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10 CFR 54

August 20, 2015
NRC-15-0083

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 33 (TAC No. MF4222)," dated May 20, 2015 (ML15139A461)

4) DTE Electric Company Letter to NRC, "Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 33," NRC-15-0066, dated July 6, 2015 (ML15187A457)

Subject: Supplemental Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 33

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. DTE previously responded to the request for additional information (RAI) in Reference 4. DTE is providing a supplemental response to the RAI based on a clarification call with the NRC on July 31, 2015. The supplemental response is provided in Enclosure 1.

One new commitment is being made in this submittal. The new commitment is in LRA Table A.4 Item 7, BWR Vessel Internals, as indicated in the response to RAI 4.1-4a 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 August 20, 2015

Vito A. Kaminskas
Site Vice President
Nuclear Generation

Enclosures: 1) DTE Supplemental Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 33

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-15-0083

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

DTE Supplemental Response to NRC Request for Additional Information for the Review of the Fermi 2 License Renewal Application – Set 33

Set 33 RAI 4.1-4a

Background

The response to Request for Additional Information (RAI) 4.1-4, dated February 5, 2015, states that the standby liquid control (SLC)/core ΔP lines internal to the reactor pressure vessel (RPV) do not perform a license renewal intended function. A proprietary response to RAI 4.1 4, Part 2, which requested a clarification on whether the current licensing basis included any analyses for the internal portions of the SLC system that would need to be identified as time-limited aging analyses (TLAAs), was also provided.

Updated Final Safety Analysis Report (UFSAR) Section 4.5.1.2.11 indicates that the internal portions of the SLC/core ΔP piping consists of two concentric pipes that enter into the RPV lower plenum area and that the inner piping serves the following objectives: (a) facilitates good mixing and dispersion of the sodium pentaborate in the SLC system, and (b) reduces thermal shock to the RPV nozzle should the SLC system be actuated. UFSAR Section 4.5.2.4.1 states that the SLC system supports a number of design bases, including the design basis that the "neutron absorber shall be dispersed with the reactor core in sufficient quantity to provide a reasonable margin for leakage or imperfect mixing."

Issue

Based on information provided in UFSAR Sections 4.5.1.2.11 and 4.5.2.4.1, the staff has concluded that internal portions of the SLC line (i.e., the portions of the line inside of the reactor pressure vessel) need to be included within the scope of license renewal in accordance with either: (a) Title 10 of the Code of Federal Regulations (10 CFR) 54.4(a)(2), where its failure could potentially impact the ability of the SLC/core ΔP nozzle to achieve its reactor coolant pressure boundary function, or (b) 10 CFR 54.4(a)(3) for mitigating the consequences of anticipated transients without scram (ATWS) events.

Request

a. *Justify why the structural integrity of the internal portions of the SLC/core ΔP line has not been identified as an intended function for the LRA and why the internal portions of the SLC/core ΔP line have not been identified as being within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). In addition, justify why the internal portions of the SLC/core ΔP line would not need to be within the scope of license renewal in accordance with the requirement in 10 CFR 54.4(a)(3).*

b. *If it is determined that the internal portions of the SLC/core ΔP line do serve license renewal intended functions, justify why the application would not need to be amended to include the internal portions of the SLC line as a component that needs to be within the scope of license renewal in accordance with the requirements in 10 CFR 54.4(a)(2) or 10 CFR 54.4(a)(3) for regulated ATWS events.*

c. *State the applicable aging effects requiring management that apply to the components and state (with justification) how these aging effects will be managed during the period of extended operation. Otherwise, justify why the applicable aging effects do not need to be age-managed if condition monitoring activities (i.e., inspections) will not be performed on the internal portions of the SLC during the period of extended operation.*

Response:

DTE previously responded to RAI 4.1-4a by letter dated July 6, 2015 (NRC-15-0066). The July 6 response to RAI 4.1-4a is supplemented below to include additional information based on a clarification call with the NRC held on July 31, 2015.

