(via email)

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To: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-001

From: Mike Hoehn II, Ameren Missouri, MRP Integration Committee Chairman
Brian Burgos, EPRI, MRP Program Manager

Subject: Follow-Up Comments on February 28, 2017, NRC Public Meeting on Peening Confirmatory Research

References:

1. U.S. NRC, NRC Peening Validation Program Update, Presentation at February 28, 2017, Public Meeting. [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 3-A)*, EPRI, Palo Alto, CA: 2016. 3002009241. [Freely Available at www.epri.com]
3. U.S. NRC, Final Safety Evaluation of the Electric Power Research Institute MRP-335, Revision 3, "Materials Reliability Program: Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement [Peening]" (TAC No. MF2429), August 24, 2016. [NRC ADAMS Accession No.: ML16208A485]
4. *Materials Reliability Program: Technical Basis for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-267, Revision 1)*, EPRI, Palo Alto, CA: 2012. 1025839. [Freely Available at www.epri.com]
5. Letter from D. Gullott (Exelon) to U.S. Nuclear Regulatory Commission, Byron Station, Unit 2, "Request for Relief for Extension of Examination Interval for Reactor Pressure Vessel Head Penetration Nozzles with Mitigated Alloy 600/82/182 Peened Surfaces in Accordance with 10 CFR 50.55a(z)(1)," RS-16-249, dated December 16, 2016. [NRC ADAMS Accession No. ML16356A019]
6. Letter from D. Gullott (Exelon) to U.S. Nuclear Regulatory Commission, Braidwood Station, Unit 1, "Request for Relief for Extension of Examination Interval for Reactor Pressure Vessel Head Penetration Nozzles with Mitigated Alloy 600/82/182 Peened Surfaces in Accordance with 10 CFR 50.55a(z)(1)," RS-17-039, dated March 31, 2017. [NRC ADAMS Accession No.: ML17095A268]

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7. J. A. Pineault, M. Belassel, and M. E. Brauss, Section titled "X-Ray Diffraction Residual Stress Measurement in Failure Analysis," pp. 484–497, *ASM Handbook, Volume 11, Failure Analysis and Prevention*, ASM, 2002.

8. "Standard Test Method for Verifying the Alignment of X-Ray Diffraction Instrumentation for Residual Stress Measurement," E915 - 16, ASTM.

9. "Standard Test Method for Determining the X-Ray Elastic Constants for Use in the Measurement of Residual Stress Using X-Ray Diffraction Techniques," E1426 - 14, ASTM.

10. M. E. Fitzpatrick, A. T. Fry, et al., *Measurement Good Practice Guide No. 52: Determination of Residual Stresses by X-ray Diffraction – Issue 2*, National Physical Laboratory, September 2005.

Introduction

This letter is a follow-up to the NRC public meeting held on February 28, 2017 between NRC and the Materials Reliability Program (MRP) of the Electric Power Research Institute (EPRI). At this meeting, NRC presented slides [1] outlining its planned confirmatory research program on the topic of peening surface stress improvement to mitigate primary water stress corrosion cracking (PWSCC) of certain Alloy 600/82/182 primary pressure boundary components in pressurized water reactors (PWRs).

As stated at this meeting, MRP understands that the purpose of the planned NRC confirmatory research is to provide NRC staff with additional information to facilitate NRC reviews of relief requests submitted by individual licensees seeking alternative volumetric examination intervals supported by the MRP-335 R3-A topical report [2]. NRC stated that the planned confirmatory research would be used to check specific areas of interest, and as such, is not intended to be a comprehensive validation. NRC further stated that this testing is not intended to revisit conclusions reached in the NRC Safety Evaluation [3] on the topical report. Finally, NRC stated that NRC will not delay the review of any relief requests submitted by individual licensees until confirmatory research results are available.

