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MRP Materials Reliability Program MRP 2015-020

(via email)

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

From: Bernie Rudell, Exelon, MRP Integration Chairman
Anne Demma, EPRI, MRP Program Manager

Subject: Response to the NRC Second Request for Additional Information for MRP-335, Revision 1, "Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement [Peening]" (TAC No. MF2429)

References:

1. U.S. NRC, Second Request for Additional Information for MRP-335, Revision 1, "Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement [Peening]" (TAC No. MF2429), April 2, 2015. [NRC ADAMS Accession No. ML15057A028]
2. *Materials Reliability Program: Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-335, Revision 1)*, EPRI, Palo Alto, CA: 2013. 3002000073. [Freely Available at www.epri.com]
3. Letter from B. C. Rudell and A. Demma to U.S. NRC, "Response to the NRC Request for Additional Information (RAI) related to Electric Power Research Institute (EPRI) MRP-335, Revision 1, 'Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement [Peening]' (TAC No. MF2429)," MRP 2014-027, October 10, 2014. [NRC ADAMS Accession No. ML14288A370]

This letter transmits two copies of the responses to the Requests for Additional Information (RAI) received in Reference 1. Attachment 1 is a table with the responses to the individual RAI questions. Attachments 2 through 6 provide technical content to address items discussed in some of the individual RAI items:

- Attachment 2 provides a revised version of Section 4 of MRP-335R1 (Reference 2) that proposes inspection requirements and performance criteria for Alloy 82/182 piping dissimilar metal butt welds (DMWs) and Alloy 600 reactor pressure vessel head penetration nozzles (RPVHPNs) mitigated by peening surface stress improvement. The revised proposed requirements reflect the peening processes now available for mitigation of RPVHPNs.

- Attachment 3 provides a revised version of Section 5 of MRP-335R1 that documents the results of revised supporting deterministic and probabilistic analyses. All the supporting analyses presented in Section 5 and Appendices A and B of MRP-335R1 have been revised to reflect changes in the proposed performance criteria since the original calculations were completed in mid-2012. In addition, the main analysis cases now reflect the minimum surface stress effect meeting the performance criteria. The analyses provide the technical bases for the inspection regime that is specified in Attachment 2.
- Attachment 4 documents the inputs and results of the revised probabilistic analyses for peened DMWs.[1] Various sensitivity cases are included to evaluate the effect of different inspection regimes and input parameters on the probability of through-wall penetration and leakage. The analyses reflect some small revisions to the probabilistic model detailed in Appendix A of MRP-335R1.
- Attachment 5 documents the inputs and results of the revised probabilistic analyses for peened RPVHPNs.[1] Various sensitivity cases are included to evaluate the effect of different inspection regimes and input parameters on the probability of leakage and frequency of nozzle ejection. The analyses reflect some small revisions to the probabilistic model detailed in Appendix B of MRP-335R1.
- Attachment 6 discusses the magnitude and through-wall distribution of the tensile stress that develops in response to the peening compressive residual stress effect at the treated surface. The results of this assessment, including finite-element analysis (FEA) modeling, support the form of the post-peening residual stress profile applied in the deterministic and probabilistic analyses of Attachments 3 through 5.

The revised sections of MRP-335R1 that are provided by Attachments 2 and 3 include the modifications that are discussed in several of the responses to RAI questions both in Attachment 1 of this letter and in the responses submitted to the first RAI (Reference 3). EPRI MRP intends to submit a complete revision of MRP-335R1 including the material in Attachments 2 through 5 plus other appropriate revisions consistent with the responses provided in Attachment 1 by August 15, 2015.

If you should have any questions concerning this letter, please contact Paul Crooker, EPRI MRP Project Manager, at (pcrooker@epri.com) or 650-855-2028.

[1] The revised version of MRP-335R1 to be submitted by August 15, 2015, will include full versions of Appendices A and B describing the probabilistic models, as well as the inputs and results that are provided in Attachments 4 and 5.

Sincerely,

Bernard Rudell
MRP Chairman
Exelon Generation

Anne Demma
MRP Program Manager
Electric Power Research Institute

Attachment 1: Table of RAI Responses
Attachment 2: Examination Requirements [Revised Section 4 of MRP-335R1]
Attachment 3: Supporting Analyses [Revised Section 5 of MRP-335R1]
Attachment 4: Revised Probabilistic Analyses for Alloy 82/182 Dissimilar Metal Welds (DMWs) in Primary System Piping
Attachment 5: Revised Probabilistic Analyses for Reactor Pressure Vessel Head Penetration Nozzles (RPVHPNs)
Attachment 6: Tensile Balancing Stresses in Residual Stress Profile in Response to Peening

cc: Paul Crooker, EPRI
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Joe Holonich, NRC