a. The scope of license renewal is defined in 10 CFR 54.4(a). The Fermi 2 scoping methodology is described in LRA Section 2.1.1 which states that scoping is performed at a system level, consistent with NEI 95-10. The standby liquid control (SLC) system is in scope for license renewal as indicated in LRA Table 2.2-1. LRA Section 2.3.3.2 also indicates that the SLC system is in scope and has intended functions per 10 CFR 54.4(a). Although the scoping is performed at a system level, screening is performed at a component level. The Fermi 2 screening methodology is described in LRA Section 2.1.2. As defined in 10 CFR 54.21(a)(1), components subject to an aging management review are those that (i) perform an intended function per 10 CFR 54.4(a) without moving parts or without a change in configuration or properties, and (ii) are not subject to replacement based on a qualified life or specified time period. Regarding the first criterion in 10 CFR 54.21(a)(1), the evaluation of whether the SLC/core ΔP line internal to the vessel performs an intended function per 10 CFR 54.4(a) is provided in the subsections below. The SLC/core ΔP line internal to the vessel is not subject to replacement based on a qualified life or specified time period and therefore meets the second criterion in 10 CFR 54.21(a)(1).

   Applicability of Intended Function per 10 CFR 54.4(a)(2)
   The evaluation of whether the SLC/core ΔP line internal to the vessel performs an intended function per 10 CFR 54.4(a)(2) was provided in the previous RAI response dated July 6, 2015 (NRC-15-0066). No changes or supplements to that portion of the previous response are needed.

   Applicability of Intended Function per 10 CFR 54.4(a)(3)
   As indicated in this RAI, the NRC staff concluded that the SLC/core ΔP line internal to the vessel performs an intended function per 10 CFR 54.4(a)(3) (i.e. to facilitate boron mixing to shut down the core during an ATWS) based on statements in the Fermi 2 UFSAR Sections 4.5.1.2.11 and 4.5.2.4.1. The previous response dated July 6, 2015 (NRC-15-0066) provided a detailed justification of why DTE concluded that the SLC/core ΔP line internal to the vessel does not perform an intended function per 10 CFR 54.4(a)(3). This justification included discussion of the Fermi 2 UFSAR, the Fermi 2 SLC design basis document, NUREG-1801, and multiple BWRVIP documents (e.g. BWRVIP-27-A, BWRVIP-06-1-A, and

BWRVIP-53-A) that are approved by the NRC and applicable to Fermi 2. DTE believes that the statement in UFSAR Section 4.5.1.2.11 that says that the location of the SLC/core ΔP line internal to the vessel inner pipe *facilitates* good mixing and dispersion does not mean that it is *required* for mixing. This understanding is consistent with the conclusions in the BWRVIP documents that the line is not required for boron mixing. However, DTE understands that the UFSAR statement may not clearly reflect the conclusions of the BWRVIP documents and creates confusion about whether the Fermi 2 current licensing basis does or does not credit the location of this line. Therefore, for the purpose of license renewal, DTE will conservatively assume that the SLC/core ΔP line internal to the vessel does perform a license renewal intended function per 10 CFR 54.4(a)(3) (i.e. to facilitate boron mixing to shut down the core during an ATWS). Since the SLC system is within scope and the SLC/core ΔP line internal to the vessel performs an intended function, the line is therefore subject to aging management review. Consistent with this response, the LRA will be amended as indicated below in the "LRA Revision" subsection.

Note that DTE also plans to evaluate whether the UFSAR statement should be revised based on the latest information in the BWRVIP documents. If it is determined that a change to the UFSAR is appropriate, DTE would use the applicable change process to modify the UFSAR. The impact on license renewal, such as screening out the line if it did not perform a license renewal intended function, would then be evaluated at that time.

b. As described in the response to request "a" above, the SLC system is within the scope of license renewal and the SLC/core ΔP line internal to the vessel is conservatively assumed to perform a license renewal intended function. Therefore the SLC/core ΔP line internal to the vessel is subject to aging management review. Consistent with this response, the LRA will be amended as indicated below in the "LRA Revision" subsection.

c. As described in the response to request "a" above, the SLC/core ΔP line internal to the vessel is conservatively assumed to be subject to aging management review. The SLC/core ΔP line internal to the vessel is stainless steel and exposed to an environment of treated water >140°F. Based on this material/environment combination, the applicable aging effects requiring management are loss of material and cracking. These two aging effects will be managed as follows:

   - Loss of material will be managed by the Water Chemistry Control – BWR Program described in LRA Section B.1.43. Note that the One-Time Inspection Program (LRA Section B.1.33) utilizes visual or volumetric inspections of representative samples to verify that the Water Chemistry Control – BWR Program is effective at managing aging effects. The samples for the One-Time Inspection program are 20 percent of the components in each material/environment/aging effect group, up to a maximum of 25 components. The SLC/core ΔP line internal to the vessel will be included in the stainless steel/treated water >140°F/loss of material sample group.