At the February 28 public meeting, MRP representatives made comments on the planned confirmatory research. This letter follows up on the discussions at the meeting by providing more detailed feedback. First and foremost, MRP believes that sufficient information is already available such that the planned NRC confirmatory testing is not necessary. The advanced peening methods now being applied in the U.S. to mitigate PWSCC were first applied in Japanese light water reactors (LWRs) about 18 years ago. Extensive information on the effectiveness of water jet peening and laser peening has been developed by the peening vendors and MRP. This information has been made available to NRC in conjunction with the topical report, including MRP-267 R1 [4]. These mitigation methods are recognized as a mature technology available to licensees to address the potential for future occurrences of PWSCC. MRP believes that the plans for confirmatory research are creating the unintended result of regulatory uncertainty that is discouraging licensees from pursuing peening mitigation in the short term, and thus delaying realization of the benefits of peening mitigation to reduce the risks associated with PWSCC.

Attachment 1 identifies the locations in the publicly available documentation for the existing information already addressing the stated objectives of the NRC confirmatory research. Key discussion points on each of the four areas of planned confirmatory research follow below. No feedback is provided on the "Optional Validation Work" items covered in the latter half of the NRC presentation [1]. During the February 28 public meeting, NRC requested feedback from the industry participants whether they desire the NRC to include these "Optional Validation Work" items in the NRC confirmatory research program. The industry participants decline to request that NRC pursue these testing items identified by NRC as optional confirmatory scope.

Existing Data Already Addressing Objectives of Planned NRC Confirmatory Research

X-Ray Diffraction (XRD) Stress Measurement Uncertainty

XRD is often applied to measure the effect of peening on residual stresses. As discussed in the February 28 public meeting, previous work investigating the benefit of weld overlay mitigation raised an NRC concern about the ability of XRD to measure residual stresses in welds. In fact, as discussed in Attachment 1, measurements using XRD have been successfully applied to weld metals, including Alloys 82/182. MRP also notes that the residual stress at the surface of unpeened welds is often subject to large spatial variability that might be misinterpreted as an indication of excessive stress measurement uncertainty.

MRP acknowledges that explicit treatment of residual stress measurement uncertainty was excluded from the MRP-335 R3-A topical report [2]. XRD stress measurements are implemented by individual peening and stress measurement vendors according to vendor-specific controls and equipment. Thus, the individual peening vendors are best positioned to provide detailed information addressing the concern of NRC regarding XRD stress measurement uncertainty in conjunction with relief requests submitted by individual licensees. As such, MRP suggests that NRC staff discuss with the peening and XRD vendors their bases for the reported XRD stress measurement uncertainty before determining that additional effort is needed for confirmatory research.

As an example, MRP is aware that one licensee has recently submitted relief requests proposing alternative volumetric examination intervals for two reactor vessel heads ([5], [6]) on the basis of peening mitigation. These relief requests describe how internationally recognized best practices were applied for instrument calibration and for verification and validation of XRD stress measurement results. The validation included a comparison of XRD stress measurement results obtained by two different independent laboratories. The relief requests cite proprietary reports issued by the peening vendor for full documentation of the verification and validation. MRP understands that these reports (including the XRD stress measurement verification and validation report and the Special Process Qualification Record) have already been made available to NRC in conjunction with its review of these relief requests. MRP believes that the technical information provided in these reports should be considered in the determination of whether confirmatory research on the topic of XRD stress measurement uncertainty is necessary.

The *ASM Handbook* [7] has established best practices and universal validation procedures for XRD residual stress measurements. According to the *ASM Handbook*, performing the following five steps successfully provides a high level of confidence in XRD residual stress measurements:

