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DTE Energy

10 CFR 54

April 10, 2015
NRC-15-0031

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 23 (TAC No. MF4222)," dated March 13, 2015 (ML15051A420)

4) NRC Letter, "Requests for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 24 (TAC No. MF4222)," dated March 11, 2015 (ML15051A317)

5) NRC Letter, "Requests for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 26 (TAC No. MF4222)," dated March 13, 2015 (ML15062A336)

6) DTE Electric Company Letter to NRC, "Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 15," NRC-15-0009, dated January 15, 2015 (ML15016A063)

7) DTE Electric Company Letter to NRC, "Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 16," NRC-15-0010, dated February 5, 2015 (ML15037A531)

Subject: Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Sets 23, 24, and 26

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NRR

In Reference 2, DTE Electric Company (DTE) submitted the License Renewal Application (LRA) for Fermi 2. In References 3, 4, and 5, 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 revised responses to RAIs as discussed with the NRC during clarification calls on March 5 and 6, 2015. The revised responses are for RAIs 2.4.4-2 and 4.1-1, previously submitted in References 6 and 7, respectively.

One new commitment is being made in this submittal. The new commitment is in LRA Table A.4 Item 14, Fire Water System, as indicated in the response to RAI B.1.19-2a in Enclosure 1. In addition, revisions have been made to commitments previously identified in the LRA. The revised commitments are in LRA Table A.4 Item 3, Aboveground Metallic Tanks, as indicated in the response to RAI B.1.1-1a in Enclosure 1, and in LRA Table A.4 Item 14, Fire Water System, as indicated in the response to RAI B.1.19-8a in Enclosure 1.

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 April 10, 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 – Sets 23, 24, and 26
2. DTE Revised Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 15 RAI 2.4.4-2 and Set 16 RAI 4.1-1

cc: NRC Project Manager
NRC License Renewal Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Michigan Public Service Commission,
Regulated Energy Division (kindschl@michigan.gov)

**Enclosure 1 to**
**NRC-15-0031**

**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 – Sets 23, 24, and 26**

***Set 23 RAI B.1.1-1a***

*Background*

*In request for additional information (RAI) B.1.1-1 dated December 17, 2014, the staff requested that DTE Electric state how the aging effects of loss of material and cracking of the aluminum in the proximity of the interface between the condensate storage tank (CST) and its concrete foundation will be managed during the period of extended operation.*

*In its response dated January 20, 2015, DTE Electric stated that the insulation on the CST prevents access to the interface between the tank and its concrete foundation and is expected to prevent the intrusion of water and moisture. License Renewal Application (LRA) Sections A.1.1, A4, and B.1.1 were revised to perform a volumetric examination consisting of four 1-foot sections of the tank/concrete interface prior to entering the period of extended operation. The RAI response also stated that although caulking was not included in the design and installation specifications for the CST there appears to be caulking present at some locations along the tank/concrete interface.*

*Issue*

*The RAI response did not provide a basis for why it is expected that the insulation will prevent access to the tank/concrete interface and prevent loss of material from occurring during the period of extended operation. It is unclear to the staff how the configuration of the tank and insulation preclude the possibility of water and moisture intrusion in the outdoor environment/weather. If the interface is not appropriately protected from water and moisture intrusion the partially present caulk may potentially act to trap moisture that has intruded. If a one-time volumetric examination is conducted to demonstrate that aging effects are being effectively managed, then the examination is to be of a representative area. Based on its review, the staff has concluded that four 1-foot sections do not constitute a representative sample size for this type of inspection. License Renewal Interim Staff Guidance (LR-ISG)-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," Aging Management Program (AMP) XI.M29, "Aboveground Metallic Tanks," provides examples of representative sample sizes.*

*Request*

1. *If the tank insulation is being credited as a moisture barrier or preventive measure, provide the basis and justification for why it is expected that the insulation on the CST will prevent the access of water and moisture to the tank/concrete interface and is an appropriate preventive action to manage loss of material during the period of extended operation. The response should include:*

    - *the intended function of the insulation on the CST*

- *a physical description or drawing of the insulation relative to the tank/concrete interface. The level of detail in the description should provide for an understanding of how the configuration of the tank and insulation preclude the possibility of water and moisture intrusion in the outdoor environment/weather. The description should include relevant dimensions. This description is only needed if the tank insulation is being credited as a preventive measure against loss of material at the tank/concrete interface.*

- *an estimate (both total length and percentage) of how much of the tank/concrete interface has the preexisting caulking present to potentially entrap water and moisture. Clarify if the caulking will remain in a partially present condition during the period of extended operation.*

- *if caulking is credited as a preventive measure, clarify if it will be inspected consistent with Generic Aging Lessons Learned (GALL) Report AMP XI.M29, as modified by LR-ISG-2012-02.*

2. *If the one-time volumetric inspection is being performed to demonstrate the effectiveness of the insulation in preventing moisture intrusion at the tank/concrete interface, instead of establishing the general condition of the tank prior to entering the period of extended operation, state and justify the basis used to determine that four 1 foot sections of the tank/concrete interface is a representative sample. If an alternate inspection is being used to manage the loss of material in the proximity of the tank/concrete interface, provide the basis and justification for the inspection method, extent of inspection, and frequency of inspection.*

**Response:**

1. The condensate storage tank (CST) insulation and caulking is not credited as a moisture barrier. As discussed in the Updated Final Safety Analysis Report (UFSAR) Section 9.2.6, corrosion resistance of the tank is achieved through the use of a high-strength aluminum alloy (grade 5454).

2. External inspection is not sufficient to assess the condition of the tank bottom interface with the concrete support structure for loss of material. Therefore, an alternate inspection will be used to manage the loss of material in the proximity of the tank/concrete interface as follows. Inspection of the tank bottom/concrete interface zone will be performed using volumetric techniques from inside the tank. This inspection will be conducted once in the ten-year period prior to the period of extended operation and every ten years thereafter in accordance with the frequency recommended in NUREG-1801 Section XI.M29 Aboveground Metallic Tanks for tank bottoms. A minimum of 25% of this interface surface will be examined. The volumetric inspection will be on a 2" grid or less, depending on the technology utilized. Further, the inspection of the concrete/tank bottom interface zone will be in addition to that required by the GALL for a general tank bottom volumetric inspection.

   Loss of material is the aging effect being managed. Inspection for cracking is not necessary

as cracking is not an aging effect requiring management for aluminum alloy 5454. Aluminum alloy 5454, since it contains less than 12% zinc, less than 6% magnesium, and less than 1% copper, is not susceptible to cracking per EPRI 1010639 "Non Class 1 Mechanical Implementation Guide and Mechanical Tools" Appendix D, Table 4-1 (air environment) and Appendix B, Table 4-3 (raw water environment).

