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

December 17, 2014

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

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE FERMI 2 LICENSE RENEWAL APPLICATION – SET 15 (TAC NO. MF4222)

Dear Mr. Kaminskas:

By letter dated April 24, 2014, DTE Electric Company (DTE or the applicant) submitted an application pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 54, to renew the operating license NPF-43 for Fermi 2, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information were discussed with Ms. Lynne Goodman, and a mutually agreeable date for the response is within 30 days from the date of this letter. For requests for additional information 4.2.5-1 and 4.2.6-1 the applicant requested 45 days from the date of this letter. The staff agreed with this request. If you have any questions, please contact me at 301-415-3301 or e-mail Daneira.Melendez-Colon@nrc.gov.

Sincerely,

/RA/

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

Docket No. 50-341

Enclosure:
Requests for Additional Information

cc w/encl: Listserv

December 17, 2014

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Site Vice President - Nuclear Generation
DTE Electric Company
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6400 North Dixie Highway
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Dear Mr. Kaminskas:

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Daneira Meléndez-Colón, Project Manager
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FERMI 2
LICENSE RENEWAL APPLICATION
REQUESTS FOR ADDITIONAL INFORMATION SET 15
(TAC NO. MF 4222)

RAI 2.3.3.7-4

Background:

License Renewal Application (LRA) Section 2.3.3.7, "Fire Protection – Water," acknowledges that fire damper housings mounted in ductwork that are needed for compliance with 10 CFR 50.48 are addressed in LRA Section 2.3.3.11, "Heating, Ventilation and Air Conditioning." LRA Tables 2.3.3-11 and 3.3.2-11 include the component type "damper housing" as a component subject to an aging management review (AMR), and list the intended function as "pressure boundary."

Table IX.B, "Selected Definitions & Use of Terms for Describing and Standardizing STRUCTURES AND COMPONENTS," of the Generic Aging Lessons Learned (GALL) Report defines "ducting and components" as including fire dampers. However, NUREG-1800, Revision 2, "Standard Review Plan for License Renewal Applications for Nuclear Power Plants" (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:

When fire dampers are tested, (e.g., in accordance with the Underwriters Laboratories' (UL) Standard 555), the entire fire damper assembly is tested, including the frame or sleeve to determine the hourly classification of the damper assembly.

Part 54 of 10 CFR, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," paragraph 54.4(a)(3), states that plant systems, structures, and components within the scope of this part are, "[a]ll systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48)." Paragraph 54.4(b) further states that "[t]he intended functions that these systems, structures, and components must be shown to fulfill in § 54.21 are those functions that are the bases for including them within the scope of license renewal as specified in paragraphs (a)(1) - (3) of this section."

If the fire damper assemblies are required for compliance with 10 CFR 50.48, then the appropriate intended function should be identified and maintained during the period of extended operation.

Request:

State whether the fire damper assemblies form part of the plant fire barriers. If so, explain why fire damper assemblies have not been identified as fire barrier intended function in accordance with 10 CFR 54.4(b).

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.

RAI B.1.18-1

Background:

LRA Section 2.3.3.7 acknowledges that dampers (housings) in ductwork that are needed for compliance with 10 CFR 50.48 are subject to an AMR, as documented in LRA Section 2.3.3.11.

Table IX.B of the GALL Report defines "ducting and components" as including fire dampers.

The SRP-LR includes AMR items for ducting and components and recommends the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components and the External Surfaces Monitoring Programs to manage for loss of material.

Issue:

During the aging management program (AMP) Audit, the staff noticed that the AMP Evaluation Report for Fire Protection, under the comparison statement for the "detection of aging effects" program element states that "[v]isual inspection by fire protection qualified personnel of the fire barrier walls, ceilings, floors, and doors, and other fire barrier materials, *including fire barrier* *dampers*, is performed at a frequency in accordance with the TRM [technical requirements manual]." DTE references two procedures for the test and inspection of fire dampers. These procedures state that visual inspections of the damper housings are conducted for cracks and evidence of corrosion every 18 months.

Consistent with the SRP-LR and the GALL Report, DTE selected the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components and the External Surfaces Monitoring Programs to manage for loss of material. It appears that the TRM requires inspection of the fire damper housings on a frequency of every 18 months. The staff is concerned that selection of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program may conflict with DTE's current requirement to inspect the fire damper housings every 18 months. The inspection frequency for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is based on a sampling of at least 20 percent or maximum of 25 components every 10 years. The frequency and scope of this inspection is less than what is currently required by the TRM.