- Cracking will also be managed by the Water Chemistry Control – BWR Program. Similar to as described above, the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Control – BWR Program, with the SLC/core ΔP line internal to the vessel being included in the stainless steel/treated water >140°F/cracking sample group. In addition, cracking will be managed by the BWR Vessel Internals Program described in LRA Section B.1.10. The BWR Vessel Internals Program is based on NUREG-1801, Section XI.M9, BWR Vessel Internals. As described in Section XI.M9, the program includes inspection in conformance with the guidelines of applicable and NRC staff-approved BWRVIP documents. For the SLC/core ΔP systems, BWRVIP-27-A is the NRC staff-approved guideline. BWRVIP-27-A recommends that no inspections be performed for the SLC/core ΔP line internal to the vessel. Consistent with the BWRVIP-27-A recommendation, DTE will not perform periodic inspections of the SLC/core ΔP line internal to the vessel during the period of extended operation. However, DTE will enhance the BWR Vessel Internals Program to perform opportunistic inspections of the SLC/core ΔP line internal to the vessel during the period of extended operation. As described in the "Operating Experience" subsection of LRA Section B.1.7, DTE has previously performed an opportunistic inspection of portions of the SLC/core ΔP line internal to the vessel. This previous inspection did not identify any degradation. Opportunistic inspections performed under the BWR Vessel Internals Program, rather than periodic inspections, are adequate based on: 1) the plant-specific operating experience which shows no history of degradation, 2) the use of the Water Chemistry Control – BWR Program to control water chemistry parameters to manage cracking in a treated water environment, 3) the inspections of sample components in the same material/environment combination as the SLC/core ΔP line that will be performed as part of the One-Time Inspection Program, and 4) the recommendations of BWRVIP-27-A.

Consistent with this response, the LRA will be amended as indicated below in the "LRA Revision" subsection.

LRA Revisions:

LRA Sections 2.3.1.1.2, 2.3.3.2, A.1.10, A.4, B.1.10, and C as well as LRA Tables 2.3.1-2 and 3.1.2-2 are revised as 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 response above are shown as revisions.

2.3.1.1.2 Reactor Vessel Internals

Description of Components Subject to Aging Management Review

Differential Pressure (ΔP) and Standby Liquid Control (SLC) Line

The differential pressure and SLC line serves two functions: to sense the differential pressure across the core support plate and to provide a path for the injection of the liquid control solution into the coolant stream. The instrumentation lines provide information on core flow performance for diagnostic purposes, CRD system water differential pressure indication, and core spray piping break detection. This line enters the RPV at a point below the core shroud as two concentric pipes. In the lower plenum, the two pipes separate. If the standby liquid control system actuates, the inner pipe at the nozzle reduces thermal shock to the RPV nozzle. The outer pipe terminates immediately above the core support plate and senses the pressure in the region outside the fuel assemblies.

A complete loss of integrity at any location along the ΔP/SLC injection pipe during operation will result in a reduction in core plate differential pressure indication that is detectable in the control room. Failure of this line will not have an adverse impact on achieving safe shutdown. In the BWR Vessel and Internals Project document BWRVIP-06 safety assessment, there are several components where extensive degradation can be tolerated because of the redundancy provided in the SLC system. A number of these failures are readily detected, but even without detection of cracking, the SLC system would perform its function adequately when initiated as long as the sodium pentaborate is injected into the bottom head. This conclusion is based on the most conservative scenario, following the Emergency Procedure Guidelines for Anticipated Transient Without SCRAM (ATWS), where water level in the vessel is lowered initially to decrease power level and then increased to establish natural circulation which carries the boron into the core. The injection of sodium pentaborate is also credited for post-LOCA control of suppression pool pH. However, this function is similarly dependent only on injection of the sodium pentaborate into the vessel and then into the suppression pool via the break. Therefore, the BWRVIP documents conclude that the ΔP/SLC line~~s~~ inside the reactor vessel has ~~have~~ no license renewal intended function and is ~~are~~ not subject to aging management review. UFSAR Section 4.5.1.2.11 states that the location of the ΔP/SLC line inside the reactor vessel facilitates mixing of boron. Since the UFSAR description may not clearly reflect the conclusions of the BWRVIP documents, the ΔP/SLC line inside the reactor vessel has been conservatively assumed to perform a license renewal intended function and subject to aging management review.