**LRA Revisions:**

LRA Tables 3.4.1 and 3.4.2-1 and LRA Sections A.1.1, A.4, and B.1.1 are revised as shown on the following pages. Additions are shown in underline and deletions are shown in strike-through. Note that previous changes to these same LRA sections made in the July 30, 2014 letter (NRC-14-0051) and January 20, 2015 letter (NRC-15-0005) are not shown in underline or strike-through such that only the new changes due to RAI B.1.1-1a are shown as revisions.

**Table 3.4.1**
**Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801**

| Table 3.4.1: Steam and Power Conversion Systems | | | | | |
|---|---|---|---|---|---|
| **Item Number** | **Component** | **Aging Effect/ Mechanism** | **Aging Management Programs** | **Further Evaluation Recommended** | **Discussion** |
| 3.4.1-31 | Stainless steel, aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation | Loss of material due to pitting, and crevice corrosion; cracking due to stress corrosion cracking | Chapter XI.M29, "Aboveground Metallic Tanks" | No | Consistent with NUREG-1801. Loss of material ~~and cracking~~ for aluminum tanks exposed to outdoor air, concrete or soil is managed by the Aboveground Metallic Tanks Program. Cracking is not an aging effect requiring management for aluminum tanks with low zinc, magnesium, and copper content. There are no stainless steel tanks (consistent with the scope of NUREG-1801, Chapter XI.M29, "Aboveground Metallic Tanks") in the steam and power conversion systems. |

| Table 3.4.1: Steam and Power Conversion Systems | | | | | |
|---|---|---|---|---|---|
| **Item Number** | **Component** | **Aging Effect/ Mechanism** | **Aging Management Programs** | **Further Evaluation Recommended** | **Discussion** |
| 3.4.1-63 | Insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor | Loss of material due to general (steel, and copper alloy), pitting, or crevice corrosion, and cracking due to stress corrosion cracking (aluminum, stainless steel and copper alloy (>15% Zn) only) | Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks" (for tanks only) | No | Consistent with NUREG-1801. Loss of material for steel insulated piping components exposed to condensation is managed by the External Surfaces Monitoring Program. Loss of material ~~and cracking~~ of aluminum insulated tanks exposed to outdoor air is maintained by the Aboveground Metallic Tanks Program. Cracking is not an aging effect requiring management for aluminum tanks with low zinc, magnesium, and copper content. |

**Table 3.4.2-1**
**Condensate Storage and Transfer System**
**Summary of Aging Management Evaluation**

| **Table 3.4.2-1: Condensate Storage and Transfer System** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Component Type** | **Intended Function** | **Material** | **Environment** | **Aging Effect Requiring Management** | **Aging Management Programs** | **NUREG-1801 Item** | **Table 1 Item** | **Notes** |
| ~~Insulated tank~~ | ~~Pressure boundary~~ | ~~Aluminum~~ | ~~Air – outdoor (ext)~~ | ~~Cracking~~ | ~~Aboveground Metallic Tanks~~ | ~~VIII.E.S-402~~ | ~~3.4.1-63~~ | ~~A, 404~~ |
| Insulated tank | Pressure boundary | Aluminum | Air – outdoor (ext) | Loss of material | Aboveground Metallic Tanks | VIII.E.S-402 | 3.4.1-63 | A, 404 |

### A.1.1 Aboveground Metallic Tanks Program

The Aboveground Metallic Tanks Program is a new program that will manage loss of material and cracking for outdoor tanks within the scope of license renewal that are sited on soil or concrete. Preventive measures to mitigate corrosion and cracking were applied during construction, such as using the appropriate materials, protective coatings, and elevation as specified in design and installation specifications. For the painted carbon steel combustion turbine generator (CTG) fuel oil tank, the program will monitor the external surface condition for indications and precursors of loss of material. For the insulated aluminum condensate storage tank (CST), the program will monitor the condition of a representative sample of the tank external surface for signs of loss of material~~ and cracking~~, using visual inspections and surface examinations. Exterior portions of the tanks will be inspected in accordance with Table 4a, "Tank Inspection Recommendations," identified in LR-ISG-2012-02. There are no indoor tanks included in this program.

CST internal inspections will be conducted in accordance with Table 4a, identified above. Internal inspections of the CTG fuel oil tank will be conducted in accordance with NUREG-1801, XI.M30.

This program will also manage the bottom surfaces of both in-scope aboveground metallic tanks, which are on concrete ring foundations and sand. The program will require ultrasonic testing (UT) of the tank bottoms to assess the thickness against the thickness specified in the design specification. UT of the tank bottoms will be performed whenever the tanks are drained or at intervals not less than those recommended in Table 4a during the period of extended operation. Caulking or sealant at the concrete/tank interfaces is not credited in the installation and design specifications.

~~Within the ten years prior to the period of extended operation, a volumetric examination of four 1-foot sections of the interface between the CST and concrete ring foundation will be performed for cracking and loss of material. If cracking and loss of material are not present, this program will conduct subsequent inspections of the exterior surface of the insulation.~~ Within the ten years prior to the period of extended operation and every ten years thereafter, a volumetric examination of a minimum 25% of the CST tank bottom interface with the concrete ring foundation will be performed to manage loss of material. The volumetric inspection will be on a 2” grid or less, depending on the technology utilized.

This program will be implemented prior to the period of extended operation, with initial inspections within the ten years prior to the period of extended operation.

## A.4 LICENSE RENEWAL COMMITMENT LIST

| No. | Program or Activity | Commitment | Implementation Schedule | Source |
|---|---|---|---|---|
| 3 | Aboveground Metallic Tanks | Implement new Aboveground Metallic Tanks Program that will manage loss of material and cracking for outdoor tanks within the scope of license renewal that are sited on soil or concrete. CST internal inspections will be conducted in accordance with Table 4a of LR-ISG-2012-02; internal inspections of the CTG fuel oil tank will be conducted in accordance with NUREG-1801, XI.M30. This program will also manage the bottom surfaces of both in-scope aboveground metallic tanks. Within the ten years prior to the period of extended operation, a volumetric examination of four 1-foot sections of the interface between the CST and concrete ring foundation will be performed for cracking and loss of material. If cracking and loss of material are not present, this program will conduct subsequent inspections of the exterior surface of the insulation. Within the ten years prior to the period of extended operation and every ten years thereafter, a volumetric examination of a minimum 25% of the CST tank bottom interface with the concrete ring foundation will be performed to manage loss of material. The volumetric inspection will be on a 2" grid or less, depending on the technology utilized. | Prior to September 20, 2024, or the end of the last refueling outage prior to March 20, 2025, whichever is later. Initial inspections will be performed within the ten years prior to March 20, 2025. | A.1.1 |

## B.1.1 ABOVEGROUND METALLIC TANKS

**Program Description**

The Aboveground Metallic Tanks Program is a new program that will manage loss of material and cracking for outdoor tanks within the scope of license renewal that are sited on soil or concrete. Preventive measures to mitigate corrosion and cracking were applied during construction, such as using the appropriate materials, protective coatings, and elevation as specified in design and installation specifications. For the painted carbon steel combustion turbine generator (CTG) fuel oil tank, the program will monitor the external surface condition for indications and precursors of loss of material. For the insulated aluminum condensate storage tank (CST), the program will monitor the condition of a representative sample of the tank external surface for signs of loss of material ~~and cracking~~ using visual inspections and surface examinations. Exterior portions of the tanks will be inspected in accordance with Table 4a, "Tank Inspection Recommendations," identified in LR-ISG-2012-02. There are no indoor tanks included in this program.

