

**MRP Materials Reliability Program** \_\_\_\_\_ **MRP 2014-031**

(via e-mail)

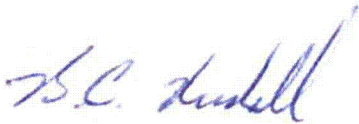
October 31, 2014

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U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

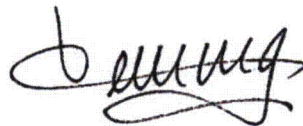
Subject: Transmittal of the additional RAI responses to the NRC relating to WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473R5.

This letter transmits two (2) enclosures providing additional information relative to WCAP-17096-NP, Section W-ID: 2, Control Rod Guide Tube Assembly Lower Flange Welds, and additional information related to visual inspections for cracking and proposed re-inspection intervals for defects / cracking identified from said visual inspections. Should you require any additional information regarding this topic please do not hesitate to contact Kyle Amberge, [kamberge@epri.com](mailto:kamberge@epri.com) or 650-804-8037.

Sincerely,



B. C. Rudell  
MRP Chairman  
Exelon



Anne Demma  
MRP Program Manager  
EPRI

Cc: Joe Holonich, NRC  
James Molkenhain, PWROG Program Manager

Enclosures:

- Additional RAI Response (LTR-RIAM-14-94, Rev 1) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473R5, 10/27/14 (OG-14-394)
- Additional RAI Response (LTR-RIAM-14-91, Rev 2) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473R5, 10/27/14 (OG-14-349)

Docket No. 669

Together . . . Shaping the Future of Electricity

D035  
NRK



October 27, 2014

WCAP-17096-NP, Rev. 2  
Project Number 694

OG-14-394

Mr. Kyle Amberge, EPRI Project Manager  
Electric Power Research Institute (EPRI)  
3420 Hillview Avenue  
Palo Alto, CA 94304

Subject: Pressurized Water Reactor Owners Group  
**Additional RAI Response (LTR-RIAM-14-94, Rev 1) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-C-0473R5**

Dear Mr. Amberge:

In January 2010, the Pressurized Water Reactor Owners Group (PWROG), provided the Electric Power Research Institute (EPRI) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (Reference 1). EPRI submitted the document to the Staff for review and comment under the MRP-227 umbrella (Reference 2). In June 2010, the Staff accepted the topical report (Reference 3) and provided a Request for Additional Information (RAI) (Reference 4) on May 19, 2011. On July 15, 2011, the Staff provided a revision for Request for Additional Information (RAI) (Reference 5) and the PWROG provided responses. Based on the draft RAI input provided under Reference 6, teleconferences were held with the Staff to discuss both the AREVA and Westinghouse responses. The minutes from both calls are provided in Reference 7. Based on those minutes, the RAI responses were revised and provided to EPRI for submittal to the NRC (Reference 8). On October 11, 2012, the NRC provided a second Request for Additional Information (RAI) (Reference 9). The Planning Team has reviewed and provided comments on the second Request for Additional Information (RAI) (Reference 10) and submitted them to EPRI under Reference 11. On December 10, 2012, the NRC provided additional comments via email (Reference 12) on the responses to the RAIs that were submitted under Reference 11. The PWROG provided additional responses on December 20, 2012 (Reference 13). On August 18, 2014 the NRC provided two additional RAIs to the PWROG through the EPRI MRP (Reference 14). The PWROG provided responses to those RAIs on October 27, 2014 (Reference 15).

This letter provides additional information relative to WCAP-17096-NP, Section W-ID: 2, Control Rod Guide Tube Assembly Lower Flange Welds (Enclosure 1).

The PWROG would like to request that we are kept on distribution, via letter, once the additional response is submitted to the Staff. Updates to the WCAP will be made in parallel with the NRC review of the RAI response. The updated WCAP will be provided to the Staff at a later date.