<u>Request</u>:

Explain why the frequency and number of fire damper housings to be inspected per the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is acceptable in light of the requirements in the TRM and its implementing procedures for fire damper housings.

RAI 3.5.2-1

<u>Background</u>:

Enhancement 2 in LRA Section B.1.18 states that procedures will be revised to require visual inspections of in-scope fire wrap and fire stop materials constructed of fibersil cloth, cerafoam, kaowool, Thermo-lag®, Flamemastic®, and Pyrocrete®.

<u>Issue</u>:

Section 54.21(a)(1) of 10 CFR requires that the integrated plant assessment identify and list the passive and long-lived structures and components subject to an AMR.

LRA Table 3.5.2-4 includes AMR items for fire stops and fire wraps constructed from carborundum durablanket, carborundum fibersil cloth, fiberboard, silicone elastomers, and Thermo-lag®. However, LRA Table 3.5.2-4 does not appear to include AMR items for cerafoam, kaowool, Flamemastic® or Pyrocrete®.

During the AMP Audit, the staff noted that, in the aging management review basis document for bulk commodities, the applicant uses carborundum durablankets, carborundum fibersil cloth, silicone fabric boot, silicone elastomers, and steel for fire stops and fire wraps.

There appears to be a discrepancy between the materials that are described in the enhancement and the materials apparently used at Fermi 2 for fire stops and fire wraps.

Request:

State whether cerafoam, kaowool, Flamemastic®, and Pyrocrete® are used as fire stops or fire wraps at Fermi 2. If so, state how the effects of aging of these components and materials will be managed. If AMR items for these components and materials do not already exist in the LRA, provide the appropriate revisions to the LRA.

RAI 3.5.2.78-1

Background:

LRA Table 3.5.1, item 3.5.1-78, states that the "Steel components: spent fuel pool liner" is managed for loss of material and cracking by the Water Chemistry Program and monitoring of the leak chase channel drainage system in accordance with technical specifications. LRA Table 3.5.2-1 includes several stainless steel components exposed to a fluid environment that do not line the spent fuel pool and which reference item 3.5.1-78, note E, to manage loss of material. These components include the reactor cavity liner, refueling bellows, and skimmer surge tank. The staff also noted that monitoring of the leak chase channel drainage system is not performed on AMR items in LRA Table 3.5.2-1 that reference 3.5.1-78, note E.

LRA Table 3.0-2 defines a fluid environment as containing either raw water or treated water and includes the following GALL Report environments: ground water, treated water, treated water greater than 140°F, flowing water, and standing water.

For stainless steel exposed to treated water greater than 140°F, the GALL report recommends AMP XI.M2, "Water Chemistry," to manage cracking due to stress corrosion cracking and AMP XI.M32, "One-Time Inspection," to verify the effectiveness of the Water Chemistry Program.

Issue:

It is unclear to the staff if appropriate activities to verify the effectiveness of the Water Chemistry Program are being performed for the components in LRA Table 3.5.2-1 that reference AMR item 3.5.1-78. It is also unclear to the staff if the aging effect of cracking is being managed for stainless steel components exposed to a fluid environment that reference AMR item 3.5.1-78.

Request:

(1) Provide clarification on how the effectiveness of the Water Chemistry Program is being verified for items that reference 3.5.1-78, note E, in LRA Table 3.5.2-1.
(2) State the basis for why the aging effect of cracking is not being managed for AMR items that reference 3.5.1-78.

RAI 3.3.2.3-1

Background:

In LRA Table 3.3.2-9, the applicant identifies that loss of material is an applicable aging effect for the following diesel generator piping components or elements that are exposed to an internal diesel exhaust environment: (a) bellows, (b) housings, (c) liners, and (d) tubes. The applicant stated that LRA AMP B.1.24, “Internal Surfaces in Miscellaneous Piping and Ducting Components,” will be used to manage loss of material in these components. In LRA Table 3.3.2-10, the applicant identified that stainless steel expansion joints exposed internally to diesel exhaust gas and subject to cracking due to fatigue will be managed using the metal fatigue time-limited aging analyses (TLAA).

AMR item VII.H2.AP-104 in the GALL Report, identifies that stainless steel diesel engine exhaust piping, piping components, and piping elements that are exposed to a diesel exhaust environment may be susceptible to loss of material due to pitting and crevice corrosion. This AMR item states that GALL Report AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” will be used to manage loss of material due to pitting and crevice corrosion in the components.