CST internal inspections will be conducted in accordance with Table 4a, identified above. Internal inspections of the CTG fuel oil tank will be conducted in accordance with NUREG-1801, XI.M30.

This program will also manage the bottom surfaces of both in-scope aboveground metallic tanks, which are on concrete ring foundations and sand. The program will require ultrasonic testing (UT) of the tank bottoms to assess the thickness against the thickness specified in the design specification. The UT testing of the tank bottoms will be performed whenever the tanks are drained or at intervals not less than those recommended in Table 4a during the period of extended operation. Caulking or sealant at the concrete/tank interfaces is not credited in the installation and design specifications.

~~Within the ten years prior to the period of extended operation, a volumetric examination of four 1-foot sections of the interface between the CST and concrete ring foundation will be performed for cracking and loss of material. If cracking and loss of material are not present, this program will conduct subsequent inspections of the exterior surface of the insulation.~~ Within the ten years prior to the period of extended operation and every ten years thereafter, a volumetric examination of a minimum 25% of the CST tank bottom interface with the concrete ring foundation will be performed to manage loss of material. The volumetric inspection will be on a 2" grid or less, depending on the technology utilized.

This program will be implemented prior to the period of extended operation, with initial inspections within the ten years prior to the period of extended operation.

***Set 24 RAI B.1.4-2a***

*Background*

*Request for Additional Information (RAI) B.1.4-2 requested the basis for why a 100 mV polarization acceptance criterion will provide adequate protection for buried steel piping in a mixed metal environment.*

*The response dated January 15, 2015, states that:*

> *If the new program, when developed, allows use of the -100 mV criterion for piping within the scope of the Buried and Underground Piping AMP, then the program will address why the effects of mixed potentials are minimal and why the most anodic metal in a system for which this criteria is used is adequately protected as required by Note 2 of Table 6a of GALL Report AMP XI.M41 as modified by LR-ISG-2011-03.*

*License Renewal Interim Staff Guidance (LR-ISG)-2011-03, "Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, 'Buried and Underground Piping and Tanks,'" Table 6a, "Cathodic Protection Acceptance Criteria," footnote 2 states that, "applicants must explain in the application why the effects of mixed potentials are minimal and why the most anodic metal in the system is adequately protected."*

*Issue*

*Given that the basis for use of the 100 mV polarization acceptance criterion was not provided in the application or response to RAI B.1.4-2, the staff cannot complete its evaluation of the "acceptance criteria" program element.*

*Request*

*State the basis for why the effects of mixed potentials will be minimal and why the most anodic metal in the system will be adequately protected if the 100 mV polarization cathodic protection acceptance criterion is used.*

**Response:**

The basis for why the effects of mixed potentials will be minimal and why the most anodic metal in the system will be adequately protected if the 100 mV polarization cathodic protection acceptance criterion is used is as follows. In performing cathodic protection surveys, the -850 mV polarized potential criterion specified in National Association of Corrosion Engineers (NACE) SP0169-2013 for steel piping will be the primary acceptance criterion to determine cathodic protection (CP) system effectiveness. Alternately, as specified in NACE SP0169-2013 for steel piping (Section 6.2.1), the following criteria can be used to demonstrate cathodic protection effectiveness:

1 – 100mV or greater cathodic polarization;
2 – Any empirically verified criteria that has been shown to be effective (e.g. corrosion rate).

When either of the alternate criteria is applied, electrical resistance probes (ERPs) will be installed in select locations as determined by a Cathodic Protection Specialist. The ERPs will be made of the most anodic metal in the system to ensure adequate protection of the most anodic system metal. The ERPs provide for measurements that can be used to demonstrate CP effectiveness in controlling the corrosion rate. Based on these measurements, the level of CP can be adjusted to reduce the corrosion rate to acceptable levels. Concurrent with the ERPs, permanent reference cells and reference metal will be installed. Installation of the permanent reference cells at pipe depth and near the piping of interest will allow for an accurate measurement of pipe-to-soil potential, minimizing the influence of mixed metals. The reference metals will allow both instant-off (polarized metal) and native readings to be obtained for a particular portion of piping without the necessity of interrupting or powering down the rectifiers. This information can be used either concurrently with, or in place of the measured corrosion rate from the ERPs to determine if criteria 1 and 2 above are met.

An upper limit of -1200 mV for pipe-to-soil potential measurements of coated pipes will also be established, so as to preclude potential damage to coatings.

If the -850 mV instant-off criterion is not met, the following acceptance criteria can be used to assess cathodic protection effectiveness during the annual surveys:

- A measured corrosion rate from the soil corrosion probes of 1 mil per year (mpy) or less will demonstrate that the cathodic protection system has provided effective protection for that surveillance year and no further evaluation is necessary. The loss of material rate will be established based on the past 1 year of measurements taken on a semi-annual frequency in conjunction with rectifier readings.
- If the measured corrosion rate for the given surveillance year exceeds 1 mpy, the corrosion rate will be used as an input into a remaining life calculation for the component. If the measured corrosion rate indicates that the remaining life of the pipe exceeds the life of the plant, it will be concluded that the cathodic protection system has been effective in mitigating significant corrosion for that surveillance year at the location of interest.
- If the observed corrosion rates from the probes, over the given surveillance year, do not support the conclusion that the intended function of the component would be maintained through the period of extended operation, it will be concluded that the cathodic protection system has not been effective over the surveillance interval. The measurements will count against the cathodic protection effectiveness determinations performed in accordance with LR-ISG-2011-03, Table 4a, footnote 2.c.iii.