References:

1. PWROG Letter from Dennis Buschbaum to Anne Demma, EPRI Transmittal of Final WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements", December 2009, OG-10-22, dated 1/13/10.
2. Report Transmittal: Westinghouse Non-Proprietary Class 3 Report, "Reactor Internals Acceptance Criteria Methodology and Data Requirements, WCAP-17096-NP, Revision 2, December 2009, MRP 10-034, dated 5/19/10.
3. Acceptance for Review of PWR Owners Group (PWROG) Topical Report WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200), letter from NRC to EPRI, dated 6/28/10.
4. Request of Additional Information on WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements (TAC NO. ME4200) PA-MS-0473, dated 5/19/11 and posted to the PWROG website under OG-11-163, dated 5/23/11.
5. Revision 1 to the Request of Additional Information on WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, dated 7/10/11 and posted under the PWROG website under OG-11-223, dated 7/ 15/11.
6. Responses to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-11-264, dated 9/6/11.
7. High Level Minutes (LTR-RIAM-11-50) from October 4th and 12th Teleconferences with the NRC to Discuss the Draft RAI Responses Related to PWROG WCAP-17096, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (PA-MS-0473), OG-11-343, dated 11/2/11.
8. Revised Responses (LTR-RIAM-12-12) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-12-202, dated May 25, 2012.
9. Request of Additional Information Related to WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" December 2009 (TAC NO. ME4200) PA-MS-0473, dated 10/11/12 and posted to the PWROG website under OG-12-444, dated October 26, 2012.
10. Review and Comment of Additional RAI Responses (LTR-RIAM-12-134) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-12-475, dated November 9, 2012.
11. Additional RAI Responses (LTR-RIAM-12-138, Rev 0) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-12-495, dated November 21, 2012.

References (Continued)

12. Additional RAI Responses (LTR-RIAM-12-138, Rev 0) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-12-495, dated November 21, 2012.
13. Comments to Additional RAI Responses via email from the NRC. Joe Golla (NRC) to Kyle Amberge (EPRI), dated December 10, 2012.
14. Additional RAI Responses (LTR-RIAM-12-138, Rev 1) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-12-519, dated December 20, 2012.
15. Letter from J. Holonich (U.S. NRC Senior Project Manager) to B.C. Rudell (EPRI Materials Reliability Program Chairman), "Request for Additional Information Related to WCAP-17096-NP, Revision 2, 'Reactor Internals Acceptance Criteria Methodology and Data Requirements' (TAC No. ME4200)," dated August 18, 2014, ML14177A071 and posted to the PWROG website under OG-14-331, dated September, 18, 2014.
16. Additional RAI Response (LTR-RIAM-14-91, Rev 2) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473R5, OG-14-349, dated October 27, 2014.

If you have any questions feel free to contact Mr. Jim Molkenhuth of the PWR Owners Group Project Management Office at (860) 731-6727.

Regards,

J. Molkenhuth Approving for J. Stringfellow

Jack Stringfellow  
Chief Operating Officer & Chairman  
Pressurized Water Reactor Owners Group

NJS:JPM:kpr

Enclosures (1): Additional RAI Response for WCAP-17096-NP (LTR-RIAM-14-94, Rev 1)

cc: PWROG Steering Committee	PWROG Management Committee
PWROG Licensing Subcommittee	PWROG Materials Subcommittee
PWROG Program Management Office	R. Lott, Westinghouse
J. Rowley, USNRC	J. McKinley, Westinghouse
S. Stuchell, USNRC	P. Paden, Westinghouse
J. Andrachek, Westinghouse	T. Natour, AREVA Inc
P. Paesano, Westinghouse	S. Fyfitz, AREVA Inc
C. Boggess, Westinghouse	B. Grambau, AREVA Inc
E. Deemer, Westinghouse	A. Demma, EPRI
B. Snyder, Westinghouse	

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To: James Molkenthin  
cc: Barbara Snyder  
Date: October 20, 2014  
From: Reactor Internals Aging Management  
Ext: (412) 374-3751  
Fax: (724) 940-8548  
Your ref: N/A  
Our ref: LTR-RIAM-14-94, Rev. 1

Subject: Update to WCAP-17096-NP Section on Control Rod Guide Tube Assembly Lower Flange Welds

- References:
1. Westinghouse Report, WCAP-17096-NP, Revision 2, "Reactor Internals Acceptance Criteria Methodology and Data Requirements," December 2009.
  2. PWR Owners Group Letter, OG-12-202, "Pressurized Water Reactor Owners Group: Revised Responses (LTR-RIAM-12-12) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473," May 25, 2012.
  3. PWR Owners Group Letter, OG-12-519, "Pressurized Water Reactor Owners Group: Additional RAI Responses (LTR-RIAM-12-138, Rev 1) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473," December 20, 2012.
  4. PWR Owners Group Project Authorization, PA-MS-0473, Revision 5, "Reactor Internals Acceptance Criteria Methodology and Data Requirements," October 2013.