1. *Alignment of XRD Instrumentation* – This step is performed according to the ASTM E915 standard [8].
2. *X-Ray Elastic Constant (XEC) Determination* – Dependent on the mechanical properties of the material and the crystallographic plane selected to perform the measurements, these values can be determined through testing (usually according to ASTM E1426 [9]) or theoretical calculations.
3. *Surface Condition Evaluation* – The effect of surface conditions such as surface roughness, oxide layers, etc. on XRD residual stress measurement results should be considered prior to final surface-stress measurements. Electropolishing and subsequent near-surface residual-stress measurements may be desired.
4. *Collection Parameter Selection* – Because multiple factors can introduce random and/or systematic errors into the residual-stress measurements, the following collection parameters should be carefully considered:
   - Collection time
   - Number of tilt angles (ψ) used for d-spacing versus $\sin^2\psi$ plots
   - X-ray diffraction peak position determination
   - Effects of microstructure
   - Effects of surface curvature and beam size

   Fitzpatrick et al. [10] discuss good practices with regard to the effects of key collection parameters.
5. *Repeatability and Reproducibility Determination* – Repeatability is a measure of the consistency in results obtained sequentially using the same setup. Random errors, such as those that are introduced due to low collection times, can be observed during repeatability tests. Reproducibility is a measure of the consistency in results across different tests. Systematic errors, such as those that are introduced due to improper selection of the X-ray diffraction peak position, become apparent during reproducibility tests. In the case of both repeatability and reproducibility assessments, uncertainty in the test results can be assessed through use of typical statistical metrics (i.e., mean and standard deviation).

<u>CRDM Nozzle and J-Groove Weld Stress Measurement Locations</u>

MRP believes that sufficient information is already available to address this item regarding the influence of pre-existing residual stress. The initial residual stress state is not important to the final residual stress state subsequent to peening. The planned confirmatory testing presumes that the locations of greatest pre-existing tensile residual stresses are limiting. In reality, the greatest pre-peening tensile residual stresses tend to result in the highest level of compression post-peening. References on this topic that demonstrate that the peak tensile pre-peening stresses do not create a limiting post-peening residual stress state are provided in Attachment 1.

Non-Destructive Examination of Alloy 82/182 Dissimilar Metal Welds in PWR Primary System Piping (DMWs)
The peening performance criteria of the MRP-335 R3-A topical report [2] require that the capability to perform ultrasonic testing (UT) examinations of the relevant volume and eddy current testing (ET) examinations of the relevant surface are not affected by the peening. Furthermore, the performance criteria also require that the peening does not result in any adverse effects, including detrimental surface conditions. We believe that EPRI and the peening vendors have adequately addressed this item to demonstrate that UT and ET qualified for use on unmitigated DMWs are reliable for use on peened DMWs. References on this topic that demonstrate that peening does not affect inspectability, including with regard to component surface condition, are provided in Attachment 1. Water jet peening and laser peening have minor effects on surface roughness that are not of any practical significance.

PWSCC Initiation Testing
Peening surface stress improvement has had a long history of success in mitigating initiation of stress corrosion cracking, not only fatigue initiation. With regard to the types of water jet peening and laser peening now being applied in U.S. PWRs, many studies are already available demonstrating that peening when properly applied is effective in mitigating PWSCC initiation in accelerated corrosive environments, as well as in simulated primary water environments. The available studies include testing sponsored by EPRI independent of the peening vendors. References on this topic that demonstrate that peening is successful in mitigating PWSCC initiation are provided in Attachment 1. There is wide recognition in the research community that tensile stresses substantially greater than +10 ksi are required for initiation at plant conditions within plant time periods.

Technical Comments if Confirmatory Research Proceeds
If NRC decides to pursue confirmatory research as described in the February 28 NRC presentation [1], MRP submits for consideration the comments documented in Attachment 2. These comments are based on the considerable experience of industry organizations in assessing the effect of various peening mitigation methods.

Conclusions
MRP believes that the planned NRC confirmatory testing program is not necessary considering the extensive information already available with regard to the use of peening surface stress improvement to mitigate PWSCC. Furthermore, there is an industry concern that the planned NRC confirmatory research is producing a negative view of peening and discouraging activities to mitigate PWSCC and reduce risk.

