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Proprietary Information – Withhold Under 10 CFR 2.390

10 CFR 54

May 19, 2015
NRC-15-0056

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555-0001

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) DTE Electric Company Letter to NRC, "Fermi 2 License Renewal Application," NRC-14-0028, dated April 24, 2014 (ML14121A554)

3) NRC Letter, "Requests for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 32 (TAC No. MF4222)," dated April 22, 2015 (ML15099A016)

4) DTE Electric Company Letter to NRC, "Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Sets 19, 20, and 21," NRC-15-0020, dated March 5, 2015 (ML15064A105)

Subject: Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 32

In Reference 2, DTE Electric Company (DTE) submitted the License Renewal Application (LRA) for Fermi 2. In Reference 3, NRC staff requested additional information regarding the Fermi 2 LRA. Enclosure 1 to this letter provides the DTE response to the requests for additional information (RAIs). Enclosure 2 to this letter provides a revised response to Set 20 RAI 4.7.1-1 as discussed with the NRC during a clarification call on March 24, 2015. The response to RAI 4.7.1-1 was previously submitted in Reference 4. Enclosure 5 to this letter includes additional LRA revisions that have been identified as a result of the April 2015 NRC inspection.

**Enclosure 2 contains Proprietary Information – Withhold Under 10 CFR 2.390.
When separated from Enclosure 2, this document is decontrolled.**

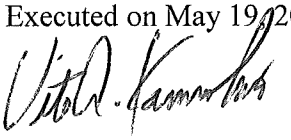
Enclosure 2 contains proprietary information as defined by 10 CFR 2.390. General Electric – Hitachi (GEH), as the owner of the proprietary information, has executed the affidavit in Enclosure 4, which identifies that the enclosed proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. The proprietary information was provided to DTE in a GEH transmittal that is referenced by the affidavit. The proprietary information has been faithfully reproduced in the enclosed documentation such that the affidavit remains applicable. GEH herein requests as set forth in the enclosed affidavit of Lisa K. Schichlein that the enclosed proprietary information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390. A non-proprietary version of the documentation in Enclosure 2 is provided in Enclosure 3.

One new commitment is being made in this submittal. The new commitment is in LRA Table A.4 Item 37, BWR CRD Return Line Nozzle, as indicated in Enclosure 5. In addition, revisions have been made to commitments previously identified in the LRA. The revised commitments are in LRA Table A.4 Item 10, Diesel Fuel Monitoring, and LRA Table A.4 Item 24, Non-EQ Insulated Cables and Connections, as indicated in Enclosure 5.

Should you have any questions or require additional information, please contact Lynne Goodman at 734-586-1205.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 19, 2015



Vito A. Kaminskas
Site Vice President
Nuclear Generation

Enclosures:
1. DTE Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 32
2. Enclosure 1 to GEH Letter 318178-16, "Revised Response to RAI 4.7.1-1" – PROPRIETARY
3. Enclosure 2 to GEH Letter 318178-16, "Revised Response to RAI 4.7.1-1" – NON-PROPRIETARY
4. GE-Hitachi Nuclear Energy Americas LLC Affidavit for Enclosure 1 of 318178-16
5. Additional License Renewal Application Revisions from April 2015 NRC Inspection

cc w/ all Enclosures:
NRC Project Manager
NRC License Renewal Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III

cc w/o Enclosure 2:
Michigan Public Service Commission,
Regulated Energy Division (kindschl@michigan.gov)

Enclosure 1 to
NRC-15-0056

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

DTE Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 32

Set 32 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.

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.*

Response:

1. In response to RAI 3.5.2.2.2.2-1 (DTE letter NRC-14-0082 dated December 26, 2014), Fermi 2 had conservatively assumed the turbine building steam tunnel concrete temperature was above the temperature criteria (>150°F general; >200°F local) cited in Generic Aging Lessons Learned (GALL) Report. Therefore, GALL line item III.A3.TP 114 was applied to the Fermi 2 turbine building steam pipe tunnel concrete because concrete temperatures were assumed to exceed the GALL Report threshold. However, additional review of temperature

data has confirmed that sustained bulk air temperatures in the turbine building steam tunnel are below the GALL Report threshold. DTE reviewed temperature data recorded over a recent cycle (the cycle from 2010-2012 was selected as representative since the most recent cycle from 2012-2014 had a lower capacity factor) during normal operations (Modes 1, 2 and 3) from thermocouples located near the steam tunnel ceiling and averaged this data to determine the bulk air temperature. Since the highest temperatures are expected near the ceiling, lower temperatures are expected at lower elevations and below the surface of the concrete. Because the bulk air temperature is below 150°F, bulk concrete temperatures below the criteria cited in the GALL report are expected. Therefore reduction in strength and modulus for accessible and inaccessible concrete is not an aging effect requiring management. As a result, the discussion column of License Renewal Applications (LRA) Table 3.5-1, item 48, corresponding to GALL Report item III.A3.TP-114, addressing the aging effect of reduction in strength and modulus due to elevated temperature (i.e., exceeding 150°F general; 200°F local) in Group 3 concrete structures will be revised. The resulting changes to LRA Section 3.5.2.1.3, Section 3.5.2.2.2.2, Table 3.5-1 Item 48, and Table 3.5.2-3 are included in this response.

2. As discussed in the response to request 1 above, since the bulk temperature for concrete structures and components of the turbine building steam tunnel (pipe tunnel) is below the GALL temperature threshold, reduction in strength and modulus is not an aging effect requiring management. However, continued implementation of the Structures Monitoring Program (SMP) with the enhancements identified in LRA Section B.1.42 assures that other effects of aging are managed for Group 1-5 concrete and concrete components crediting this program.