Attachment A contains the update for WCAP-17096-NP, Section W-ID: 2, Control Rod Guide Tube Assembly Lower Flange Welds [1]. Attachment A incorporates the Request for Additional Information (RAI) responses from RAI 26 in OG-12-202 [2] and RAI F in OG-12-519 [3]. The RAI response is part of the scope under Pressurized Water Reactor Owners Group (PWROG) project authorization PA-MS-0473 [4].

Revision 1 of this letter provides the resolutions to address PWROG Materials Committee member comments on the previous revision of this document. The comments and their resolutions are electronically attached to this document.

If there are any questions, please contact Barbara Snyder by either phone at (412) 374-3751 or email at [snyderbr@westinghouse.com](mailto:snyderbr@westinghouse.com).

Authored by: ELECTRONICALLY APPROVED<sup>1</sup>  
Ernest W. Deemer  
Reactor Internals Aging Management

Verified by: ELECTRONICALLY APPROVED<sup>1</sup>  
Karli N. Szweda  
Reactor Internals Aging Management

<sup>1</sup> *Electronically approved records are authenticated in the electronic document management system.*

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Page 2 of 2  
Our ref: LTR-RIAM-14-94,  
Rev. 1  
October 20, 2014

Approved by: ELECTRONICALLY APPROVED<sup>1</sup>  
Patricia C. Paesano, Manager  
Reactor Internals Aging Management

**Attachment A**

**Update for  
WCAP-17096-NP, Section W-ID: 2  
Control Rod Guide Tube Assembly Lower Flange Welds**



**W-ID: 2                    Control Rod Guide Tube Assembly****Lower Flange Welds**

Category:	Primary	Applicability:	All plants
Degradation Effect:	Cracking (SCC, fatigue) Aging Management (IE and TE)		
Expansion Link:	Lower support column bodies (cast), lower support forging or casting, and upper core plate if two or more failed control rod guide tube (CRGT) welds are observed. Bottom-mounted instrumentation (BMI) column bodies if two or more failed CRGT welds are observed along with flux thimble insertion/withdrawal difficulty. For a single failed weld, an extent of condition evaluation should be incorporated in the MRP-227-A expansion program.		
Function:	The control rod guide tube assembly provides alignment and insertion path for control rods through upper internals. The lower flange welds retain the structural alignment of the component. Guide tubes must maintain rod stability in normal and LOCA transients.		

**Inspection**

Method:	Enhanced visual (EVT-1) examination to determine the presence of crack-like surface flaws in flange welds no later than 2 refueling outages from the beginning of the license renewal period and subsequent examination on a 10-year interval.
Coverage:	100% of outer (accessible) CRGT lower flange weld surfaces and adjacent base metal as prescribed in the latest approved version of MRP-227. See MRP-227-A Figure 4-21.  The intent of the CRGT lower flange weld inspection is to provide a reasonable sample size for monitoring cracking degradation in the flange welds. The size of the sample is determined by the coverage requirements established in MRP-227-A. The adequacy of the sample size may be evaluated using the statistical analysis techniques described in NUREG-1475, Revision 1.
Observable Effect:	Any individual weld with observed crack must be assumed to have failed. The vertical beam portion appears to be out of position.

**Failure**

Failure Mechanism:	Flow in the upper head applies bending moment to control rod guide tube assembly. Maximum bending stresses tend to occur near top of continuous guidance section. Stresses may lead to formation of SCC or fatigue cracks. Weld cracking may lead to loss of stiffness in guide tube assembly and loss of support capability.
Failure Effect:	Loss of structural stability. Excessive deflection could impede control rod assembly insertion.
Failure Criteria:	Design limits on the CRGT assembly are generally expressed as a maximum allowable load, which is determined based on the assembly compliance. This analysis implies a maximum allowable deflection. Interference between the guide cards and the guide tubes occur when the deflection exceeds this limit.