If NRC does pursue the planned confirmatory research, MRP suggests that the comments in Attachment 2 be considered. In addition, MRP would request the opportunity to review and comment on the NRC test plans and a public meeting to discuss the test plans. If the confirmatory research is pursued, MRP feels that its experience and the experience of the peening vendors would be valuable to help ensure that the results from the testing are technically valid and meaningful.

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.

Sincerely,

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MRP Integration Committee Chairman
Ameren Missouri

Brian Burgos
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Attachment 1: References for Existing Data Already Addressing Objectives of Planned NRC Confirmatory Research
Attachment 2: EPRI MRP Comments on NRC Peening Confirmatory Research Program

cc: Paul Crooker, EPRI
Brian Burgos, EPRI
William Sims, Entergy
Timothy Wells, Southern Nuclear Operating Co.

References for Existing Data Already Addressing Objectives of Planned NRC Confirmatory Research

Topic	Objective/Basis	References	Comments	Applicability
XRD Uncertainty	Determine x-ray diffraction (XRD) uncertainty by testing plate and weld material. The stated basis is that XRD has been reported to have high uncertainty, especially on welds. In addition, residual stress measurement uncertainty was excluded from the MRP-335 R3-A topical report at the request of the industry.	• MRP-335 R3-A,[1] Section 2.3.6 and References 46,[2] 47,[3] 48,[4] and 49[5] • MRP-335 R3-A,[1] Section 2.3.6 and References 50[6] and 51[7]	• References demonstrating that XRD stress measurements can be successfully applied to welds. • References demonstrating that XRD stress measurements can be successfully applied to Alloy 82/182 welds.	RPVHPNs and DMWs
Stress Measurement Locations	Identify locations of high tensile stresses in CRDM nozzles and associated J-groove welds. Weld residual stress measurements will be performed on an unpeened mockup at areas predicted by finite element analyses to have high tensile stress. The stated basis is that areas with high tensile residual stress prior to peening should be checked to show that the required peening effect is realized.	• MRP-335 R3-A,[1] Section 3.3.3 • Pages 7-24 through 7-31 of TR-103696[8] • J. Katsuyama, et al.[9] • MRP-267 R1,[10] Section 4.5, 2nd paragraph; MRP-267 R2,[11] Section 4.2.1.6	• Explains how peening effect is self-normalizing as the effect is enhanced for areas with relatively high tensile initial residual stress and attenuated for areas with compressive initial residual stress. Example stress measurement data are presented showing the relative insensitivity of the peening compressive residual stress to the pre-peening residual stress state, with the greatest peening response in the area with the highest amount of initial tension. Hence, identification of the areas with highest pre-existing tensile residual stress is not necessary. • Shows results of past studies measuring weld residual stresses and associated deformations in CRDM nozzles and associated J-groove welds. • Compares residual stress measurements of the bulk J-groove weld material made using deep hole drilling to finite-element analysis predictions for a CRDM nozzle mockup. • Provides additional data demonstrating that areas with higher tensile pre-peening residual stress tend to attain a more compressive residual stress subsequent to peening.	RPVHPNs