3. The sustained bulk air temperature in the turbine building steam tunnel (pipe tunnel) is below the concrete temperature criterion of 150°F identified in GALL Report item III.A3.TP-114. Since the nominal sustained bulk area temperature is below 150°F, concrete in the steam tunnel is not subjected to prolonged exposure to elevated temperatures and therefore reductions in the compressive strength, tensile strength, and the modulus are not expected. Additionally, local area temperature of the concrete is not above the 200°F threshold at which ACI 349 recommends special provisions. Because the normal sustained bulk temperatures in the main steam tunnel of the turbine building are below the specified GALL report criteria, additional evaluations of the concrete's ability to withstand postulated design loads are not necessary. As a result, the evaluation discussion in Section 3.5.2.2.2.2 of the LRA will be revised to indicate that reduction in strength and modulus due to elevated temperature is not an aging effect requiring management.

4. Consistent with the responses provided above, the LRA will be revised as indicated below.

LRA Revisions:

LRA Sections 3.5.2.1.3 and 3.5.2.2.2.2 and LRA Tables 3.5.1 and 3.5.2-3 are revised as shown below. Additions are shown in underline and deletions are shown in strike-through. Note that

previous changes to these same LRA sections made in the December 26, 2014 letter (NRC-14-0082) are not shown in underline or strike-through such that only the new changes due to RAI 3.5.2.2.2.2-1a are shown as revisions.

3.5.2.1.3 Turbine Building, Process Facilities, and Yard Structures

Aging Effects Requiring Management

The following aging effects associated with the turbine building, process facilities, and yard structures require management.

- Cracking
- Cracks and distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- ~~Reduction of strength and modulus~~

3.5.2.2.2.2 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

ACI 349 specifies concrete temperature limits for normal operations or any other long-term period. ~~With the exception of the main steam tunnel (pipe tunnel) in the turbine building,~~ Fermi 2 Group 1-5 concrete structures are maintained below a general temperature of 150°F during normal operation by plant cooling systems. Process piping carrying hot fluid (pipe temperature > 200°F) routed through penetrations in the concrete walls by design do not result in temperatures above ~~exceeding~~ 200°F locally or result in "hot spots" on the concrete surface. The penetration configuration includes guard pipes and insulation of the process piping to minimize heat transfer from the process pipe to the exterior environment surrounding the process piping. As discussed in *EPRI Report TR-103842*, 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 the data suggests that reductions in excess of ten percent begin to occur in the range of 180°F to 200°F. Section 9.4.4.1 of the UFSAR states that the maximum nominal temperature of the main steam tunnel is 180°F, however actual site data show that the normal bulk sustained temperature is not above 150°F. This is acceptable since the actual temperature is below the temperature above which a reduction of strength and modulus is expected. Furthermore, localized concrete temperatures are below the 200°F temperature at which ACI 349 recommends special provisions.

Therefore, change in material properties due to elevated temperature is not an aging effect requiring management for Fermi 2 Group 1-5 concrete structures~~, with the exception of the main steam tunnel (pipe tunnel) in the turbine building. For the main steam tunnel (pipe tunnel) in the turbine building, the Structures Monitoring Program manages change in material properties due to elevated temperature for Groups 1-5 concrete structures~~. The aging effect "change in material properties" is equivalent to the NUREG-1801 aging effect "reduction of strength and modulus of elasticity."

Table 3.5.1
Summary of Aging Management Programs for Structures and Component Supports
Evaluated in Chapter II and III of NUREG-1801

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-48	Group 1-5: concrete: all	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded	Listed aging effect does not require management at Fermi 2. Fermi 2 concrete in areas for this grouping is ~~are~~ not exposed to temperatures that exceed the thresholds~~, with the exception of the main steam tunnel of the turbine building. For the main steam tunnel, the Structures Monitoring Program manages this aging effect~~. For further evaluation, see Section 3.5.2.2.2.2.

Table 3.5.2-3
Turbine Building, Process Facilities and Yard Structures
Summary of Aging Management Evaluation

Table 3.5.2-3: Turbine Building, Process Facilities and Yard Structures								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
~~Pipe tunnel~~	~~EN, MB, SRE~~	~~Concrete~~	~~Air – indoor uncontrolled~~	~~Reduction of strength and modulus~~	~~Structures Monitoring~~	~~III.A3.TP-114~~	~~3.5.1-48~~	~~E~~

Set 32 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."

Response:

The aging effects of increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation are applicable for Groups 1-5, 7-9 structures. In the response to RAI 3.5.2.2.2.1-3 dated January 26, 2015 (DTE letter NRC-15-0008), DTE enhanced the Structures Monitoring Program to include testing and evaluation of water/mineral deposits for leaching of calcium hydroxide and carbonation. For consistency, LRA Table 3.5.1 item numbers 3.5.1-47 and 3.5.1-63 will be revised to show that the aging effects are applicable and will be managed by the Structures Monitoring Program. LRA Tables 3.5.2-1 and 3.5.2-3 will both be revised to add line items which reference the LRA Table 3.5.1 item numbers 3.5.1-47 and 3.5.1-63. In addition, LRA Section 3.5.2.2.2.1 item 4 will be revised to state that the Structures Monitoring Program will manage the aging effects described above and to remove the discussion of the flowing water environment not being applicable.

For Group 6 structures, the aging effects are already included as being managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program as indicated by LRA Table 3.5.1 item numbers 3.5.1-51 and 3.5.1-61 and the corresponding line items in LRA Table 3.5.2-2 that reference these item numbers. However, LRA Section 3.5.2.2.2.3 item 3 does include a discussion of the flowing water environment not

being applicable. For consistency, LRA Section 3.5.2.2.2.3 item 3 will also be revised to remove this discussion.