**W-ID: 2                      Control Rod Guide Tube Assembly**  
**Lower Flange Welds**

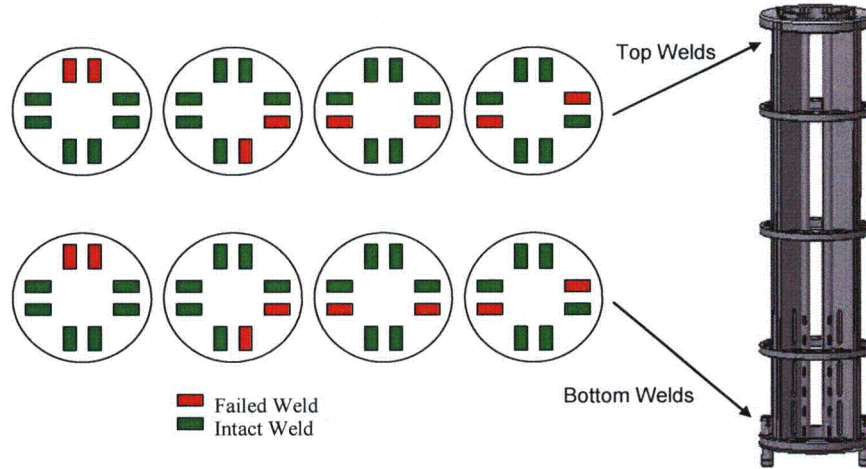
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**Methodology**

- Goal:**                      The goal of the acceptance criteria is to evaluate the adequacy of any CRGT found to have failed lower flange welds. The stiffness of a CRGT assembly with failed welds must be sufficient to maintain allowable deflections when LOCA and SSE loads are applied. Allowable load on control rod guide tube assembly is defined by empirical testing.
- Data Requirements:**    Loads  
Finite element model of lower CRGT assembly to evaluate weld failures calibrated to benchmark data
- Analysis:**                1. Determine design basis assumptions for CRGT assembly (maximum allowable load, assembly compliance).  
2. Lower section must be modeled in detail, upper sections may be treated as large beams.  
3. Calibrate FEA model and boundary constraints against design basis assumptions.  
4. Remove test pattern of welds.  
5. Run FEA.  
6. If deflection is greater than limit in Step 1, pattern is not acceptable.  
7. Iterate Steps 4–6 to create library of acceptable and unacceptable patterns.  
8. Match patterns to field observations assuming that any weld with flaw has failed.  
9. Should be able to observe sufficient number of welds to demonstrate that assembly is acceptable.
- Acceptance Criteria:**    This acceptance criteria is based on a minimum number of welds that must continue to function (without cracking) to allow scrambling of the control rods in the event of combined LOCA and SSE.  
  
The inspection plan for the CRGTs is a sampling approach. If indications are detected then evaluation of the CRGT(s) with the indication must be performed. This may also lead to an increase of the sample being inspected, or subsequent additional inspections.  
  
This sampling approach is cognizant of industry operating experience and if no indications are found in the inspected reactor then there is no assumption that uninspected welds in that reactor may have flaws.

