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L-18-030

10 CFR 50.61(b)(1)
10 CFR 50.61(c)(3)
10 CFR 50 Appendix H

ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT:
Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
Response to Request for Additional Information Regarding
Request to Modify RT_{PTS} Values (EPID: L-2017-LLL-0024)

By letter dated October 6, 2017 (Accession Number ML17284A195), FirstEnergy Nuclear Operating Company (FENOC) requested approval of modified pressurized thermal shock reference temperature (RT_{PTS}) values for reactor vessel beltline and extended beltline region materials, and proposed changes to the reactor vessel material irradiation surveillance capsule withdrawal schedule.

By e-mail dated January 18, 2018 the NRC staff requested additional information to complete its review of the FENOC request. The FENOC response to the NRC staff request for information is attached to this letter. The pressurized thermal shock (PTS) evaluation for Beaver Valley Power Station, Unit No. 1, is contained in Appendix E of the enclosed report WCAP-18102-NP, Revision 1, "Beaver Valley Unit 1 Heatup and Cooldown Limit Curves for Normal Operation."

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at 330-315-6810.

Sincerely,

Richard D. Bologna

Attachment:

Response to Request for Additional Information Regarding Request to Modify RT_{PTS} Values

Enclosure:

WCAP-18102-NP, Revision 1, "Beaver Valley Unit 1 Heatup and Cooldown Limit Curves for Normal Operation"

cc: NRC Region I Administrator
NRC Resident Inspector
NRC Project Manager
Director BRP/DEP
Site BRP/DEP Representative

The NRC staff's request for additional information is provided below in bold text, followed by the FENOC response.

RAI 1

The pressurized thermal shock (PTS) evaluation for Beaver Valley Unit No. 1, is contained in Appendix E to WCAP-18102-NP, Revision 0, "Beaver Valley Unit 1 Heatup and Cooldown Limit Curves for Normal Operation," which is Enclosure C of the licensee's submittal (Ref. 1).

With regard to determination of the RT_{PTS} values, Appendix E cited U.S. NRC Technical Letter Report TLR-RES/DE/CIB-2013-01, "Evaluation of the Beltline Region for Nuclear Reactor Pressure Vessels," Office of Nuclear Regulatory Research [RES], dated November 14, 2014 (Ref. 2) as a basis for not considering the shift due to irradiation for reactor pressure vessel (RPV) materials for which the predicted shift in the reference temperature (ΔRT_{NDT}) is less than 25 degrees Fahrenheit (°F). Section 4 of TLR-RES/DE/CIB-013-01 concluded that:

1. **The beltline is defined as the region of the RPV adjacent to the reactor core that is projected to receive a neutron fluence level of $1x10^{17}$ n/cm^2 [neutrons per square centimeter] (E > 1.0 MeV [energy > 1 megaelectronvolt]) or higher at the end of the licensed operating period.**
2. **Embrittlement effects may be neglected for any region of the RPV if either of the following conditions are met: (1) neutron fluence is less than $1x10^{17}$ n/cm^2 (E > 1.0 MeV) at EOL, or (2) the mean value of ΔT_{30} estimated using an ETC acceptable to the staff is less than 25°F at EOL. The estimate of ΔT_{30} at EOL shall be made using best-estimate chemistry values**

Using this basis, the licensee did not add a shift due to irradiation for several beltline materials, including the reactor pressure vessel inlet and outlet nozzles, the inlet and outlet nozzle-to-vessel welds, and certain weld metal heats used in the upper shell-to-intermediate shell girth weld.

Discounting the shift in RT_{NDT} due to irradiation if the predicted shift is less than 25°F does not meet the NRC regulation in 10 CFR 50.61. 10 CFR 50.61(a)(4) states that for the reactor vessel beltline materials, RT_{NDT} must account for the effects of neutron radiation. 10 CFR 50.61(c) details how ΔRT_{NDT} must be calculated. The staff notes that RIS 2014-11,

"Information On Licensing Applications For Fracture Toughness Requirements For Ferritic Reactor Coolant Pressure Boundary Components," (Ref. 3) clarifies that the 10 CFR 50 Appendix G and 10 CFR 50 Appendix H define the beltline as including all RPV materials that will receive a neutron fluence greater than or equal to $1x10^{17}$ n/cm2 (E> 1 MeV).

The staff also notes that TLR-RES/DE/CIB-2013-01 is not NRC guidance, and the recommendation that the shift due to irradiation can be discounted if it is less than 25°F is not endorsed in any NRC guidance document or regulation. Therefore, to apply the recommendation of the TLR that the shift in RT_{NDT} may be discounted if it is less than 25°F, the licensee would need to submit a request for exemption accompanied by a detailed technical basis. The staff therefore requests that, unless it plans to submit an exemption, the licensee:

1. **Revise its PTS evaluation to include RT_{PTS} values for all RPV beltline and extended beltline materials calculated in accordance with 10 CFR 50.61.**
2. **Revise its submittal to remove the reference to TLR-RES/DE/CIB-2013-01.**

References

1. **Beaver Valley, Unit 1 - Modified RT PTS Values and Reactor Vessel Surveillance Capsule Withdrawal Schedule, October 6, 2017 (ADAMS Accession No. ML17284A195)**
2. **U.S. NRC Technical Letter Report TLR-RES/DE/CIB-2013-01, "Evaluation of the Beltline Region for Nuclear Reactor Pressure Vessels," Office of Nuclear Regulatory Research [RES], dated November 14, 2014. (ADAMS Accession No. ML14318A177)**
3. **NRC Regulatory Issue Summary 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components." October 14, 2017 (ADAMS Accession No. ML14149A165)**

RAI-1 Response

The pressurized thermal shock (PTS) evaluation contained in Appendix E of WCAP-18102-NP, Revision 0, has been revised as described below. Revision 1 of WCAP-18102-NP, "Beaver Valley Unit 1 Heatup and Cooldown Limit Curves for Normal Operation," is enclosed.

The pressurized thermal shock reference temperature (RT_{PTS}) values for the beltline and extended beltline materials are included in Appendix E of WCAP-18102-NP, Revision 1, and account for the effects of neutron radiation, consistent with 10 CFR 50.61.

The Beaver Valley Power Station, Unit No. 1, PTS evaluation contained in Appendix E of WCAP-18102-NP, Revision 1, does not utilize the conclusions contained in Section 4 of TLR-RES/DE/CIB-2013-01, and has been revised to remove references to TLR-RES/DE/CIB-2013-01.

Enclosure
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WCAP-18102-NP, Revision 1, "Beaver Valley Unit 1 Heatup and Cooldown Limit Curves for Normal Operation"

(123 pages follow)