LRA Revisions:

LRA Sections 3.5.2.2.2.1 and 3.5.2.2.2.3 and LRA Tables 3.5.1, 3.5.2-1, and 3.5.2-3 are revised as shown below. Additions are shown in underline and deletions are shown in strike-through.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging Management of Inaccessible Areas

4. Increase in Porosity and Permeability, and Loss of Strength Due to Leaching of Calcium Hydroxide and Carbonation of Below-Grade Inaccessible Concrete Areas of Groups 1-5 and 7-9 Structures

The Fermi 2 Groups 1-5 and 7-9 concrete structures are designed in accordance with ACI 318-63 and/or ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63 and ACI 318-71 using ingredients/materials conforming to ACI, CSA, Michigan Department of State Highways and ASTM standards, which provide for a good quality, dense, well cured, and low permeability concrete. The concrete mix uses Portland cement conforming to ASTM C150 (Types II and V) or CSA Standard A5 along with flyash (ASTM C618). Concrete aggregates conform to the requirements of Michigan Department of State Highways Standard Specifications for Road and Bridge Construction, Article 8.02. Fine aggregates are of the natural sand designation 2NS. Coarse aggregates are of the designation 6AA; these requirements equal or exceed those of ASTM Specification C33. The type and size of aggregate, slump, cement and additives have been established to produce durable concrete in accordance with ACI. Cracking is controlled through proper arrangement and distribution of reinforcing steel. Concrete structures and concrete components are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R-77. ~~The Fermi 2 Groups 1-5 and 7-9 concrete structures are not subject to the flowing water environment necessary for this aging effect to occur.~~

The Structures Monitoring Program manages ~~Therefore,~~ increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in below-grade inaccessible concrete areas ~~is not an applicable aging effect~~ for the inaccessible concrete of Fermi 2 Groups 1-5 and 7-9 concrete structures. ~~However, i~~ Inspections will be performed of inaccessible areas in environments where observed conditions in accessible areas exposed to the same environment indicate that significant degradation is occurring.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

3. Increase in Porosity and Permeability and Loss of Strength due to Leaching of Calcium Hydroxide and Carbonation in Inaccessible Areas of Concrete Elements of Group 6 Structures

ACI 318-63 and/or ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63 and ACI 318-71 using ingredients/materials conforming to ACI, CSA, Michigan Department of State Highways and ASTM standards, which provide for a good quality, dense, well cured, and low permeability concrete. The concrete mix uses Portland cement conforming to ASTM C150 (Types II and V) or CSA Standard A5 along with flyash (ASTM C618). Concrete aggregates conform to the requirements of Michigan Department of State Highways Standard Specifications for Road and Bridge Construction, Article 8.02. Fine aggregates are of the natural sand designation 2NS. Coarse aggregates are of the designation 6AA; these requirements equal or exceed those of ASTM Specification C33. The type and size of aggregate, slump, cement and additives have been established to produce durable concrete in accordance with ACI. Cracking is controlled through proper arrangement and distribution of reinforcing steel. Concrete structures and concrete components are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R-77. ~~The Fermi 2 Group 6 concrete structures are not subject to the flowing water environment necessary for this aging effect to occur.~~

~~Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in below grade inaccessible concrete areas is not an applicable aging effect for the inaccessible concrete of Fermi 2 Group 6 concrete structures. Nevertheless, t~~ The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program manages increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in below grade inaccessible concrete areas of inaccessible concrete of Fermi 2 Group 6 concrete structures.

Table 3.5.1
Summary of Aging Management Programs for Structures and Component Supports
Evaluated in Chapter II and III of NUREG-1801

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-47	Groups 1-5, 7-9: concrete (inaccessible areas): exterior above and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	~~Not applicable. Category I structures at Fermi 2 are founded on bedrock and do not have water flowing underneath the foundation. Leaching has not been observed on accessible portions of Fermi 2 accessible concrete areas.~~ Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect. For further evaluation, see Section 3.5.2.2.2.1 Item 4.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-63	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Structures Monitoring Program	No	~~Not applicable. Category I structures at Fermi 2 are founded on bedrock. Fermi 2 structures do not utilize porous concrete subfoundations, do not rely on a de-watering system to control settlement, and do not have water flowing underneath the foundation.~~ Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.

Table 3.5.2-1
Reactor/Auxiliary Building and Primary Containment
Summary of Aging Management Evaluation

Table 3.5.2-1: Reactor/Auxiliary Building and Primary Containment								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (accessible areas): exterior above and below-grade; foundation	EN, FLB, MB, SNS, SRE, SSR	Concrete	Exposed to fluid environment	Increase in porosity and permeability; Loss of strength	Structures Monitoring	III.A2.TP-24	3.5.1-63	A
Concrete (inaccessible areas): exterior above and below-grade; foundation	EN, FLB, MB, SNS, SRE, SSR	Concrete	Exposed to fluid environment	Increase in porosity and permeability; Loss of strength	Structures Monitoring	III.A2.TP-67	3.5.1-47	A

Table 3.5.2-3
Turbine Building, Process Facilities and Yard Structures
Summary of Aging Management Evaluation

Table 3.5.2-3: Turbine Building, Process Facilities and Yard Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (accessible areas): exterior above and below-grade; foundation	EN, FLB, MB, SNS, SRE	Concrete	Exposed to fluid environment	Increase in porosity and permeability; Loss of strength	Structures Monitoring	III.A3.TP-24	3.5.1-63	A
Concrete (inaccessible areas): exterior above and below-grade; foundation	EN, FLB, MB, SNS, SRE	Concrete	Exposed to fluid environment	Increase in porosity and permeability; Loss of strength	Structures Monitoring	III.A3.TP-67	3.5.1-47	A

Enclosure 3 to
NRC-15-0056

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

Enclosure 2 to GEH Letter 318178-16, "Revised Response to RAI 4.7.1-1" – NON-PROPRIETARY

ENCLOSURE 2

318178-16

Revised Response to RAI 4.7.1-1

Non-Proprietary Information – Class I (Public)

INFORMATION NOTICE

This is a non-proprietary version of Enclosure 1 of 318178-16, which has the proprietary information removed. Portions of the document that have been removed are indicated by white space inside open and closed bracket as shown here [[ ]].