Issue:

It is unclear to the staff why loss of material due to pitting and crevice corrosion is not an applicable aging effect requiring management for the stainless steel expansion joints exposed to an internal diesel exhaust environment.

Request:

Justify why loss of material due to pitting and crevice corrosion is not an applicable aging effect requiring management for the stainless steel expansion joints exposed to diesel exhaust gas. Otherwise, provide appropriate justification of how loss of material due to pitting and crevice corrosion will be managed in these components during the period of extended operation.

RAI 3.3.1.83-1

Background:

In LRA Table 3.0-1, the applicant identified that components in the emergency diesel exhaust system are exposed to an internal diesel exhaust environment which is comprised of gases, fluids, and particulates present in diesel exhaust. LRA Table 3.3.1, AMR item 3.3.1-83, states that stainless steel piping, piping components, and piping elements exposed to this internal environment are not subject to a stress corrosion cracking effect/mechanism because the “configuration of stainless steel diesel engine exhaust components precludes moisture collection necessary to concentrate contaminates.”

SRP-LR Table 3.3-1, AMR item 83, states that stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust are susceptible to cracking due to stress corrosion cracking, and should be managed by the "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" AMP.

Issue:

It is unclear how the exhaust gas (internal) environment described in the LRA is different from the exhaust gas environment in the GALL Report. Therefore, it is unclear to the staff why cracking induced by a stress corrosion cracking mechanism is not an applicable aging effect requiring management for those stainless steel diesel exhaust piping, piping components, and piping elements that are exposed to a diesel exhaust environment.

Request:

Justify why cracking due to stress corrosion cracking is not an applicable aging effect requiring management for the diesel exhaust piping, piping components, and piping elements that are made from stainless steel and are exposed to a diesel exhaust environment. Otherwise, clarify how cracking due to stress corrosion cracking will be managed in these components during the period of extended operation.

RAI 3.3.2.3.8-1

Background:

LRA Table 3.3.2-8 states that for Teflon® flex connections exposed externally to indoor air and internally to gas, there is no aging effect and no proposed AMP. The AMR items cite generic note F.

Issue:

The staff cannot find the applicant's proposal acceptable based on its review of:

- National Aeronautics and Space Administration (NASA) Technical Memorandum 105753, "High Temperature Dielectric Properties of Apical, Kapton, Peek, Teflon® AF, and Upilex Polymers," A N Hammoud, 1992, Table 1, which states that Teflon® can handle long term temperatures up to 285 °C; however, there are studies which demonstrate that certain grades of Teflon® degrade when exposed to radiation.
- PTFE [Teflon®] Expansion Joint Engineering Guide, 2200, Ethylene LLC, Kentwood, MI, www.ethylene.com, which states that the service life of Teflon® flexible connections will be reduced if it is subject to scratching, abrasion, and weld splatter.
- Dupont Teflon® PTFE fluoropolymer resin Properties Handbook, http://www.rjchase.com/ptfe_handbook.pdf, which states that Teflon®-based products are susceptible to creep.

The staff lacks sufficient information to conclude that the radiation levels are low enough in the vicinity of the flex connections. In addition, although external scratching, abrasion, and weld splatter could be considered as event-driven, these mechanisms can occur in the power plant environment as a matter of course. Further, the staff lacks sufficient information to conclude that with creep, the material will retain sufficient material properties throughout the period of extended operation.

Request:

State the following:

(1) the specific Teflon® material type for these flexible connections
(2) the basis why there are no aging effect requirement management and no proposed AMP;
(3) if the specific Teflon® material type is susceptible to aging, state how the aging effects will be managed.

RAI 3.3.2.3.12-1

Background:

LRA Table 3.3.2-12 states that for graphite rupture discs exposed externally to indoor air and internally to gas, there is no aging effect and no proposed AMP. The AMR items cite generic note F.

Issue:

During the audit, the staff reviewed plant-specific drawings and identified that the graphite rupture discs exposed externally to indoor air and internally to gas are Mersen Bursting Discs constructed of GRAPHILOR® material. The staff reviewed the supplier's website, https://www.mersen.com/en/products/anticorrosion-and-process-equipment/graphilor-bursting-discs.html. The website states, "GRAPHILOR® a resin-impregnated graphite developed and patented by Mersen, is virtually impervious to most corrosive liquids and vapours within its temperature/pressure rating. GRAPHILOR® is a unique material insensitive to thermal shock." The staff lacks sufficient info to justify not conducting inspections given the 60-year life of the rupture disc.