EPRI document 3002005067, "Evaluation for Installing or Upgrading Cathodic Protection Systems," describes two methods for determining service life. Both predict service life based on

design margin and established corrosion rates. One uses the difference between nominal and minimum wall thickness in conjunction with the measured corrosion rate to predict service life. The other uses the difference between measured and minimum wall thickness to predict remaining service life. Either method may be used.

Additionally, DTE will review minimum wall calculations for in-scope piping for which corrosion rates will be used, and for piping segments without pre-existing minimum wall calculations, a comparison of critical piping characteristics (e.g., piping specifications, system design information, pipe diameter) will be performed. These calculations and comparisons would demonstrate that considering all design loads (i.e. hoop stresses, axial stress, soil overburden) the buried in-scope piping is capable of withstanding at least 60 mils (1 mpy for 60 years) of material loss from 87.5 percent of the nominal thickness. If this review determines 60 mils of material loss is not acceptable for a given portion of piping, the allowable corrosion rate will be adjusted accordingly.

Where used, the electrical resistance probes will be uncoated and placed in the immediate vicinity of the buried piping it is representing. For each installation application, two probes will be installed; one connected to the cathodic protection system and one left unprotected. The test probe left unprotected (not connected to the pipe) will be free of the mixed metals influence. Information provided in NACE International Publication 05107, "Report on Corrosion Probes in Soil or Concrete," will be considered during the application, installation, and use of soil corrosion probes. However, the specific details on installation and use of the soil corrosion probes will be in accordance with vendor, manufacturer, and NACE-qualified cathodic protection specialist recommendations.

Soil corrosion probes will not necessarily be installed at each cathodic protection survey test point. Frequently, the soil corrosion probe assemblies will be installed away from cathodic protection test points. With regard to the soil corrosion probe locations and utilization of the data: (a) a NACE-qualified cathodic protection specialist will assist in selecting the location(s); (b) both the soil corrosion probes and the permanent reference electrode are installed below-grade and in close proximity to the buried piping of interest; (c) a NACE-qualified cathodic protection specialist will evaluate the difference in the respective locations between the soil corrosion probes and the cathodic protection test point to determine whether the difference in the relative data could be reasonably attributed to other site features (e.g., exposed large surface area tank bottoms, heavily congested areas of other buried piping, very large diameter pipes); and (d) if the difference in the observed data could be attributed to adjacent site features, cathodic protection effectiveness at the existing test point will not be evaluated by use of data from the soil corrosion probes. Placement of soil corrosion probes will consider existing soil (e.g. moisture content, pH and resistivity measurements) through the use of soil sampling.

**LRA Revisions:**

LRA Sections A.1.4 and B.1.4 are revised as shown. Additions are shown in underline and deletions are shown in strike-through.

## A.1.4 Buried and Underground Piping Program

The Buried and Underground Piping Program is a new program that will manage the effects of aging on the external surfaces of buried and underground piping components within the scope of license renewal. The program will manage aging effects of loss of material and cracking for the external surfaces of buried and underground piping fabricated of aluminum, carbon steel, gray cast iron, and stainless steel through preventive and mitigative measures (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic or directed excavations. There are no underground or buried tanks for which aging effects would be managed by the Buried and Underground Piping Program. Fermi 2 utilizes a cathodic protection system. Fermi 2 has performed preliminary laboratory soil composition analyses on samples removed from the site to evaluate the potential corrosivity of the soil for use in life cycle management.

Soil testing will be conducted once in each ten-year period starting ten years prior to the period of extended operation, if a reduction in the number of inspections recommended in Table 4a of NUREG-1801, XI.M41, is taken based on a lack of soil corrosivity.

If the 100 mV criterion is applied for cathodic protection for specific piping, electric resistance probes (ERPs) will be installed in select locations as determined by a Cathodic Protection Specialist. The ERPs will be made of the most anodic metal in the system to ensure adequate protection of the most anodic system metal. Concurrent with the ERPs, permanent reference cells and reference metal will be installed. Installation of the permanent reference cells at pipe depth and near the piping of interest will allow for an accurate measurement of pipe-to-soil potential, minimizing the influence of mixed metals. Where used, the electrical resistance probes will be uncoated and placed in the immediate vicinity of the buried piping it is representing. For each installation application, two probes will be installed; one connected to the cathodic protection system and one left unprotected. The test probe left unprotected (not connected to the pipe) will be free of the mixed metals influence.

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

## B.1.4 BURIED AND UNDERGROUND PIPING

**Program Description**

The Buried and Underground Piping Program is a new program that will manage the effects of aging on the external surfaces of buried and underground piping within the scope of license renewal. The program will manage aging effects of loss of material and cracking for the external surfaces of buried and underground piping fabricated of aluminum, carbon steel, gray cast iron, and stainless steel through preventive and mitigative measures (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic or directed excavations. There are no underground or buried tanks for which aging effects would be managed by the Buried and Underground Piping Program. Fermi 2 utilizes a cathodic protection system. Fermi 2 has performed preliminary laboratory soil composition analyses on samples removed from the site to evaluate the potential corrosivity of the soil for use in life cycle management.

Soil testing will be conducted once in each ten-year period starting ten years prior to the period of extended operation, if a reduction in the number of inspections recommended in Table 4a of NUREG-1801, Section XI.M41 is taken based on a lack of soil corrosivity.

If the 100 mV criterion is applied for cathodic protection for specific piping, electric resistance probes (ERPs) will be installed in select locations as determined by a Cathodic Protection Specialist. The ERPs will be made of the most anodic metal in the system to ensure adequate protection of the most anodic system metal. Concurrent with the ERPs, permanent reference cells and reference metal will be installed. Installation of the permanent reference cells at pipe depth and near the piping of interest will allow for an accurate measurement of pipe-to-soil potential, minimizing the influence of mixed metals. Where used, the electrical resistance probes will be uncoated and placed in the immediate vicinity of the buried piping it is representing. For each installation application, two probes will be installed; one connected to the cathodic protection system and one left unprotected. The test probe left unprotected (not connected to the pipe) will be free of the mixed metals influence.