The ΔP/SLC lines outside the vessel do have a safety function and are subject to aging management review. The RPV nozzle associated with the differential pressure and standby liquid control line is reviewed in Section 2.3.1.1.1, Reactor Pressure Vessel and Appurtenances. The remaining Class 1 components associated with ΔP/SLC lines are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary.

Table 2.3.1-2
Reactor Vessel Internals
Components Subject to Aging Management Review

Component Type	Intended Function
Control rod guide tubes • Base • Thermal sleeve • Tube	Structural support
Core support plate assembly	Structural support
Core support plate rim hold-down bolts	Structural support
Core spray lines and spargers	Flow distribution
Differential pressure and standby liquid control line	Flow distribution
Fuel supports • Four-lobed • Peripheral	Structural support
Fuel supports • Orifices	Flow distribution
In-core instrument flux monitoring • Guide tube	Structural support
In-core instrument flux monitoring • Dry tube	Pressure boundary

2.3.3.2 Standby Liquid Control

Components Subject to Aging Management Review

The differential pressure and standby liquid control line inside the reactor vessel is evaluated with the vessel internals in Section 2.3.1.1.2, Reactor Vessel Internals. Class 1 components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining SLC system components are reviewed as listed below.

Table 2.3.3-2 lists the component types that require aging management review.

Table 3.3.2-2 provides the results of the aging management review.

Table 3.1.2-2
Reactor Vessel Internals
Summary of Aging Management Evaluation

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Core spray lines and spargers	Flow distribution	Stainless steel	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Differential pressure and standby liquid control line	Flow distribution	Stainless steel	Treated water > 140°F (ext)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-99	3.1.1-103	C D
Differential pressure and standby liquid control line	Flow distribution	Stainless steel	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Fuel supports • Four lobed	Structural support	CASS	Treated water > 140°F (ext)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-104	3.1.1-102	A B

A.1.10 BWR Vessel Internals Program

The BWR Vessel Internals Program will be enhanced as follows.

- Revise BWR Vessel Internals Program procedures to perform opportunistic inspections of the differential pressure and standby liquid control line inside the reactor vessel when the line becomes accessible.

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
7	BWR Vessel Internals	Enhance BWR Vessel Internals Program as follows: e. Revise BWR Vessel Internals Program procedures to perform opportunistic inspections of the differential pressure and standby liquid control line inside the reactor vessel when the line becomes accessible.	Prior to September 20, 2024, or the end of the last refueling outage prior to March 20, 2025, whichever is later.	A.1.10

B.1.10 BWR VESSEL INTERNALS

Enhancements

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

Element Affected	Enhancement
4. Detection of Aging Effects	Revise BWR Vessel Internals Program procedures to perform opportunistic inspections of the differential pressure and standby liquid control line inside the reactor vessel when the line becomes accessible.

Appendix C
Response to BWRVIP Applicant Action Items

Action Item Description	Response
BWRVIP-27-A (4) Due to the susceptibility of the subject components to fatigue, applicants referencing the BWRVIP-27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue.	The BWRVIP-27-A fatigue analysis of the SLC/core ΔP line for 60 years of operation is a TLAA. The NRC SER (BWRVIP-27-A, Appendix D) states that fatigue and the projected CUF should be addressed by each applicant for license renewal. Refer to Section 4.3 and Table 4.3-2 for the fatigue TLAA evaluation of the SLC/core ΔP nozzle. ~~Consistent with~~ Although BWRVIP-27-A~~,~~ states that the SLC/core ΔP line~~s~~ inside the reactor vessel is ~~are~~ not subject to aging management review, the line is conservatively assumed to be subject to aging management review at Fermi 2 and the results are provided in LRA Table 3.1.2-2. The aging management review results for the SLC/core ΔP nozzle and safe end are provided in LRA Table 3.1.2-1.