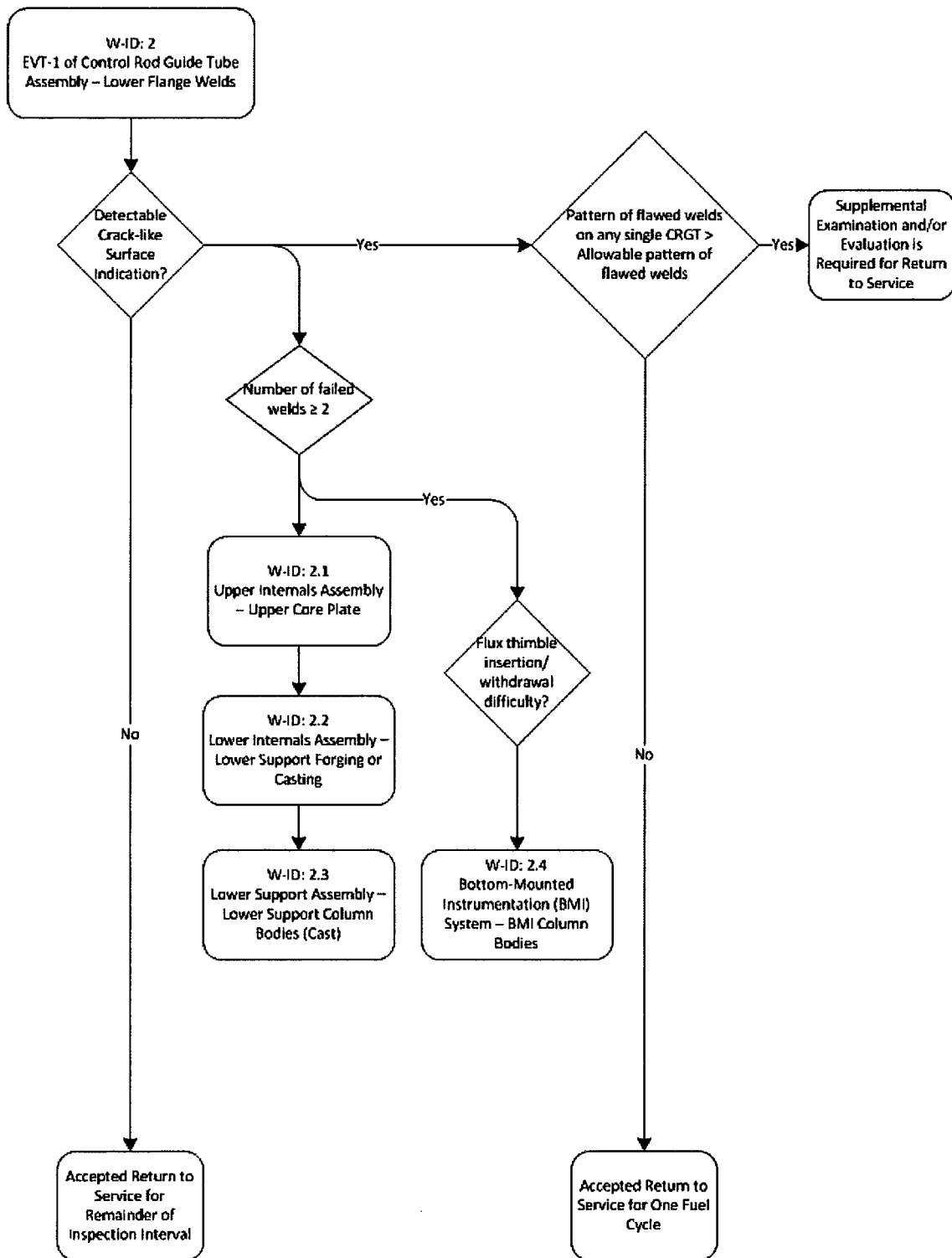
W-ID: 2

**Control Rod Guide Tube Assembly  
Lower Flange Welds**



Approach:

Plant-specific analysis due to large variety of sizes and designs. There may be some potential for smaller plant groupings.





October 27, 2014

WCAP-17096-NP, Rev. 2  
Project Number 694

OG-14-349

Mr. Kyle Amberge, EPRI Project Manager  
Electric Power Research Institute (EPRI)  
3420 Hillview Avenue  
Palo Alto, CA 94304

Subject: Pressurized Water Reactor Owners Group  
**Additional RAI Response (LTR-RIAM-14-91, Rev 2) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 “Reactor Internals Acceptance Criteria Methodology and Data Requirements” (TAC NO. ME4200) PA-MS-C-0473R5**

Dear Mr. Amberge:

In January 2010, the Pressurized Water Reactor Owners Group (PWROG), provided the Electric Power Research Institute (EPRI) WCAP-17096-NP, Revision 2 “Reactor Internals Acceptance Criteria Methodology and Data Requirements” (Reference 1). EPRI submitted the document to the Staff for review and comment under the MRP-227 umbrella (Reference 2). In June 2010, the Staff accepted the topical report (Reference 3) and provided a Request for Additional Information (RAI) (Reference 4) on May 19, 2011. On July 15, 2011, the Staff provided a revision for Request for Additional Information (RAI) (Reference 5) and the PWROG provided responses. Based on the draft RAI input provided under Reference 6, teleconferences were held with the Staff to discuss both the AREVA and Westinghouse responses. The minutes from both calls are provided in Reference 7. Based on those minutes, the RAI responses were revised and provided to EPRI for submittal to the NRC (Reference 8). On October 11, 2012, the NRC provided a second Request for Additional Information (RAI) (Reference 9). The Planning Team has reviewed and provided comments on the second Request for Additional Information (RAI) (Reference 10) and submitted them to EPRI under Reference 11. On December 10, 2012, the NRC provided additional comments via email (Reference 12) on the responses to the RAIs that were submitted under Reference 11. The PWROG provided additional responses on December 20, 2012 (Reference 13). On August 18, 2014 the NRC provided two additional RAIs to the PWROG through the EPRI MRP (Reference 14). Attachment A to Enclosure 1 provides the PWROG response.