RAI 4.7.1-1

Background:

License Renewal Application (LRA) Section 4.7.1 describes the applicant's time-limited aging analysis evaluation for erosion of the main steam line flow restrictors. The LRA states that Updated Final Safety Analysis Report (UFSAR) Section 5.5.4.4 summarizes the existing analysis. Per the UFSAR, it was postulated that even with an erosion rate of 0.004 inches per year, the increase in choked flow through the restrictors after 40 years of operation would be no more than 5 percent. The LRA states that the applicant re-evaluated this erosion rate and established a new rate for the period of extended operation. Based on re-calculating the analysis with the new erosion rate and a time frame of 60 years, the LRA states that the increase in choked flow will remain within the 5 percent limit specified in the UFSAR.

Issue:

The LRA does not provide the new erosion rate, nor does it describe how this rate was calculated. The LRA also does not describe how the choked flow rate was calculated or quantify by how much it will increase as a result of re-calculating the analysis. As such, the LRA does not provide sufficient information to demonstrate that the increase in the choked flow rate will remain less than the 5 percent limit identified in UFSAR Section 5.5.4.4. Considering these issues, the LRA does not satisfactorily demonstrate that the existing analysis has been projected to the end of the period of extended operation pursuant to 10 CFR 54.21(c)(1)(ii).

Request:

(a) Quantify the new erosion rate and describe and justify the methodology that was used to calculate it. As part of the response, indicate whether wall thickness measurements of all the Fermi 2 main steam line flow restrictors were considered in the determination of the new erosion rate. If such measurements were taken, provide the results in terms of the date of measurement and the amount of wall loss. Provide justification if such measurements were not considered in the determination of the new erosion rate.

(b) Quantify the increase in the choked flow rate that was determined as a result of re-calculating the analysis using the new erosion rate and a time frame of 60 years. Indicate whether the methodology used for this calculation is the same as the methodology used in the existing analysis. Provide justification if the methodology is different.

Revised Response

a. The new erosion-corrosion rate of the stainless steel, high chromium Grade CF8 main steam line (MSL) flow restrictor was determined by engineering judgment based on the following abridged information:

   - Per the Corrosion Survey Database (Reference 4.7.1-1-1): For carbon steel and stainless steel (at up to 475°F steam) the corrosion rate is less than 0.002 inches per year; note the oxygen content and flow velocity were not reported. This data was not collected with the sensitivity necessary to be able to distinguish the differences between carbon steel and stainless steel.
   - For carbon steel (at a flow velocity of [[ ]] and [[ ]]) the corrosion rate is bounded by [[ ]] based on GE Hitachi Nuclear Energy (GEH) corrosion data.

Therefore, the expected erosion corrosion rate for the Grade CF8 MSL flow restrictor would be much less than [[ ]].

- The use of high chromium material (Grade CF8) provides resistance to erosion-corrosion damage for the upstream casting in the MSL flow restrictor.
- Specific cases where high chromium steels (12% and above) have shown erosion-corrosion damage have involved higher moisture content fluids relative to the [[ ]] liquid present in the MSL flow. Because of the low moisture content of the steam in the MSL flow restrictor, significant erosion-corrosion damage is not expected.
- The gradual reduction in diameter minimizes the angle of impact on the narrowest section of the element, reducing the effect of erosion-corrosion within the region containing the minimum diameter. Therefore, the geometry of the MSL flow restrictor further reduces the severity of erosion-corrosion relative to increases in the minimum diameter.
- The relative erosion-corrosion rate for steels begins to reduce at temperatures above approximately 302°F and is dramatically reduced in the presence of oxygen (over approximately 100 ppb). Therefore, in a 550°F environment with ~ [[ ]], the erosion-corrosion rate would be expected to be very low.
- Increasing the chromium content reduces the dependence of flow velocity on the erosion corrosion rate in steels. Because CF8 material has an ~18% chromium content, the dependency of the erosion-corrosion rate on flow velocity is expected to be greatly reduced.
- Chloride intrusion is not expected to occur in the MSL therefore, the Grade CF8 material will not experience the potential for pitting and/or stress corrosion cracking associated with chloride ions.
- Evaluation of an Advanced Boiling Water Reactor (ABWR) MSL elbow concluded that [[ ]] in the carbon steel components that are even more susceptible to erosion-corrosion than components made from Grade CF8 material. Therefore, the Grade CF8 MSL flow restrictor is expected to have very little erosion-corrosion.

Based on the above points, a reduction in the erosion-corrosion rate to [[ ]] for the MSL flow restrictor castings is justified. The available information is justified as an acceptable basis to reduce the erosion-corrosion rate without needing confirmatory wall thickness measurements. In addition, the expected uncertainty in the methods to measure the wall thickness of the MSL flow restrictor would exceed the expected reduction in wall thickness. Therefore, wall thickness measurements would not be expected to aid in determining a revised erosion-corrosion rate.

b. The method used to calculate choked flow is the GEH proprietary Homogenous Equilibrium Method (HEM) model. The new erosion-corrosion rate of [[ ]], described in the response to Part A of this RAI, and the 60 year time frame is used in the HEM model. The increase in choked flow rate is [[ ]]. The HEM model is an enhanced method from the previous conservative analysis described in UFSAR Section 5.5.4.4 and is documented in Reference 4.7.1-1-2. The calculated increase of [[ ]] is less than the 5% increase allowed in UFSAR Section 5.5.4.4.

References

4.7.1-1-1 Corrosion Survey Database (COR•SUR) © 2002 NACE International.

4.7.1-1-2 GE Hitachi Nuclear Energy, "Main Steam Line High Flow Trip Setting," SIL 438, Revision 2, May 13, 2013.

