Path Forward for NRC Review of RNP Topical Reports for SLR

May 22, 2024

AGENDA

- Purpose of Request for Topical Report Review and Approval
- Regulatory Path
- Summary of Topical Reports
  - WCAP-18909-NP
  - WCAP-18933-NP
- Conclusion
- NRC Feedback

PURPOSE

- To discuss path forward for review of topical reports
- Support timely submittal of the RNP SLR application in 2nd quarter 2025
- Submit topical reports for NRC review/approval
  - Increase efficiency of SLR application review/approval
  - Allow staff to meet 18-month review schedule
- Provide demonstration of compliance to 10 CFR 50.61 for weld #W5214 for 70 Effective Full Power Years (i.e., 80 years of operation)
  - Utilize an acceptable methodology to meet PTS screening criteria
  - Utilize WCAP-18909 and WCAP-18933 as input to satisfy the PTS screening criteria

Regulatory Path

- Utilize an acceptable methodology in 10 CFR 50.61 to develop RT_{NDT} for weld #W5214.
  - 10 CFR 50.61(a)(5) - "$RT_{NDT(U)}$ means the reference temperature for a reactor vessel material in the pre-service or unirradiated condition, evaluated according to the procedures in the ASME Code, Paragraph NB–2331 or other methods approved by the Director, Office of Nuclear Reactor Regulation."
- Develop RT_{T0} with 2019 Edition ASME Subsection NB-2331(a)(5) based on fracture toughness.
- Duke will illustrate in the SLR application that the RT_{NDT} for weld #W5214 succeeds in satisfying the PTS screening criteria for 80 years.

Summary WCAP-18909 NP

- Purpose: Measure initial unirradiated fracture toughness-based reference temperature RT_{T0} for #W5214 weld material

- Develop T_0 with fracture toughness test of unirradiated specimen
  - ASTM E1921
- Develop material specific RT_{T0} with fracture toughness results
  - ASME Section III, NB-2331(a)(5)
- Duke <u>will</u> develop RT_{T0} for #W5214 and shows the PTS screening criterion are met for 80 years
  - $RT_{NDT(U)} = RT_{T0} = T_0 + 35F + 2\sigma$
  - $RT_{PTS} = RT_{T0}$ + Charpy Shift + Margin

Summary WCAP-18933 NP

- Purpose: Measure irradiated RT_{T0} for Robinson #W5214 weld material
  - Note: Duke will submit revised WCAP-18933 to focus review only on #W5214 material
- Develop irradiated T_0 with fracture toughness test
  - ASTM E1921
- Develop material specific RT_{T0} with fracture toughness results
  - ASME Section III, NB-2331(a)(5)
- Illustrate that the difference between the irradiated RT_{T0} and the Charpy-based RT_{PTS} methods is minimal to demonstrate margin for the PTS screening criterion

Conclusion

- Provisions in 10 CFR 50.61(a)(5) allow the use of 2019 Edition ASME Subsection NB-2331(a)(5) to develop RT_{T0}.
- Duke requests review and approval of WCAP-18909 and WCAP-18933.
  - Duke will resubmit WCAP-18933 to limit NRC review and approval of only the material associated with the weld #W5214.
- Duke will utilize these WCAPs as input to demonstrate weld material #W5214 satisfies the 10 CFR 50.61 screening criterion in the SLR application for 80 years (70 EFPY).

NRC Feedback

NRC FEEDBACK