The PWROG would like to request that we are kept on distribution, via letter, once the additional response is submitted to the Staff. Updates to the WCAP will be made in parallel with the NRC review of the RAI response. The updated WCAP will be provided to the Staff at a later date.

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References (Continued)

11. Additional RAI Responses (LTR-RIAM-12-138, Rev 0) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-12-495, dated November 21, 2012.
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13. Additional RAI Responses (LTR-RIAM-12-138, Rev 1) to the NRC Request for Additional Information (RAI) on PWR Owners Group (PWROG) WCAP-17096-NP, Revision 2 "Reactor Internals Acceptance Criteria Methodology and Data Requirements" (TAC NO. ME4200) PA-MS-0473, OG-12-519, dated December 20, 2012.
14. Letter from J. Holonich (U.S. NRC Senior Project Manager) to B.C. Rudell (EPRI Materials Reliability Program Chairman), "Request for Additional Information Related to WCAP-17096-NP, Revision 2, 'Reactor Internals Acceptance Criteria Methodology and Data Requirements' (TAC No. ME4200)," dated August 18, 2014, ML14177A071 and posted to the PWROG website under OG-14-331, dated September, 18, 2014.

If you have any questions feel free to contact Mr. Jim Molkenhain of the PWR Owners Group Project Management Office at (860) 731-6727.

Regards,

J. Molkenhain Approving for J. Stringfellow

Jack Stringfellow  
Chief Operating Officer & Chairman  
Pressurized Water Reactor Owners Group

NJS:JPM:kpr

Enclosures (1): Additional RAI Response for WCAP-17096-NP (LTR-RIAM-14-91, Rev 2)

cc: PWROG Steering Committee	PWROG Management Committee
PWROG Licensing Subcommittee	PWROG Materials Subcommittee
PWROG Program Management Office	R. Lott, Westinghouse
J. Rowley, USNRC	J. McKinley, Westinghouse
S. Stuchell, USNRC	P. Paden, Westinghouse
J. Andrachek, Westinghouse	T. Natour, AREVA Inc
P. Paesano, Westinghouse	S. Fyfitz, AREVA Inc
C. Boggess, Westinghouse	B. Grambau, AREVA Inc
E. Deemer, Westinghouse	A. Demma, EPRI
B. Snyder, Westinghouse	

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To: James Molkenthin

Date: October 21, 2014

cc: Barbara Snyder

From: Reactor Internals Aging Management

Your ref: N/A

Ext: (412) 374-3751

Our ref: LTR-RIAM-14-91, Rev. 2

Fax: (724) 940-8548

Subject: WCAP-17096-NP, Revision 2 RAI Response

- References:
1. PWROG PA-MS-C-0473, Revision 5, "Reactor Internals Acceptance Criteria Methodology and Data Requirements," October 2013. (Available from the PWROG website.)
  2. Letter from J. Holonich (U.S. NRC Senior Project Manager) to B.C. Rudell (EPRI Materials Reliability Program Chairman), "Request for Additional Information Related to WCAP-17096-NP, Revision 2, 'Reactor Internals Acceptance Criteria Methodology and Data Requirements' (TAC No. ME4200)," dated August 18, 2014, ML14177A071.
  3. WCAP-17096-NP, Revision 2, "Reactor Internals Acceptance Criteria Methodology and Data Requirements," December 2009.

Attachment A contains the Westinghouse response to the U.S. NRC (United States Nuclear Regulatory Commission) request for additional information (RAI) [2] on WCAP-17096-NP, Revision 2 [3]. The RAI response is part of the scope under PWROG project authorization PA-MS-C-0473 [1].

Revision 1 of this letter provides the resolutions to address PWROG Materials Committee member comments on the previous revision of this document.

Revision 2 of this letter incorporates additional comments received from the Electric Power Research Institute (EPRI) and the PWROG Materials Committee after the issuance of Revision 1. The comments are electronically attached to this document.

If there are any questions, please contact Barbara Snyder by either phone at (412) 374-3751 or email at [snyderbr@westinghouse.com](mailto:snyderbr@westinghouse.com).