Topic	Objective/Basis	References	Comments	Applicability
Non-Destructive Examinations	Validate that peening has no adverse effects on the ability of ultrasonic or eddy current testing to detect pre-existing cracks. These examination methods require the probe to be in contact with the peened surface. The stated basis asks whether the effect of peening on a component could affect the ability to detect cracking using these methods.	• MRP-267 R1,[10] Section 4.5 and Appendix A.4.1; MRP-267 R2,[11] Section 4.5.3 and Appendix A.4.1 (also MRP-335 R3-A,[1] Section 3.6) • MRP-267 R1,[10] Section 4.5 and Appendix A.1.7; MRP-267 R2,[11] Section 4.5.4 and Appendix A.4.2 and A.4.3 • EPRI 3002008359[12]	• Summarizes and presents UT and ET studies that have been completed demonstrating that peening has no adverse effect on the UT and ET methods typically applied to Alloy 82/182 dissimilar metal butt welds in primary system piping (i.e., DMWs). • Summarizes and presents data showing minor effects on surface roughness that are not of any practical significance. • Documents tests performed by EPRI that demonstrate that UT and ET qualified for use on unmitigated DMWs are reliable for use on peened DMWs.	DMWs
PWSCC Initiation	Validate the efficacy of peening with respect to initiation of PWSCC cracks. The stated basis is that peening has a long history of effectiveness in mitigating fatigue cracks and that the initiation mechanisms for fatigue and PWSCC are different. The time to PWSCC initiation for peened and unpeened specimens will be compared to determine a peening improvement factor that is intended to confirm the relief in volumetric examination frequency.	• "Improving Resistance to Stress Corrosion" under "Shot Peening" in 1982[13] and 1994[14] Editions of Volume 5 of ASM Handbook • MRP-267 R1,[10] Section 4.2.2; MRP-267 R2,[11] Section 4.2.2 • MRP-267 R1,[10] Appendix A.2; MRP-267 R2,[11] Appendix A.2 • MRP-267 R1,[10] Appendix A.3; MRP-267 R2,[11] Appendix A.3 • MRP-267 R1,[10] Figure 2-27; MRP-267 R2,[11] Figure 2-29 • MRP-267 R1,[10] Section 3; MRP-267 R2,[11] Section 3	• Documents the long history of the effectiveness of peening in mitigating stress corrosion cracking (i.e., large benefit for SCC initiation time). • Provides a summary of SCC initiation testing demonstrating the effectiveness of water jet peening and laser peening to mitigate SCC initiation. • Provides vendor SCC initiation test data for peened and unpeened components, including testing in simulated PWR primary water. • Provides independent EPRI-sponsored SCC initiation test data for simulated PWR primary water showing the effectiveness of peening in preventing PWSCC initiation. • Presents example of use of peening to eliminate SCC in 300M steel used for aircraft landing gear. • Documents experience with shot peening of Alloy 600 PWR steam generator tubes and shot peening of Alloy 600 pressurizer heater sheaths.	RPVHPNs and DMWs

[1] *Materials Reliability Program: Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-335, Revision 3-A)*, EPRI, Palo Alto, CA: 2016. 3002009241. [Freely Available at www.epri.com]

[2] Section titled "X-Ray Diffraction Residual Stress Measurement in Failure Analysis," page 484–497, *ASM Handbook*, Volume 11, "Failure Analysis and Prevention," ASM, 2002.

[3] J. A. Pineault, M. E. Brauss, and J. S. Eckersley, "Residual Stress Characterization of Welds Using X-Ray Diffraction Techniques," *Welding Mechanics and Design*, American Welding Society, 1996.

[4] M. Belassel, M. E. Brauss, and J. A. Pineault, "Residual Stress Characterization Using X-ray Diffraction Techniques, Applications on Welds," *Proceedings 2001 ASME PV&P Conference*, PVP-Vol. 429, 2001.

[5] L. Zhang, Y. K. Zhang, et al., "Effects of Laser Shock Processing on Electrochemical Corrosion Resistance of ANSI 304 Stainless Steel Weldments after Cavitation Erosion," *Corrosion Science*, vol. 66, pp. 5–13, January 2013.

[6] J. J. Wall, K. J. Krzywosz, et al., "Residual Stress Measurement in Alloy 182," *Proceedings of the Seventh International Conference on NDE in Relation to Structural Integrity for Nuclear and Pressurised Components. 12-14 May 2009 - Yokohama, Japan*, Publications Office of the European Union, 2009.

[7] A. Joseph, S. K. Rai, T. Jayakumar, and N. Murugan, "Evaluation of Residual Stresses in Dissimilar Weld Joints," *International Journal of Pressure Vessels and Piping*, vol. 82, no. 9, pp. 700–705, September 2005.

