identified in the "Issue" section and the broader definition of "water flowing" environment by the GALL Report, clarify and/or reconcile the inconsistencies between LRA Commitments No. 34m and 34n, and the non-applicability of LRA Table 3.5.1, items 3.5.1-47 and 3.5.1-63, and provide the Table 2 line items for the structures and components associated with this aging effect. Otherwise, provide the technical basis to justify why LRA Table 3.5.1, items 3.5.1-47 and 3.5.1-63, remain as "not applicable."