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

***Set 24 RAI B.1.19-2a***

*Background*

*By letter dated December 17, 2014, the staff issued RAI B.1.19-2 requesting the basis for why there is reasonable assurance that the intended function of the deluge systems for the control center HVAC (heating, ventilation, and air conditioning) make-up filter charcoal filter absorber unit and the control center HVAC recirculation filter charcoal absorber unit will be met during the period of extended operation when their piping and nozzle inspections only occur when the charcoal media is replaced. During the audit, the staff reviewed charcoal filter media replacement work orders and determined that the media is replaced approximately every 7 to 10 years.*

*The response dated January 15, 2015, provides a basis for why the stainless steel piping exposed to the air environment downstream of the manual closed isolation valves from the fire water system would not be susceptible to flow blockage from that portion of the piping. The response also states that the piping upstream of the manual isolation valves is constructed of carbon steel and "is routinely flushed to ensure no blockage."*

*Issue*

*Flow blockage due to buildup of corrosion products would not be expected to occur in the stainless steel, normally-dry portions of the charcoal filter water distribution piping. However, corrosion products could accumulate in the upstream carbon steel piping and, although the RAI response states that this piping is routinely flushed, it did not state the periodicity of these flushes. The staff lacks sufficient information to conclude that corrosion product debris will not prevent the fire water distribution piping from performing its intended function during the period of extended operation.*

*Request*

*State and justify the periodicity of, and the method of, flushing the carbon steel piping upstream of the control center HVAC make-up filter charcoal filter absorber unit and control center HVAC recirculation filter charcoal absorber unit; and state how the periodicity of the flushing is documented.*

**Response:**

The carbon steel fire protection water supply leading to the CCHVAC makeup and recirculation units is normally drained. The isolation valve directly feeding this section of piping is locked closed. In accordance with the Technical Requirements Manual (TRM) surveillance requirements this isolation valve is cycled open and closed once every 12 months. Following closure of the isolation valve the downstream piping is drained. During draining, DTE personnel

inspect for particulates and other indications of flow blockage. However, the valve operability test procedure does not require documentation of this inspection.

Therefore, the Fire Water System Program will be enhanced to revise the valve operability test procedure to include formal documentation of the drain down inspection for indications of flow blockage. As addressed in the enhancement in the response to RAI B.1.19-6 (DTE letter NRC-15-0002 dated January 15, 2015), if any criteria of Sections 14.2.1.3 or 14.3.1 of NFPA 25-2011 are met, an obstruction investigation will be conducted.

**LRA Revisions:**

LRA Sections A.1.19, A.4, and B.1.19 are revised as shown. Additions are shown in underline and deletions are shown in strike-through. Note that previous changes to these same LRA sections made in the July 30, 2014 letter (NRC-14-0051) and January 15, 2015 letter (NRC-15-0002) are not shown in underline or strike-through such that only the new changes due to RAI B.1.19-2a are shown as revisions.

## A.1.19 Fire Water System Program

The Fire Water System Program will be enhanced as follows.

- Revise Fire Water System Program procedures to include formal documentation of the CCHVAC makeup and recirculation fire water supply drain down inspection for indications of flow blockage.

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

## A.4 LICENSE RENEWAL COMMITMENT LIST

| No. | Program or Activity | Commitment | Implementation Schedule | Source |
|---|---|---|---|---|
| 14 | Fire Water System | Enhance Structures Monitoring Program as follows:<br><br>g. Revise Fire Water System Program procedures to include formal documentation of the CCHVAC makeup and recirculation fire water supply drain down inspection for indications of flow blockage. | Prior to September 20, 2024, or the end of the last refueling outage prior to March 20, 2025, whichever is later, with the exception that the activities described in this commitment for piping segments designed to be dry but determined to be collecting water shall be conducted within five years prior to March 20, 2025. | A.1.19 |

**B.1.19 FIRE WATER SYSTEM**

**Enhancements**

| Element Affected | Enhancement |
|---|---|
| 4. Detection of Aging Effects | Revise Fire Water System Program procedures to include formal documentation of the CCHVAC makeup and recirculation fire water supply drain down inspection for indications of flow blockage. |
| 6. Acceptance Criteria | Revise Fire Water System Program procedures to include acceptance criteria that any indication of fouling is evaluated. |

***Set 24 RAI B.1.19-8a***

*Background*

*One of the plant-specific operating experience examples cited in the license renewal application (LRA) describes fire suppression flow testing that demonstrated degrading conditions in the underground piping system. The LRA states that the frequency of testing and evaluation of this piping has been increased from 3 years, to annual testing.*

*The response to RAI B.1.19-8, dated January 15, 2015, states an enhancement to the LRA Section B.1.19 "corrective action" program element. The enhancement states, "[r]evise Fire Water System Program procedures to consider in accordance with the Corrective Action Program increasing test frequency if there is a decreasing trend in flow in the fire water system flow test."*

*Issue*

*The staff recognizes that if an adverse trend in system performance is detected during the period of extended operation, the condition adverse to quality will be evaluated in accordance with the Corrective Action Program. However, given the existing degraded condition, the staff lacks sufficient information to:*

- *Find the enhancement acceptable because the use of the term "consider" leaves it indeterminate whether the frequency of fire water system flow testing will be increased during the period of extended operation if the current decreasing trend in system performance reveals that the system may not be capable of performing its intended function throughout the period of extended operation.*

- *Conclude that existing corrective actions will be sufficient to correct the adverse trend prior to the period of extended operation.*

*Therefore, the staff cannot conclude that plant-specific operating experience associated with flow testing of the underground fire water system has been adequately evaluated.*

*Request*

*State and justify the basis for why the current trend in fire water system performance will be corrected prior to the period of extended operation. Alternatively, revise LRA Section A.1.1.19, as necessary, to continue the increased frequency of fire water system flow tests until such time as trend data demonstrates that the system will be capable of performing its intended function throughout the period of extended operation.*

**Response:**

DTE performs annual water flow tests per the Corrective Action Program due to anomalies in water flow test data first observed in 2008. DTE will continue the increased frequency (i.e. annual) water flow tests until such a time as trend data from test results indicate the system will be capable of performing its intended function throughout the period of extended operation. The enhancement to the Fire Water System Program made in the response to RAI B.1.19-8 (DTE letter NRC-15-0002 dated January 15, 2015) will be revised to ensure this occurs.

Once the trend data from test results indicate the system will be capable of performing its intended function throughout the period of extended operation, DTE will resume Technical Requirements Surveillance Requirement (TRSR) 3.12.2.19 water flow test frequency of at least once every 3 years; exceeding the NFPA 25 Section 7.3.1 provision of once every 5 years.

**LRA Revisions:**

LRA Sections A.1.19, A.4, and B.1.19 are revised as shown. Additions are shown in underline and deletions are shown in strike-through. Note that previous changes to these same LRA sections made in the July 30, 2014 letter (NRC-14-0051) and January 15, 2015 letter (NRC-15-0002) are not shown in underline or strike-through such that only the new changes due to RAI B.1.19-8a are shown as revisions.

## A.1.19 Fire Water System Program

The Fire Water System Program will be enhanced as follows.

- If the decreasing trend in fire water system flow tests is not resolved through the Corrective Action Program prior to the period of extended operation, revise Revise Fire Water System Program procedures to consider, in accordance with the Corrective Action Program, increasing test frequency if there is a decreasing trend in flow in the continue performing annual fire water system flow tests during the period of extended operation until such a time as trend data from fire water system flow tests indicates that the system will be capable of performing its intended function throughout the period of extended operation and therefore TRM frequency may be resumed.