Enclosure 4 to
NRC-15-0056

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

GE-Hitachi Nuclear Energy Americas LLC
Affidavit for Enclosure 1 of 318178-16

ENCLOSURE 3

318178-16

Affidavit for Enclosure 1

GE-Hitachi Nuclear Energy Americas LLC

AFFIDAVIT

I, Lisa K. Schichlein, state as follows:

(1) I am a Senior Project Manager, NPP/Services Licensing, Regulatory Affairs, GE-Hitachi Nuclear Energy Americas LLC (GEH), and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 of GEH letter 318178-16, "Revised Response to Fermi 2 License Renewal Application RAI 4.7.1-1," dated April 30, 2015. The GEH proprietary information in Enclosure 1, which is entitled "Revised Response to RAI 4.7.1-1," is identified by a dotted underline inside double square brackets. [[This sentence is an example.{3}]] In each case, the superscript notation {3} refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner or licensee, GEH relies upon the exemption from disclosure set forth in the *Freedom of Information Act* ("FOIA"), 5 U.S.C. Sec. 552(b)(4), and the *Trade Secrets Act*, 18 U.S.C. Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for trade secrets (Exemption 4). The material for which exemption from disclosure is here sought also qualifies under the narrower definition of trade secret, within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975 F.2d 871 (D.C. Cir. 1992), and Public Citizen Health Research Group v. FDA, 704 F.2d 1280 (D.C. Cir. 1983).

(4) The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a. and (4)b. Some examples of categories of information that fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by GEH's competitors without license from GEH constitutes a competitive economic advantage over other companies;

b. Information that, if used by a competitor, would reduce their expenditure of resources or improve their competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information that reveals aspects of past, present, or future GEH customer-funded development plans and programs, resulting in potential products to GEH;

d. Information that discloses trade secret or potentially patentable subject matter for which it may be desirable to obtain patent protection.

(5) To address 10 CFR 2.390(b)(4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GEH, and is in fact so held. The information sought to be withheld has, to the best of my

knowledge and belief, consistently been held in confidence by GEH, not been disclosed publicly, and not been made available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary or confidentiality agreements that provide for maintaining the information in confidence. The initial designation of this information as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in the following paragraphs (6) and (7).

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, who is the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge, or who is the person most likely to be subject to the terms under which it was licensed to GEH.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist, or other equivalent authority for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GEH are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary or confidentiality agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains details on the GEH methodology for determining erosion-corrosion rates and choked flow rates for boiling water reactors (BWRs). Development of these methods, techniques, and information and their application for the design, modification, and analyses methodologies and processes was achieved at a significant cost to GEH.

The development of the evaluation processes along with the interpretation and application of the analytical results is derived from the extensive experience databases that constitute a major GEH asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GEH's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GEH's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GEH. The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial. GEH's competitive advantage will be lost if its competitors are able to use the results of the GEH experience to normalize or verify their

own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GEH would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GEH of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing and obtaining these very valuable analytical tools.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 30th day of April 2015.

Lisa K. Schichlein

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Enclosure 5 to
NRC-15-0056

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

Additional License Renewal Application Revisions from April 2015 NRC Inspection

The need for additional revisions to the License Renewal Application (LRA) was identified during the April 2015 NRC inspection. The purpose of the revisions is discussed below. These revisions are shown on the following pages. Additions are shown in underline and deletions are shown in strike-through. Note that previous changes made to these same LRA sections made in previous letters are not shown in underline or strike-through such that only the new changes due to the items below are shown as revisions.

1) The Non-EQ Insulated Cables and Connections Program in LRA Sections A.1.31 and B.1.31 is a condition monitoring program for insulated cables and connections exposed to adverse localized environments. During the NRC inspection, it was noted that chemical contamination from bird droppings could be considered an adverse localized environment. Therefore, the Non-EQ Insulated Cables and Connections Program in LRA Sections A.1.31, A.4, B.1.31 is revised to address chemical contamination from bird droppings. [Note that this was referred to as database item #665 during the NRC inspection.]

2) The scope of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program in LRA Sections A.1.23 and B.1.23 includes lifting devices. During the NRC inspection, it was noted that certain safety-related lifting devices that could fall under the scope of the program were not listed in the LRA. Therefore, LRA Sections 2.3.3.4 and 2.4.1 and LRA Tables 2.4-1 and 3.5.2-1 are revised to clarify which lifting devices are included in the scope of this program. [Note that this was referred to as database items #669 and #714 during the NRC inspection.]

3) The Diesel Fuel Monitoring Program in LRA Sections A.1.14 and B.1.14 includes an enhancement for periodic cleaning and inspection of several fuel oil tanks on ten-year intervals. During the NRC inspection, it was noted that the diesel fire pump fuel oil tank cleaning and inspection is more frequent than the once per ten-year period discussed in the LRA. Therefore, the enhancement in the Diesel Fuel Monitoring Program in LRA Sections A.1.14, A.4, B.1.14 is revised to clarify the frequency of the diesel fire pump fuel oil tank cleaning and inspection. [Note that this was referred to as database item #696 during the NRC inspection.] An additional change was made to the enhancement in Section B.1.14 to change the name of element 5 (Monitoring and Trending) to be consistent with NUREG-1801 and other LRA usage.

4) The BWR CRD Return Line Nozzle Program in LRA Sections A.1.5 and B.1.5 does not discuss visual inspections. During the NRC inspection, it was noted that visual inspections are used in the program. Therefore, LRA Sections A.1.44, A.4, and B.1.44 and LRA Table B-3 are revised to add a program enhancement to specify that ultrasonic test examinations will be used. [Note that this was referred to as database item #736 during the NRC inspection.]

5) In a March 19, 2015 letter (NRC-15-0030), DTE revised LRA Tables 3.3.2-17-11 and 3.3.2-17-13 to add line items for tubing with an internal environment of raw water. The aging management program associated with these line items was Service Water Integrity. During the NRC inspection, it was noted that the Service Water Integrity Program is for safety-related components whereas the added line items were for nonsafety-related components. Therefore, the tubing line items in LRA Tables 3.3.2-17-11 and 3.3.2-17-13 are revised to reference a different aging management program, NUREG-1801 item, and Table 1 item. In addition, LRA Table 3.3.1 item number 3.3.1-134 is revised to change the "Discussion" column to indicate the item is used for copper alloy components. [Note that this was referred to as database item #748 during the NRC inspection.]