[8] *PWSCC of Alloy 600 Materials in PWR Primary System Penetrations*, EPRI, Palo Alto, CA: 1994. TR-103696. [Freely Available at www.epri.com]

[9] J. Katsuyama, M. Udagawa, H. Nishikawa, M. Nakamura, and K. Onizawa, "Evaluation of Weld Residual Stress Near the Cladding and J-weld in Reactor Pressure Vessel Head for the Assessment of PWSCC Behavior," *E-Journal of Advanced Maintenance*, v. 2, pp. 50-64, 2010.

[10] *Materials Reliability Program: Technical Basis for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-267, Revision 1)*, EPRI, Palo Alto, CA: 2012. 1025839. [Freely Available at www.epri.com]

[11] *Materials Reliability Program: Technical Basis for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-267, Revision 2)*. EPRI, Palo Alto, CA: 2016. 3002008083. [Freely Available at www.epri.com]

[12] *Pressurized Water Reactor Materials Reliability Program: Effects of Surface Peening on the Inspectability of Nondestructive Evaluation.* EPRI, Palo Alto, CA: 2016. 3002008359. [Freely Available at www.epri.com]

[13] Section titled "Shot Peening," page 138, *ASM Handbook*, Volume 5, "Surface Engineering," ASM, 1982.

[14] Section titled "Shot Peening," page 131, *ASM Handbook*, Volume 5, "Surface Engineering," ASM, 1994.

EPRI MRP Comments on NRC Peening Confirmatory Research Program

#	Topic	NRC Presentation Text	Comment
1	XRD Uncertainty	**Slide 4 [General]**	Validation of XRD residual stress measurement uncertainty is specific to measurement procedure and equipment. Different XRD measurement vendors may use different procedures and equipment. Thus, the findings of this proposed work may not have general applicability.
2	XRD Uncertainty	**Slide 3:** Determine uncertainty of x-ray diffraction	It is unclear how the approach as described will meet the objective of determining the uncertainty of XRD stress measurement. Actively loaded fully annealed weld metal specimens would allow comparison of the XRD results with the true stress. It is expected that an annealing heat treatment could be selected to have a reasonably small effect on the grain solidification structure, which may influence the XRD stress measurement uncertainty. It is suggested that this be demonstrated for the specific test weld, for example by investigating three annealing temperatures (e.g., 1800°F, 1900°F, and 2000°F) for two durations (~10 minutes and 1 hour), with pre- and post-annealing electron backscatter diffraction (EBSD) measurements to determine grain size, shape, and texture. Complementary testing on non-textured wrought samples could be included as an experimental control.
3	XRD Uncertainty	**Slide 3:** Measurement uncertainty excluded from MRP-335 at industry request	The MRP suggested this approach as the method of residual stress measurement and the specific measurement procedures and equipment are addressed by individual peening vendors.
4	XRD Uncertainty	**Slide 4:** Perform XRD measurements	A very thin layer of tensile residual stress or not as compressive as the residual stress deeper into the material may be present for some types of peening surface stress improvement. As discussed in MRP-335 R3-A, this layer may be excluded from consideration when showing that the performance criteria are satisfied. Thus, XRD measurements 25 to 50 μm below the peened surface may be appropriate in some cases.
5	Non-Destructive Examinations (DMWs)	**Slide 9:** Use existing DMW mockup with existing implanted flaws	Flaw sizes should be relevant to the type of NDE performed, for example, flaws at least 10% through-wall in the case of ultrasonic testing.
6	PWSCC Initiation	**Slide 11:** Load to operating conditions in PWR environment at +10 ksi	In this experimental approach, the stress must be precisely controlled to ensure that the actual stress does not exceed +10 ksi. This may be challenging given the uncertainty in the residual stress at the peened surface, including the effect of changes over time.