## A.4 LICENSE RENEWAL COMMITMENT LIST

| No. | Program or Activity | Commitment | Implementation Schedule | Source |
|---|---|---|---|---|
| 14 | Fire Water System | Enhance Structures Monitoring Program as follows:<br><br>p. If the decreasing trend in fire water system flow tests is not resolved through the Corrective Action Program prior to the period of extended operation, revise Revise Fire Water System Program procedures to consider, in accordance with the Corrective Action Program, increasing test frequency if there is a decreasing trend in flow in the continue performing annual fire water system flow tests during the period of extended operation until such a time as trend data from fire water system flow tests indicates that the system will be capable of performing its intended function throughout the period of extended operation and therefore TRM frequency may be resumed. | Prior to September 20, 2024, or the end of the last refueling outage prior to March 20, 2025, whichever is later, with the exception that the activities described in this commitment for piping segments designed to be dry but determined to be collecting water shall be conducted within five years prior to March 20, 2025. | A.1.19 |

## B.1.19 FIRE WATER SYSTEM

**Enhancements**

| Element Affected | Enhancement |
|---|---|
| 7. Corrective Actions | If the decreasing trend in fire water system flow tests is not resolved through the Corrective Action Program prior to the period of extended operation, revise ~~Revise~~ Fire Water System Program procedures to ~~consider, in accordance with the Corrective Action Program, increasing test frequency if there is a decreasing trend in flow in the~~ continue performing annual fire water system flow tests during the period of extended operation until such a time as trend data from fire water system flow tests indicates that the system will be capable of performing its intended function throughout the period of extended operation and therefore TRM frequency may be resumed. |

***Set 26 RAI B.1.3-1a***

*Background*

*In a letter dated January 26, 2015, the applicant provided the 2013 BADGER test report in Enclosure 2 of the submittal. The report provides information on the condition of the Boraflex material in the spent fuel pool and by extension the effectiveness of the Boraflex Monitoring Program. The monitoring program is implemented to ensure that no unexpected degradation of the Boraflex material compromises the criticality analysis.*

*Issue*

*The staff reviewed the 2013 BADGER test report and has determined that more information is needed to complete its review. The staff has concerns on whether the program provides reasonable assurance that it can detect unexpected degradation of the Boraflex material in the spent fuel pool.*

*Request*

1. *On page 8 of Enclosure 2 to NRC-15-0008, it states that once a critical dose level has been attained (approximately $2x10^9$ rads), Boraflex becomes susceptible to dissolution by water in the spent fuel pool environment. Please discuss what percentage of Boraflex panels in the Fermi 2 spent fuel pool has attained the critical dose level of $2x10^9$ rads.*

2. *On page 8 of Enclosure 2 to NRC-15-0008, it states that a RACKLIFE model of the Fermi 2 racks is used to estimate the service history of each Boraflex panel, specifically estimated gamma exposure. The license renewal application further states that the RACKLIFE model is used to calculate the amount of boron carbide loss from the Boraflex panels. Please discuss how the RACKLIFE model predictions compare with the results of the 2013 BADGER test report.*

3. *In the conclusion section of Enclosure 2 to NRC-15-0008, it states that the areal densities of 3 of 60 panels tested (i.e., 5 percent) fell below the minimum acceptance limit of 0.015656 g-$^{10}B/cm^2$. These panels were subsequently taken out of service. Please discuss whether a similar percentage of the untested panels in the spent fuel pool would be expected to have comparable degradation and thus may not meet the acceptance limit of 0.015656 g-$^{10}B/cm^2$. If so, discuss how this will impact the assumptions found in the criticality analysis. In addition, discuss how the Boraflex Monitoring Program provides reasonable assurance that unexpected degradation of Boraflex panels in the spent fuel pool will be identified.*

**Response:**

1. 87% of the Boraflex panels had attained a dose level of 2.00E+09 rads or higher at the time of the 2013 BADGER test.

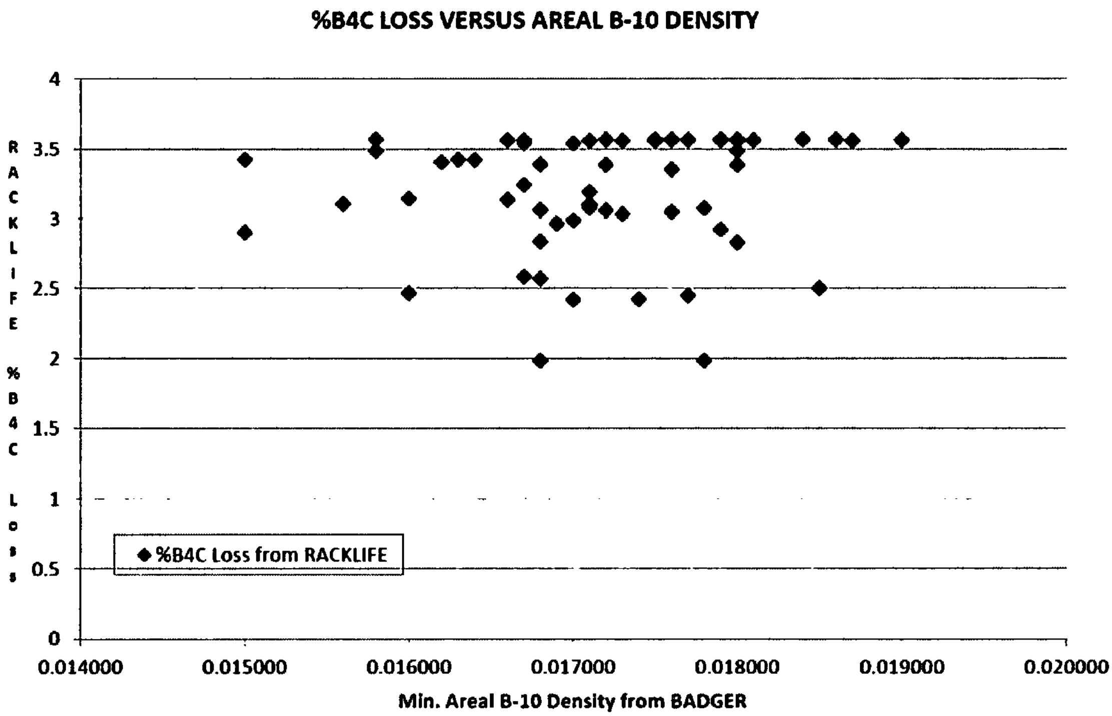
2. The RACKLIFE code is a mass balance calculation of silica in the spent fuel pool (SFP). Calculated results include gamma radiation dose absorbed by Boraflex panels, pool silica concentrations to compare with the measured silica from plant chemistry data, and the percentage boron-carbide lost from each panel. Hence, RACKLIFE will calculate boron carbide loss. BADGER testing measures the state of a set of Boraflex panels at a point in time. BADGER results can be used to confirm that a SFP still meets its criticality design basis at that point in time. A RACKLIFE projection can then be used to extrapolate these results into the future.

