

H. B. Robinson Steam Electric Plant, Unit 2

Request for Review of Reports to use Master Curve Methodology to Determine the Fracture Toughness-Based Reference Temperature

May 22, 2024

Division of New and Renewed Licenses
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

Background

- March 28, 2024 - Duke Energy Progress transmitted two reports
 - Requested NRC review and approval via Topical Report program by March 2025
 - Reports support future SLRA for H.B. Robinson Unit 2 (second quarter of 2025)
 - PTS evaluation that will be provided in HBR2 SLRA Section 4.2.3
 - P-T limit curves evaluation that will be provided in HBR2 SLRA section 4.2.4.
 - Reactor Vessel Materials Surveillance AMP in HBR2 SLRA Appendix A2.1.19 and Appendix B2.1.19
- Reports provide unirradiated and irradiated material property values for RPV materials based on Master Curve (T_0) methodology
 - WCAP-18909-NP, Revision 1, “Determination of T_0 for H.B. Robinson Unit 2 Heat number W5214, Linde 1092 Weld Metal Based on Unirradiated Data”
 - WCAP-18933-NP, Revision 0, “Determination of T_0 for H.B. Robinson Unit 2 Heat number 5214 Weld Metal and Upper Shell Plate W10201-1 Based on Available Irradiated Data”

Background

- NRC has previously approved use of T_0 based approaches through Exemptions, for example Kewaunee Exemption Safety Evaluation (ADAMS Accession No. ML011210180)
 - All current regulations are predicated on Charpy data, and include discussion of use of Charpy data within the regulations
 - Exemptions are required for 10 CFR 50.60; 10 CFR 50.61; and 10 CFR Appendices G and H
- NRC has endorsed 2019 ASME Code, Section XI of NB-2331 and Appendix G which both permit use of RT_{T_0} for Code applications as alternatives to RT_{NDT}
 - Endorsement in 10 CFR 50.55a of Code applications of T_0 data does not supersede requirements as written in 10 CFR 50.60; 10 CFR 50.61; and 10 CFR Appendices G and H
 - None of the regulations listed above permit alternatives to use of RT_{NDT}
 - Compliance with 10 CFR 50.61 requires use of Charpy surveillance data

Background

- 10 CFR 50.90 License amendments may be necessary depending on specifics of UFSAR treatment of topic
- Robinson UFSAR Rev. 27 details compliance with 10 CFR 50.60; 50.61; and Appendices G and H in detail and with reference to RT_{NDT} and Charpy results
- 10 CFR 50.59 allows changes in UFSAR if conditions are met
 - This topic appears to fall under 50.59(c)(2)(viii); e.g. cannot be “50.59’d”

Review Under NRC Topical Report (TR) Program

- Calculation of material properties through Master Curve (T_0) does not, in of itself, require a regulatory finding
- Licensee's request does not appear to have a regulatory nexus
 - Information provided would normally support a regulatory request
- Use of Master Curve as it interacts with 10 CFR 50.60 (Appendix G and H), and 10 CFR 50.61 would require regulatory findings (and Exemptions)
 - All regulations and appendices are predicated on use of Charpy or Charpy derived values, RT_{T_0} cannot be substituted without Exemption
 - 10 CFR 50.61 requires that $RT_{NDT(u)}$ be calculated in accordance with ASME Code NB-2331 or other NRC approved methodology
 - ASME Code NB-2331 provides methodologies to calculate $RT_{NDT(u)}$ and RT_{T_0} , it does not state that they are equivalent and identical, nor does it state one may be substituted for the other freely (rather, RT_{T_0} is presented as an alternative measure)

Regulatory Exemptions for RPV Integrity

- Implementation of Master Curve methodology requires 10 CFR 50.12 Exemptions
 - Appendix H to 10 CFR Part 50 (i.e., RPV material surveillance program)
 - Testing of Charpy specimens in existing capsules
 - Future plans for irradiated surveillance data
 - Use of surveillance data
 - Pressurized Thermal Shock – 10 CFR 50.61
 - Use of RT_{T0} in lieu of RT_{NDT}
 - Required use of surveillance data from Appendix H
 - Appendix G to 10 CFR Part 50 – USE and PT Limits
 - Direct reference to testing in accordance with Appendix H (e.g., Charpy specimens)
 - Compliance with requirements for Upper Shelf Energy
 - Use of RT_{T0} in lieu of RT_{NDT} for unirradiated
 - Use of RT_{T0} in lieu of RT_{NDT} for PT-Limits

Potential Review Paths

- Submit 50.90 License Amendment and 50.12 Exemptions concurrent with SLRA
 - NRC Regulatory Issue Summary 2014-06, Revision 1, “Consideration Of Current Operating Issues And Licensing Actions In License Renewal”
 - “LRA reviews that occur concurrently with licensing action reviews or other CLB changes may require extra consideration, resources, and review time, including reviews held in abeyance pending final determination of the impact of the CLB change on the LRA.”
- Submit 50.90 License Amendment and 50.12 Exemptions → Submit SLRA
 - Two reviews in series
- Others – Discussion?

Key Take Aways

- Use of T0 will require Exemptions
- Robinson UFSAR appears to require amendment through 10 CFR 50.90 license amendment

ANY QUESTIONS



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