#	Topic	NRC Presentation Text	Comment
7	PWSCC Initiation	**Slide 11:** Load to operating conditions in PWR environment at +10 ksi	As a second priority, NRC may consider testing additional samples with a surface tensile stress of +20 ksi. MRP-335R3-A cites +20 ksi as a conservative limit for which PWSCC initiation is unlikely over plant operating periods. There is interest in the industry with establishing +20 ksi as the performance criterion for peening as part of an effort to improve the consistency of the requirements for the various mitigation methods involving stress improvement. The technical basis for a stress limit of +20 ksi (tensile) is documented in a recent PVP paper.[1]
8	PWSCC Initiation	**Slide 11 [General]**	The specimen yield strength is a relevant parameter as it affects the stress ratio (applied tensile stress divided by yield strength), which is known to be a key parameter influencing the potential for PWSCC initiation.
9	PWSCC Initiation	**Slide 12:** Figure of 4-point bend bar specimens	It appears that the specimen may not be sufficiently thick to retain the stress effect that would be retained for thicker and more rigid plant components considering a nominal 1-millimeter depth of compression. Appendix C of MRP-335 R3-A[2] presents results illustrating the effect of component thickness and geometry on the level of retained compression (surface stress magnitude and depth of compression) for a given peening intensity.
10	PWSCC Initiation	**Slide 11:** 32 alloy 182 4pt bend specimen	The weld specimens should be checked for pre-existing flaws not representative of inspected plant components.
11	PWSCC Initiation	**Slide 12:** PNNL concept for crack arrest specimen by Dr. Mychailo Toloczko	MRP-335 R3-A does not credit any benefit for peening to arrest flaws. The benefit that is credited is the mitigation of initiation of new PWSCC flaws.
12	PWSCC Initiation	**Slide 11 [General]**	The "massive-bend" specimen design could also be considered. Pages A-115 and A-116 of MRP-267 R2[3] describe this specimen type, which results in massive mechanical behavior.
13	PWSCC Initiation	**Slide 11 [General]**	If the material is to be cold worked before being peened, the basis for this approach and for the chosen cold-work level should be carefully considered.
14	PWSCC Initiation	**Slide 11 [General]**	The peening should be representative of the peening now being performed in PWRs.

[1] W. Bamford, G. White, and S. Fyfitch, "Technical Basis for Stress Levels Needed to Mitigate PWSCC in Alloy 82/182/600," *Proceedings of the ASME 2016 Pressure Vessels & Piping Conference*, July 17-21, 2016, Vancouver, British Columbia, Canada, PVP2016-64041.
[2] *Materials Reliability Program: Topical Report for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-335, Revision 3-A)*, EPRI, Palo Alto, CA: 2016. 3002009241. [Freely Available at www.epri.com]
[3] *Materials Reliability Program: Technical Basis for Primary Water Stress Corrosion Cracking Mitigation by Surface Stress Improvement (MRP-267, Revision 2)*, EPRI, Palo Alto, CA: 2016. 3002008083. [Freely Available at www.epri.com]

#	Topic	NRC Presentation Text	Comment
15	PWSCC Initiation	**Slide 11 [General]**	The planned approach to confirmatory PWSCC initiation testing of peened specimens is a first-of-a-kind experimental approach. Thus, as discussed during the February 28 public meeting, an NRC public meeting with the industry would be productive to discuss the proposed initiation test methods and review the experimental design.
16	PWSCC Initiation	**Slide 11 [General]**	The initiation testing system should be commissioned, calibrated, and monitored to ensure loads are within expected limits and to quantify load transients. MRP suggests that a highly susceptible specimen material such as X-750AH be used for initial commissioning and test system validation. MRP requests that a test plan be made available for review and comment. MRP suggests that the test plan address the following elements: • Existing test methods • Details on the test system implemented • Test system commissioning, calibration, and validation • Material selection • Peening process applied to specimens • Proposed test matrix • Planned material and specimen characterization (pre- and post- test) • Lessons learned from similar previous PWSCC initiation test programs, and how those lessons learned are being applied to this test program