6) LRA Tables 3.3.2-17-28 and 3.3.2-17-33 include line items for coils associated with room coolers in the reactor/auxiliary building HVAC system and turbine building HVAC system, respectively. During the NRC inspection, it was questioned which coolers were in scope for license renewal and whether the LRA line items cover all the cooler coil materials. As a result, LRA Table 3.3.2-17-33 is revised to add a line item for stainless steel coils in an air (external) and raw water (internal) environment and LRA Table 3.3.2-17-28 is revised to add a line item for copper alloy coils in a raw water (internal) environment. [Note that this was referred to as database item #749 during the NRC inspection.] An additional change was made to the "Notes" column for two of the existing cooler coil line items in LRA Table 3.3.2-17-28 (one changed from A to C and another changed from C to A) for consistency with the new line items and other LRA usage.

7) The BWR Feedwater Nozzle Program in LRA Sections A.1.6 and B.1.6 augments the examinations in ASME Code, Section XI, with the recommendation and schedule of GE NE-523-A71-0594-A, Revision 1. During the NRC inspection, it was noted that NUREG-1801 refers to a specific table in GE NE-523-A71-0594-A, Revision 1 for inspection schedule frequency. GE NE-523-A71-0594-A, Revision 1 includes provisions to apply an alternative inspection schedule and that specific table is no longer being used for the BWR Feedwater Nozzle Program. Therefore, DTE will identify an exception to NUREG-1801 for this item. LRA Section B.1.6 and Table B-3 are revised to add an exception. [Note that this was referred to as database item #753 during the NRC inspection.]

2.3.3.4 Fuel Pool Cooling and Cleanup

Fuel Service and Handling Equipment

The fuel service and handling equipment system codes (system codes F11, F12, F13, F14, F15, F16, F17, F19) consist of equipment used for moving fuel during refueling and other outage inspections and tasks as well as spent fuel storage. With the exception of system code F16 (reactor vessel fuel storage equipment), the few components that are classified as safety-related (the RPV head strongback [system code F13] the dryer and separator sling [system code F13], and a plug for the "fuel servicing equip gamma scan collimator" [system code F11]), are not mechanical system components ~~and do not perform an intended function in accordance with 10 CFR 54.4(a)(1)~~. (For scoping discussion of lifting devices and plugs, see Section 2.4.1, Reactor/Auxiliary Building and Primary Containment).

2.4.1 Reactor/Auxiliary Building and Primary Containment

Reactor Building

The Category II/I refueling platform is used as the principal means of transporting fuel assemblies between the reactor well and the fuel storage pool. The platform travels on tracks extending along each side of the reactor well and the fuel storage pool. The platform supports the refueling grapple and auxiliary hoists. Special lifting devices at Fermi 2 include the reactor pressure vessel head strongback, the dryer/separator lifting device and spent fuel pool transfer cask lifting yoke.

Table 2.4-1
Reactor/Auxiliary Building and Primary Containment
Components Subject to Aging Management Review

Component	Intended Function[a]
Steel and Other Metals	
Hardened vent stack	Support for Criterion (a)(2) equipment
Lifting devices: reactor vessel head strongback, dryer/separator lifting device, spent fuel pool transfer cask lifting yoke	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Metal siding	Enclosure, protection Pressure boundary Pressure relief

Table 3.3.1
Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-134	Steel, stainless steel, or copper alloy piping, piping components, and piping elements, and heat exchanger components exposed to a raw water environment (for nonsafety-related components not covered by NRC GL 89-13)	Loss of material due to general (steel and copper alloy only), pitting, crevice, and microbiologically influenced corrosion, fouling that leads to corrosion	Chapter XI.MI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for steel, ~~and~~ stainless steel, and copper alloy components (nonsafety-related components not covered by NRC GL 89-13) exposed to raw water is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. ~~There are no nonsafety-related copper alloy components exposed to open cycle cooling water in the auxiliary systems in the scope of license renewal.~~

Table 3.3.2-17-11
Process Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-11: Process Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	~~Service Water Integrity~~ Internal Surfaces in Miscellaneous Piping and Ducting Components	~~VII.H2.AP-55~~ VII.C1.A-409	~~3.3.1-41~~ 3.3.1-134	A

Table 3.3.2-17-13
General Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-13: General Service Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	~~Service Water Integrity~~ Internal Surfaces in Miscellaneous Piping and Ducting Components	~~VII.C1.AP-196~~ VII.C1.A-408	~~3.3.1-36~~ 3.3.1-134	A

Table 3.3.2-17-28
Reactor/Auxiliary Building HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-28: Reactor/Auxiliary Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Coil	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	~~A~~ C
Coil	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-408	3.3.1-134	A
Coil	Pressure boundary	Copper alloy	Steam (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	--	--	G
Coil	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-409	3.3.1-134	~~C~~ A

Table 3.3.2-17-33
Turbine Building HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-33: Turbine Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Coil	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F3-AP-203	3.3.1-46	A
Coil	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Coil	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-409	3.3.1-134	A
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.5.2-1
Reactor/Auxiliary Building and Primary Containment
Summary of Aging Management Evaluation

Table 3.5.2-1: Reactor/Auxiliary Building and Primary Containment								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Hardened vent stack	SNS	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Lifting devices: reactor vessel head strongback, dryer/separator lifting device, spent fuel pool transfer cask lifting yoke	SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	C
Metal siding	EN, PB, PR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A

A.1.5 BWR CRD Return Line Nozzle Program

The BWR Control Rod Drive (CRD) Return Line Nozzle Program manages cracking of the CRD return line nozzle using preventive, mitigative, and inservice inspection activities, in accordance with Fermi 2 commitments to implement the recommendations in NUREG-0619 and ASME Code Section XI, Subsection IWB, Table IWB 2500-1. Examinations that can detect the presence of cracking are performed to assure detection of cracks before the loss of intended function of the CRD return line nozzle. Cracking found during inservice inspection is evaluated in accordance with ASME Code Section XI requirements. The CRD return line nozzle was capped during construction prior to plant operation.