   When comparing % $B_4C$ loss from RACKLIFE to minimum areal density (AD) from BADGER there does not appear to be a correlation (refer to Figure 1 on the following page). An analysis of the BADGER 2013 data using Minitab resulted in a Pearson correlation coefficient of 0.130. The Pearson correlation coefficient can range from -1 (for a strong negative correlation) to +1 (for a strong positive correlation). A value equal to zero yields no correlation. Laerd Statistics (www.statistics.laerd.com) has proposed the following guidelines for interpreting the Pearson correlation coefficient:

   | Strength of Association | Coefficient |
   |---|---|
   | Small | 0.1 - 0.3 |
   | Medium | 0.3 - 0.5 |
   | Large | 0.5 - 1.0 |

   Hence, a correlation coefficient of 0.130 shows the strength of association to be small.

Figure 1:




The reasons for this are that RACKLIFE calculates loss from an initial panel state (volumetric density and thickness). The initial panel data for each panel was not provided by Joseph Oat (the manufacturer of the racks). A calculation of % loss isn't particularly useful for purposes of comparison to a criticality analysis unless one knows the starting point or has a data point. A BADGER test provides that data point from which RACKLIFE can then predict when an areal density will be below the value assumed in the criticality analysis. RACKLIFE uses a common escape coefficient (panel cavity volumes per day) for the whole pool and assumes uniform degradation across the whole panel. There can also be differences between individual panels either from construction anomalies or damage such that the water ingress/egress rate can vary from panel to panel. RACKLIFE and BADGER must be used together to portray an accurate picture of the Boraflex panels.

3. Yes, a similar percentage of the untested panels in the spent fuel pool would be expected to have comparable degradation and thus may not meet the acceptance limit of 0.015656 g B-10/cm$^2$. As panels with low B-10 are found with the BADGER test, fuel bundles will be removed from the adjacent cells. When RACKLIFE predicts that a panel, previously tested by BADGER, will degrade to below 0.015656 g B-10/cm$^2$, fuel bundles will likewise be removed from the adjacent cells.

The impact on the assumptions in the criticality Analysis of Record (AOR) is that more panels (a similar percentage of ~5%) would be below that minimum assumed AD of

0.015656 g B-10/cm$^2$. The AOR assumed a nominal AD of 0.01648 g B-10/cm$^2$. The difference between this nominal AD and the minimum AD of 0.015656 g B-10/cm$^2$ is treated as an uncertainty (rather than a bias) in the AOR. It is acceptable to treat this as an uncertainty in the AOR because the assumption is that even though there are panels that are below the nominal AD of 0.01648 g B-10/cm$^2$, there are also panels whose AD is above the nominal AD. From the BADGER report, 16.7% of the panels tested had an AD below the nominal value but 83.3% were above the nominal value. Uncertainties are statistically combined (via Root Sum Square) in the AOR. The AOR also has an assumption for bundle reactivity in the cold core geometry of up to 1.31. This is because that is the bundle reactivity limit stated in Tech. Spec. 4.3.1.a. Fermi 2 had a sensitivity study performed by the fuel vendor that investigated the effects of increased Boraflex degradation. For an areal density as low as 0.012 g B-10/cm$^2$, a bundle reactivity of up to 1.2820 could be tolerated with a resulting rack k-effective of 0.945. The highest bundle reactivity that Fermi 2 has ever had was 1.2668. For all the Fermi 2 fuel, an areal density of as low as 0.012 g B-10/cm$^2$ could be tolerated with margin maintained to the rack k-effective limit of 0.95. An administrative limit on bundle k-infinity of 1.2820 was placed in the Fermi 2 procedure "Spent Fuel Storage Rack Management Guidelines."

It is reasonable to believe that the results of the 2013 BADGER test are representative of the entire population of Boraflex panels because of the sample size chosen. The statistically significant sample size of 60 panels was chosen based on the 95/95 criterion, i.e., for a sample size of at least 59 panels, 95% of the population would be above the minimum value tested with a 95% confidence level. The 95/95 criterion is an accepted industry practice and a sample size of 60 has become commonplace in the industry. None of the panels tested during the 2013 BADGER test were found to have an AD of less than 0.012 g B-10/cm$^2$. It is therefore reasonable to conclude that none of the Boraflex panels in the rack have degraded to this point. In addition, the likelihood of finding an areal density of less than 0.012 g B-10/cm$^2$ is considered very low due to Fermi 2's Boraflex rack management strategy. The Boraflex racks were installed in the early 1980s. For the first 2 refuel outages (1989 and 1991), Fermi 2 performed full core offloads to the same Boraflex cells in the SFP. For the 3rd and 4th refuel outages, Fermi 2 offloaded the core to a different area of the SFP to minimize Boraflex degradation. Since RF04 (with 1 exception - RF11) Fermi 2 has performed core shuffles which significantly reduce the amount of fuel bundles placed into the Boraflex racks. Fermi 2 had still maintained 4 non-poisoned GE rack modules containing 80 cells. These cells relied upon geometric spacing to maintain sub-criticality. Beginning in RF05, Fermi 2 would place approximately 76 of the hottest discharged bundles into these non-poisoned racks to minimize dose to the Boraflex racks. After allowing these 76 bundles to cool for a cycle, they would then be moved to the Boraflex racks. Another strategy that was adopted in RF07 was to use the 108-cell (9x12) Boraflex rack module for the next highest dose bundles. This strategy was adopted because this rack module was to be discharged (and was discharged) during the 2007 re-rack campaign. This resulted in keeping an additional 108 high-dose fuel bundles from the Boraflex racks that were going to remain in the pool during the period of extended operation (PEO).

In 2001, Fermi 2 added 3 Boral rack modules to the SFP during the Campaign 1 re-rack. This added 559 fuel storage cells. In 2004, an additional Boral rack module was placed into the SFP (to accommodate a full core offload). This added an additional 204 fuel storage cells. In 2007, the 108-cell Boraflex module and the 4 GE non-poisoned racks were removed from the pool during the Campaign 2 re-rack. They were replaced by 5 Boral modules which comprised 630 fuel storage cells. As these Boral rack modules were introduced into the SFP, fuel from the reactor during refuel outages was preferentially placed into these Boral racks. They would only be moved over to the Boraflex racks after 1 cycle or more of cooling. The high-energy gamma dose from freshly discharged fuel decreases exponentially with time. This has had a major effect on minimizing the degradation to the Boraflex panels.