Request:

State the basis for not conducting inspections of the rupture disc material during the period of extended operation.

RAI 3.4.2.3.3-7-1

Background:

LRA Table 3.4.2-3-7 states that for plastic piping internally exposed to raw water, there is no aging effect and no proposed AMP. The AMR item cites generic note F.

Issue:

During the audit, the staff reviewed plant-specific drawings and identified that the plastic piping exposed to raw water in LRA Table 3.4.2.3-7 is constructed of polyvinyl chloride (PVC). The staff noted that PVC Pipe – Design and Installation – Manual of Water Supply Practices, M23, American Water Works Association, Second Edition, 2002, Appendix A, "Chemical Resistance Tables," lists PVC as generally resistant to chemicals up to 140 degrees F, such as bleach (12.5 percent active chlorine), potassium hydroxide, sodium hydroxide, kerosene, hydrochloric acid, hydrogen peroxide (90 percent), sea water, soaps, and sulfuric acid (70 percent). Given that the PVC piping is located in the circulating water system, it is not clear to the staff whether chlorine is present in the PVC piping and at what levels.

Request:

State whether chlorine is injected into the circulating water system. If chlorine is injected, state the percent of active chlorine that would be present in the PVC piping; and if the free chlorine exceeds 12.5 percent, state how aging of the PVC pipe will be managed.

RAI 4.2.5-1

Background:

In LRA Section 4.2.5, "Reactor Vessel Circumferential Weld Relief," and LRA Table 4.2-6, the applicant provided its TLAA for the calculation of the mean adjusted reference temperature value (i.e., mean RT_{NDT} value) of the limiting circumferential weld (i.e., weld 1-313, as made from heat No. 10137) in the beltline of the reactor pressure vessel (RPV), as assessed to the end of the period of extended operation (i.e., 52 effective full power years [EFPY]).

LRA Section B.1.38 provides the applicant's Reactor Vessel Surveillance Program. The LRA states that the AMP is based on implementation of the Integrated Surveillance Program (ISP) that was approved by the staff in Electric Power Research Institute (EPRI) Boiling Water Reactor Vessel and Internals Program (BWRVIP) Technical Report (TR) No. BWRVIP-86-A, Revision 1, and that the AMP relies on the surveillance data obtained from specific RPV surveillance materials in ISP host reactors that are representative of materials in the base metal and weld components of the Fermi 2 RPV.

Issue:

LRA Table 4.2-6 does not include a corresponding mean RT_{NDT} analysis for RPV lower shell-to lower intermediate shell circumferential weld 1-313 (heat No. 10137) that is based on ISP surveillance data for this weld component, and uses Section 5.2 of TR BWRVIP-86-A, Revision 1, for the chemistry factor (CF) and ΔRT_{NDT} values used in the mean RT_{NDT} analysis.

Request:

Clarify whether the surveillance weld materials from the host reactors representing Fermi 2 in the EPRI BWRVIP ISP (i.e., the BWRVIP-86-A, Revision 1, program) are a match to the weld heat for RPV lower shell-to-lower intermediate shell circumferential weld 1-313 (i.e., heat No. 10137). If so, provide the basis why LRA Table 4.2-6 does not include an additional mean RT_{NDT} calculation for this circumferential weld using: (a) the applicable ISP surveillance weld data from the host reactors, and (b) the methodology in Section 5.2 of TR No. BWRVIP-86-A, Revision 1, for calculating the CF and ΔRT_{NDT} values in the mean RT_{NDT} calculation from the applicable ISP surveillance weld data. If the surveillance weld materials from the host reactors do not match the heat for RPV circumferential weld 1-313, clarify how the ISP surveillance weld data from the host reactors supports the adequacy of the predicted ΔRT_{NDT} value used in the mean RT_{NDT} calculation for RPV circumferential weld 1-313.

RAI 4.2.5-2

Background:

Section 50.55a(g)(4) of 10 CFR and Table IWB-2500-1 of the ASME Code Section XI require the applicant to perform volumetric inspections of the RPV circumferential welds once every 10-year inservice inspection (ISI) interval, unless a relief request proposing alternatives to these requirements is requested and approved for the current licensing basis (CLB) in accordance with 10 CFR 50.55a(a)(3). The applicant provided a time-dependent 40-year conditional probability of failure and mean RT_{NDT} analysis for the RPV circumferential welds in the CLB to support the staff approval of an ISI relief request (ML003693720) for the welds in accordance with 10 CFR 50.55a(a)(3). The NRC approved this relief request, and the supporting analysis, by safety evaluation (SE) dated January 27, 2000 (ML003673501). This SE granted authorization to eliminate the volumetric inspections of the RPV circumferential welds for the remainder of the current licensed operating period.