The BWR CRD Return Line Nozzle Program will be enhanced as follows.

- Revise BWR CRD Return Line Nozzle Program procedures as necessary to ensure that ultrasonic test (UT) examinations will be used to detect applicable aging effects.

Enhancements will be implemented prior to the period of extended operation.

A.1.14 Diesel Fuel Monitoring Program

The Diesel Fuel Monitoring Program will be enhanced as follows.

- Revise the Diesel Fuel Monitoring Program procedures to include a ten-year periodic cleaning and internal visual inspection of the EDG fuel oil storage tanks, EDG fuel oil day tanks, diesel fire pump fuel oil tank, and CTG fuel oil tank with the following instructions. The cleanings and internal inspections will be performed at least once during the ten-year period prior to the period of extended operation and at succeeding ten-year intervals. If visual inspection is not possible, perform a volumetric inspection. If evidence of degradation is observed during visual inspection, perform a volumetric examination of the affected area.
  The schedule for the Preventive Maintenance (PM) event to perform diesel fire pump fuel oil tank draining, flushing, and inspection will continue at its frequency at the time of the enhancement implementation, until a PM evaluation of results from fuel oil samples and tank inspections indicates that the system will be capable of continuing to perform its function during the period of extended operation with a lower frequency, not less than once per ten-year interval for cleaning and internal visual inspection consistent with NUREG-1801.

Enhancements will be implemented prior to the period of extended operation.

A.1.31 Non-EQ Insulated Cables and Connections Program

The Non-EQ Insulated Cables and Connections Program is a new condition monitoring program that provides reasonable assurance the intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation[1], ~~and~~ moisture, and chemical contamination (i.e. bird droppings) can be maintained consistent with the current licensing basis through the period of extended operation.

The program consists of accessible insulated electrical cables and connections installed in adverse localized environments to be visually inspected at least once every ten years for cable jacket and connection insulation surface anomalies, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination, that could indicate incipient conductor insulation aging degradation from temperature, radiation, or moisture.

An adverse localized environment is a condition in a limited plant area that is significantly more severe than the plant design environment for the cable or connection insulation materials.

This program will be implemented prior to the period of extended operation with the first inspection prior to the period of extended operation.

1. Reduced insulation resistance from an environment of radiation and air (oxygen) includes radiolysis, photolysis of organics, or radiation induced oxidation. Photolysis is limited to UV sensitive materials.

A.4 LICENSE RENEWAL COMMITMENT LIST

No.	Program or Activity	Commitment	Implementation Schedule	Source
10	Diesel Fuel Monitoring	Enhance Diesel Fuel Monitoring Program as follows: b. Revise the Diesel Fuel Monitoring Program procedures to include a ten-year periodic cleaning and internal visual inspection of the EDG fuel oil storage tanks, EDG fuel oil day tanks, diesel fire pump fuel oil tank, and CTG fuel oil tank with the following instructions. The cleanings and internal inspections will be performed at least once during the ten-year period prior to the period of extended operation and at succeeding ten-year intervals. If visual inspection is not possible, perform a volumetric inspection. If evidence of degradation is observed during visual inspection, perform a volumetric examination of the affected area. The schedule for the Preventive Maintenance (PM) event to perform diesel fire pump fuel oil tank draining, flushing, and inspection will continue at its frequency at the time of the enhancement implementation, until a PM evaluation of results from fuel oil samples and tank inspections indicates that the system will be capable of continuing to perform its function during the period of extended operation with a lower frequency, not less than once per ten-year interval for cleaning and internal visual inspection consistent with NUREG-1801.	Prior to September 20, 2024 or the end of the last refueling outage prior to March 20, 2025, whichever is later.	A.1.14

No.	Program or Activity	Commitment	Implementation Schedule	Source
24	Non-EQ Insulated Cables and Connections	Implement the new Non-EQ Insulated Cables and Connections Program, a condition monitoring program that provides reasonable assurance the intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation, ~~and~~ moisture, and chemical contamination (i.e. bird droppings) can be maintained consistent with the current licensing basis through the period of extended operation. The program consists of accessible insulated electrical cables and connections installed in adverse localized environments to be visually inspected at least once every ten years.	Prior to September 20, 2024 or the end of the last refueling outage prior to March 20, 2025, whichever is later.	A.1.31
37	BWR CRD Return Line Nozzle	Enhance BWR CRD Return Line Nozzle Program as follows: a. Revise BWR CRD Return Line Nozzle Program procedures as necessary to ensure that ultrasonic test (UT) examinations will be used to detect applicable aging effects.	Prior to September 20, 2024 or the end of the last refueling outage prior to March 20, 2025, whichever is later.	A.1.5

Table B-3

Fermi 2 Program Consistency with NUREG-1801

Program Name	NUREG-1801 Comparison			Plant-Specific
	Consistent with NUREG-1801	Programs with Enhancement	Programs with Exception to NUREG-1801	
BWR CRD Return Line Nozzle	X	X		
BWR Feedwater Nozzle	~~X~~		X	

B.1.5 BWR CRD RETURN LINE NOZZLE

Program Description

The BWR Control Rod Drive (CRD) Return Line Nozzle Program manages cracking of the CRD return line nozzle using preventive, mitigative, and inservice inspection activities, in accordance with Fermi 2 commitments to implement the recommendations in NUREG-0619, *BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking*, and ASME Code Section XI, Subsection IWB, Table IWB 2500-1. Examinations that can detect the presence of cracking are performed to assure detection of cracks before the loss of intended function of the CRD return line nozzle. Cracking found during inservice inspection is evaluated in accordance with ASME Code Section XI requirements. The CRD return line nozzle was capped during construction prior to plant operation.