As part of the Boraflex Monitoring and Corrective Action Programs, a condition assessment resolution document (CARD) was written on the results of the 2013 BADGER testing. Administrative actions were put into place to not use those cells whose panels were measured to be less than the 0.015656 g B-10/$cm^2$ limit for fuel storage. Long term action is being evaluated for Fermi 2, which will also consider operating experience from other plants. Also, a simple projection shows that areal density for none of the measured cells would decrease below 0.012 with the current fuel in the cells for at least twenty years after the 2013 test. RACKLIFE would need to project a 20% loss of boron carbide ($B_4C$) to challenge the 0.012 areal density needed to ensure the sub-criticality margin is maintained with the current maximum bundle reactivity of 1.2820. RACKLIFE projected a maximum loss of less than 4% $B_4C$ at the time of the BADGER test (October 2013). While the fuel will likely be moved to support core refueling and Independent Spent Fuel Storage Installation (ISFSI) campaigns, the projection indicates that BADGER testing every five years is reasonable. Testing every five years is consistent with NUREG-1801 Section XI.M22 and industry operating experience.

The next BADGER test (planned for 2018) will include 60 panels that have not been tested and some panels that were tested in 2013 so that trending and correlation between BADGER and RACKLIFE can be improved.

**LRA Revisions:**

None.

**Enclosure 2 to**
**NRC-15-0031**

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

**DTE Revised Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 15 RAI 2.4.4-2 and Set 16 RAI 4.1-1**

***Set 15 RAI 2.4.4-2***

*Background:*

*LRA Section 2.3.3.7, "Fire Protection – Water," indicates that fire dampers mounted in walls, (for compliance with 10 CFR 50.48) are addressed in LRA Section 2.4.4, "Bulk Commodities," however, LRA Section 2.4.4 does not mention damper housings as a component type that is subject to an AMR. Similarly, LRA Section 2.4.2, "Water-Control Structures," "Residual Heat Removal Complex" subsection also refers to fire dampers in walls; however, LRA Table 2.4-2 does not include any damper housings as a component type subject to an AMR.*

*Table IX.B of the GALL Report defines "ducting and components" as including fire dampers. However, the SRP-LR and the GALL Report do not differentiate between air control or air flow dampers and fire dampers that are needed for compliance with 10 CFR 50.48.*

*Issue:*

*It is not clear to the staff if all fire damper assemblies in fire barriers (walls, ceiling, and floors) have been appropriately identified as a component type as being within the scope of license renewal and subject to an AMR.*

*Request:*

*Verify whether the fire damper assemblies mounted in fire barriers (i.e., not in HVAC ductwork) are within the scope of license renewal (e.g., in the residual heat removal complex) in accordance with 10 CFR 54.4(a) and whether they are subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are not within the scope of license renewal and are not subject to an AMR, please provide justification for the exclusion.*

**Response:**

DTE previously responded to RAI 2.4.4-2 by letter dated January 15, 2015 (NRC-15-0009). The response to RAI 2.4.4-2 is revised to include additional information requested by the NRC on a clarification call held on March 6, 2015. The revised response below supersedes the response previously provided on January 15, 2015.

Fire damper assemblies mounted in fire barriers (walls, ceilings, and floors) outside of heating, ventilation and air conditioning (HVAC) ductwork are within the scope of license renewal in accordance with 10 CFR 54.4(a) and are subject to aging management review (AMR) in accordance with 10 CFR 54.21(a)(1). The fire dampers perform an active function and are not subject to aging management review. The fire damper housings are passive long-lived components subject to aging management review. The fire damper housings are included with the component type "Fire protection components – miscellaneous steel including framing steel"

with a fire barrier (FB) intended function as shown in License Renewal Application (LRA) Tables 2.4-4 and 3.5.2-4.

**LRA Revisions:**

None.

***Set 16 RAI 4.1-1***

*Background*

*LRA Table 4.1-2 states that the current licensing basis (CLB) does not include any flow-induced vibration analyses for the Fermi 2 reactor vessel internal (RVI) components that would need to be identified as TLAAs. The LRA states that the flow-induced vibration analyses for the RVI components are not based on time-dependent assumptions defined by the life of the plant and, therefore, they do not conform to the definition of a TLAA in 10 CFR 54.3.*

*Issue*

*UFSAR Section 1.5.2.3 states that flow-induced vibrations of the RVI components were qualified by prototypical testing performed in accordance with General Electric (GE) Report No. NEDO-24057-P, "Assessment of Reactor Internals Vibration in BWR/4 and BWR/5 Plants," dated November 1977, and this report is the design basis for demonstrating conformance with NRC Regulatory Guide (RG) 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing." However, the UFSAR does not indicate whether the methodology in GE Report No. NEDO-24057-P includes a time-dependent analysis for qualifying the structural integrity of the RVI components against the consequences of flow-induced vibrations.*

*Request*

*Clarify whether the methodology in GE Report No. NEDO-24057-P includes a time-dependent analysis and whether the analysis is relied upon to qualify the structural integrity of the RVI components against the consequences of flow-induced vibrations. If the analysis is time-dependent, provide justification as to why it would not need to be identified as a TLAA when compared to the six criteria in 10 CFR 54.3(a).*

**Response:**

DTE previously responded to RAI 4.1-1 by letter dated February 5, 2015 (NRC-15-0010). The response to RAI 4.1-1 is revised to include additional information requested by the NRC on a clarification call held on March 5, 2015. The revised response below supersedes the response previously provided on February 5, 2015.

The methodology in GE Report No. NEDO-24057-P does not include a time-dependent analysis as long as the flow-induced vibration stress is less than the GE criterion of 10,000 psi, 0-p. This GE criterion is more conservative than the ASME allowable peak stress intensity threshold of 13,600 psi. Based on startup vibration measurements at the prototype plant, the maximum peak stress amplitude due to flow induced vibrations is less than 10,000 psi, 0-p. As discussed in UFSAR Section 3.9.1.3.2, the RVI for Fermi 2 are substantially the same internals design configuration that was tested in the prototype plant. Therefore, these results are applicable to

Fermi 2. Since the value is less than 10,000 psi, 0-p, no fatigue usage is accumulated by the component due to flow-induced vibration (ASME Section III, Division 1, Appendix I, Figure I-9.2.2, Design Fatigue Curve for Austenitic Steels). Therefore, operating time has no effect on the RVI component evaluation.

**LRA Revisions:**

None.