In LRA Section 4.2.5, “Reactor Vessel Circumferential Weld Relief,” and LRA Table 4.2-6, the applicant provides its conditional probability of failure and mean RT_{NDT} analysis (a TLAA) for the RPV circumferential welds through 52 effect full power years of operation. The TLAA is based on the staff-approved guidelines in EPRI BWRVIP TR No. BWRVIP-05, which was approved in a safety evaluation to the EPRI BWRVIP main committee dated July 28, 1998 (ADAMS Legacy Library Accession Nos. ML98080037 and ML98080041), as supplemented in the SE of March 7, 2000 (ML003690281). The applicant stated that it will submit a relief request for these welds for the period of extended operation and that this is an acceptable basis for accepting this TLAA in accordance with 10 CFR 54.21(c)(1)(iii).

Issue:

Consistent with Section 4 of the staff’s SE on the BWRVIP-05 report, LRA Section 4.2.5 states that examinations of the RPV circumferential welds will be performed if the examinations of the RPV axial welds “reveal an active mechanistic mode of degradation.” LRA Section 4.7.5 provides the applicant’s plant-specific TLAA for flaws that were detected in the Fermi 2 RPV and the basis for accepting this TLAA in accordance with 10 CFR 54.21(c)(1)(ii). LRA Sections 4.2.5 and 4.7.5 do not indicate whether the RPV flaws evaluated in LRA Section 4.7.5 were flaws in the RPV fabrication welds or whether the RPV flaws were initiated or are growing as the result of an active mechanistic mode of degradation (i.e., as a result of an age-related initiation or growth mechanism). Therefore, the staff needs additional information to make its determination on whether: (a) the TLAA may be accepted in accordance with 10 CFR

54.21(c)(1)(iii), and (b) a relief request for these RPV circumferential welds may be submitted for the period of extended operation in accordance with 10 CFR 50.55a(a)(3).

Request:

Clarify whether the RPV flaws discussed in LRA Section 4.7.5 were detected in an RPV fabrication weld and whether the flaws had initiated or are currently growing as a result of an active degradation mechanism. If the RPV flaws were initiated or are growing by an active degradation mechanism, justify why the TLAA on the Reactor Vessel Circumferential Weld Relief may be used to support submittal of a BWRVIP-05 based relief request for the period of extended operation (i.e., in accordance with 10 CFR 50.55a(a)(3)) such that the TLAA may be accepted in accordance with 10 CFR 54.21(c)(1)(iii).

RAI 4.2.6-1

Background:

LRA Section 4.2.6 and LRA Table 4.2-7 provide the applicant's TLAA on mean RT_{NDT} for nil-ductility transition) for the limiting axial welds in the beltline of the RPV, as projected to the end of the period of extended operation (i.e., 52 EFPY).

LRA Section B.1.38 provides the applicant's Reactor Vessel Surveillance Program. The LRA indicates that the AMP is based on implementation of the ISP that has been approved by the staff in EPRI BWRVIP TR No. BWRVIP-86-A, Revision 1. The applicant's AMP relies on the surveillance data obtained from specific RPV surveillance materials in other reactors (i.e., ISP host reactors) that are representative of the base metal and weld materials in the Fermi 2 RPV.

Issue:

LRA Table 4.2-7 does not include a mean RT_{NDT} analysis for RPV lower shell axial welds 2-307A, B, an C (Tandem Heat No. 13253/12008) that is based on the ISP surveillance data for these weld components and is calculated, in part, using Section 5.2 of TR No. BWRVIP-86-A, Revision 1, for the CF and ΔRT_{NDT} values used in the mean RT_{NDT} analysis.

Request:

Clarify whether the surveillance weld materials from the host reactors representing Fermi 2 in the BWRVIP ISP match the weld heat for RPV lower shell axial welds 2-307A, B, and C (Tandem Heat No. 13253/12008). If so, provide the CF value for these welds using applicable surveillance data from the integrated reactor vessel surveillance program and mean RT_{NDT} value for these welds using this CF value. If the surveillance weld materials from the host reactors do not match the heat for RPV axial welds 2-307A, B, and C, clarify how the ISP surveillance weld data from the host reactors supports the adequacy of the predicted ΔRT_{NDT} value used in the mean RT_{NDT} calculation for RPV axial welds 2-307A, B, and C.