NUREG-1801 Consistency

The BWR CRD Return Line Nozzle Program, with enhancement, is consistent with the program described in NUREG-1801, Section XI.M6, BWR Control Rod Drive Return Line Nozzle.

Exceptions to NUREG-1801

None

Enhancements

~~None~~
The following enhancement will be implemented prior to the period of extended operation.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise BWR CRD Return Line Nozzle Program procedures as necessary to ensure that ultrasonic test (UT) examinations will be used to detect applicable aging effects.

B.1.6 BWR FEEDWATER NOZZLE

Program Description

The BWR Feedwater Nozzle Program manages cracking of the BWR feedwater nozzles using inspection activities to monitor the effects of cracking due to cyclic loading.

This program augments the examinations specified in the ASME Code, Section XI, with the recommendation and schedule of General Electric (GE) NE-523-A71-0594-A, Revision 1, *Alternate BWR Feedwater Nozzle Inspection Requirements,* and NUREG-0619 to perform periodic testing of critical regions of the BWR feedwater nozzles. The feedwater nozzles were never clad and include the improved sparger design. Cracking is evaluated and dispositioned in accordance with the ASME Code.

NUREG-1801 Consistency

The BWR Feedwater Nozzle Program is consistent with the program described in NUREG-1801, Section XI.M5, BWR Feedwater Nozzle, with one exception.

Exceptions to NUREG-1801

~~None~~
The BWR Feedwater Nozzle Program has the following exception.

Element Affected	Exception
4. Detection of Aging Effects	The inspection schedule in ASME Section XI is used instead of Table 6-1 of GE NE-523-A71-0594-A, Revision 1.[1]

Exception Note
1. NUREG-1801 states that the inspection schedule is in accordance with Table 6-1 of GE NE-523-A71-0594, Revision 1. Section 6.3 of GE NE-523-A71-0594-A, Revision 1, states that the examination schedule specified in Table 6-1 is applicable until such time that 10 CFR 50.55a is revised to require implementation of ASME Section XI, Appendix VIII. Section 6.3 also states that after compliance with Appendix VIII is required, the examinations will be in accordance with the ASME Section XI inspection frequency. Consistent with this discussion, Fermi 2 examination frequency is based on ASME Section XI rather than Table 6-1 of GE NE-523-A71-0594-A, Revision 1.

Enhancements

None

B.1.14 DIESEL FUEL MONITORING

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
2. Preventive Actions 3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending 6. Acceptance Criteria 7. Corrective Actions	Revise Diesel Fuel Monitoring Program procedures to monitor and trend water and sediment, particulates, and levels of microbiological organisms in the EDG fuel oil storage tanks, EDG fuel oil day tanks, diesel fire pump fuel oil tank, and combustion turbine generator (CTG) fuel oil tank quarterly. In addition, revise program procedures to state that biocides or corrosion inhibitors may be added as a preventive measure or are added if periodic testing indicates biological activity or evidence of corrosion, respectively.
4. Detection of Aging Effects	Revise the Diesel Fuel Monitoring Program procedures to include a ten-year periodic cleaning and internal visual inspection of the EDG fuel oil storage tanks, EDG fuel oil day tanks, diesel fire pump fuel oil tank, and CTG fuel oil tank with the following instructions. The cleanings and internal inspections will be performed at least once during the ten-year period prior to the period of extended operation and at succeeding ten-year intervals. If visual inspection is not possible, perform a volumetric inspection. If evidence of degradation is observed during visual inspection, perform a volumetric examination of the affected area. The schedule for the Preventive Maintenance (PM) event to perform diesel fire pump fuel oil tank draining, flushing, and inspection will continue at its frequency at the time of the enhancement implementation, until a PM evaluation of results from fuel oil samples and tank inspections indicates that the system will be capable of continuing to perform its function during the period of extended operation with a lower frequency, not less than once per ten-year interval for cleaning and internal visual inspection consistent with NUREG-1801.

B.1.31 NON-EQ INSULATED CABLES AND CONNECTIONS

Program Description

The Non-EQ Insulated Cables and Connections Program is a new condition monitoring program that provides reasonable assurance that intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation[1], ~~and~~ moisture, and chemical contamination (i.e. bird droppings) can be maintained consistent with the current licensing basis through the period of extended operation. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the plant design environment for the cable or connection insulation materials.

Accessible insulated cables and connections within the scope of license renewal installed in an adverse localized environment will be visually inspected for cable and connection jacket surface anomalies such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination. The inspection of accessible cables will represent, with reasonable assurance, all cables and connections in the adverse localized environment.

NUREG-1800, Revision 2, Sections 2.5.1 and NUREG-1801, Revision 2, X1.E1 allow an integrated approach. Fermi 2 will utilize an integrated approach consisting of the following methods to determine adverse localized environments: the plant spaces method, review of environmental qualification documentation, plant layout drawings, aging management review, consultation with plant staff, utilization of temperature monitoring techniques, and review of operating experience. The plant spaces approach provides for a review and walkdown of all buildings and rooms in the scope of license renewal to determine potential adverse localized environments. The determination of a potential adverse localized equipment environment will be based on the most limiting temperature, radiation, ~~or~~ moisture, or chemical contamination (i.e. bird droppings) conditions for the cables and connection insulation material located at Fermi 2. The evaluation of an adverse localized equipment environment will be based on the most limiting temperature, radiation, ~~or~~ moisture, or chemical contamination conditions for the cables and connection insulation material located within that plant space that has a potential adverse localized equipment environment.

This program will visually inspect accessible cables in an adverse localized environment at least once every ten years, with the first inspection prior to the period of extended operation.

This program will be implemented prior to the period of extended operation.

1. Reduced insulation resistance from an environment of radiation and air (oxygen) includes radiolysis, photolysis of organics, or radiation induced oxidation. Photolysis is limited to UV sensitive materials.