Authored by: ELECTRONICALLY APPROVED<sup>1</sup>  
Randy G. Lott  
Primary Systems Design & Repair

Verified by: ELECTRONICALLY APPROVED<sup>1</sup>  
Ernest W. Deemer  
Reactor Internals Aging Management

<sup>1</sup> *Electronically approved records are authenticated in the electronic document management system.*

Approved by: ELECTRONICALLY APPROVED<sup>1</sup>  
Patricia C. Paesano, Manager  
Reactor Internals Aging Management

**Attachment A**

**Response to  
Request for Additional Information Related to WCAP-17096-NP, Revision 2,  
“Reactor Internals Acceptance Criteria Methodology and Data  
Requirements”(TAC No. ME4200), dated August 18, 2014, ML14177A071**

## RAI BACKGROUND

The Electric Power Research Institute Material Reliability Program letters dated April 10, 2014 (Agencywide Documents Access and Management System Accession No. ML14104B579), and July 8, 2014 (ADAMS Accession No. ML14191A014) contained proposed revised procedures for a number of reactor vessel internals components. Proposed evaluation procedures have been received for the following welds for which MRP-227-A specifies or allows visual examinations to be conducted from one side of the weld only:

- CE-ID:6 Core Support Barrel Assembly – Upper (Core Support Barrel) Flange Weld
- CE-ID:6.1 Core Support Barrel Assembly – Lower Core Barrel Flange
- CE-ID:6.2 Core Support Barrel Assembly – Upper Cylinder (Including Welds)
- CE-ID:7, Core Support Barrel Assembly – Lower Cylinder Girth Welds
- CE-ID:7.1 Core Support Barrel Assembly – Core Barrel Assembly Axial Welds
- W-ID:3 Core Barrel Assembly – Upper Core Barrel Flange Weld
- W-ID:4 Core Barrel Assembly – Upper and Lower Core Barrel Cylinder Girth Welds
- W-ID:4.1 Core Barrel Assembly – Upper and Lower Core Barrel Cylinder Axial Welds
- W-ID:5 Core Barrel Assembly – Lower Core Barrel Flange Weld

The following discussion applies to all the welds listed above, for which the proposed evaluation procedures are virtually identical with respect to the assumptions made in determining crack growth. Under “Inputs and Assumptions,” the procedures include the following:

“The inspections identified in MRP-227-A are intended to provide a sampling of potential locations of degradation. Under this approach, inspection of one side (surface) of the weld is assumed to provide an adequate sampling for monitoring stress corrosion cracking (SCC).”

Under “Data Requirements,” the procedures, with respect to “Flaw Depth,” state (in part) that

- (a) For one-sided visual inspections, the flaw is assumed to be through-wall, and
- (b) supplemental examinations may be used to determine flaw depth for a flaw-specific criterion, if needed.

Also under “Data Requirement,” Item 4 states (in part) (b) Stresses which have an insignificant net-through-wall value (average stress is near zero), such as weld residual stresses and thermal stresses due to local through-wall temperature gradients are considered to have minimal impact on the effective crack growth rates in through-wall flaws, and (c) secondary weld residual and thermal stresses need to be considered in determination of axial and through-wall crack growth rates in partial through-wall flaws, whose dimensions would have to be determined with supplemental ultrasonic testing examinations.

Under analysis, the procedures state, in part, that:

“All analyses require an assumption of the SCC/irradiation-assisted stress corrosion cracking (IASCC) crack growth expected over the upcoming period of service. The methodology is based on analysis of a through-wall flaw with weld residual and thermal stresses relieved.”

**RAI 1**

Since supplementary inspections to determine the crack depth are allowed but not required by the evaluation procedure, a visually observed crack may not be through-wall. Considering that weld residual and thermal stresses would still act on a non-through-wall crack, to support the assumption that all visually observed cracks are through-wall is conservative, demonstrate that a non-through-wall crack will not grow at higher rate such that it would attain critical size prior to the next scheduled inspection. This demonstration may be done generically, or the evaluation procedures may be modified to require such a demonstration as part of the evaluation of the specific weld in which degradation has been detected.

**RAI 1 Response**

The through-wall crack assumption provides a conservative estimate of the observed crack depth. As the core barrel is not a pressure boundary component, extension of a crack through-wall is not considered to be a safety related component failure. Mechanical failure of the core barrel girth welds is based on the limiting solution provided by a through-wall flaw with a length equal to the observed surface length. For equivalent external loading, the maximum applied stress intensity factor for circumferential cracking is the through-wall crack.

Weld residual and thermal stresses may affect crack growth rates in cracks that have not grown through-wall. However, weld residual and thermal stresses are relieved as the crack grows through wall. Therefore, the overall effects of these secondary stresses on growth rates of a through-wall crack are diminished. Higher crack growth rates are anticipated in regions where the weld residual and thermal stresses are tensile, and retarded crack growth rates are anticipated when the weld residual and thermal stresses are compressive. For typical weld residual stress distributions, which are compressive in the mid-wall, the conditions favor accelerated crack surface crack growth rates and the formation of high aspect ratio flaws. Through-wall crack growth is not anticipated in flaws when the surface length is comparable to the barrel thickness.

Accelerated surface crack growth rates on non-through-wall cracks may be higher than the predicted circumferential crack growth rates for through-wall cracks. However, these higher crack growth rates do not imply that the crack has grown through-wall. Evaluation of crack growth in a non-through-wall crack would require both supplemental inspections to determine crack depth and complicated finite element analysis (FEA) models to simulate the relaxation of the secondary thermal and weld residual stresses as the crack grows. As an alternative, a crack growth verification requirement was included in the WCAP-17096 core barrel weld acceptance criteria methodologies. The intent of this verification requirement is to assure that the through-wall flaw analysis will remain conservative through the allowed inspection interval. Observation of crack growth rates exceeding the predicted rate would require further evaluation of the specific weld in which the degradation has been detected. The observation of unexpectedly high crack growth rates would trigger a reassessment of these criteria.

No changes to WCAP-17096-NP, Revision 2 are required to address RAI 1.

## **RAI 2**

Under “Analysis,” the procedures state that in order to apply the acceptance criteria to a full 10-year inspection interval, follow-up action is required to verify the assumptions used in the predicted crack-growth rate, and that a re-inspection of the indication at a future specified outage, for example, would provide data that could be used to satisfy this verification requirement. Modify the evaluation procedures to address the following:

- a. Define the re-inspection time, e.g. the first refueling outage after the initial inspection, and describe how the required re-inspection time is determined.
- b. Provide details about any follow-up action other than re-inspection, and justify how such actions could verify the predicted crack growth rate.

## **RAI 2 Response**

- a. The evaluation procedures will be modified to state that a crack growth rate verification plan shall be established. A technical justification will be required for any verification period greater than one fuel cycle. One fuel cycle is the shortest practical re-inspection time for the verification process. However, longer times may be justified dependent on the specific results, including supplemental exams that might have been performed and given the range of analysis options subject to the specific circumstances. The acceptance criteria methodology in WCAP-17096 requires an evaluation for allowance for ten years of crack growth in an assumed through-wall flaw. Any re-inspection requirement in the evaluation must be logically assessed against what is actually detected during the examination, taking into account any supplemental flaw characterization that might have been performed, geometry, location and optionally more complex analysis and evaluation that may be performed at the time. The actual inspection results will point the utility in the correct direction based on the guidance within WCAP-17096-NP and the reporting requirement assures that the staff will have timely oversight of the process.
- b. Initial applications of this methodology have required a follow-up re-inspection to verify the crack growth rate. It is recognized that follow-up actions other than re-inspection may involve supplemental examinations, testing or more complex analysis using updated crack growth models. Such alternatives would require technical justification.

Propose the following change to “Analysis” section for all Westinghouse and CE core barrel components in WCAP-17096:

“In order to apply the acceptance criteria to a full 10-year inspection interval, additional action is required. The flaw evaluation will address the verification process of the predicted crack growth rate. Depending on the flaw size and knowledge of the plant conditions, a re-inspection at the next refueling outage may be required to provide data needed to operate beyond one cycle. The verification plan shall be included in the evaluation which is submitted to the regulator for their information.”

# AGENDA

## Materials Reliability Program Inspection TAC Meetings

November 12-13, 2014 • Fort Lauderdale, FL

WEDNESDAY, NOVEMBER 12, 2014			
TIME	#	TOPIC	PRESENTER
8:00am	-	Introductions & Review of Meeting Objectives	<i>E. Fernandez / J. Spanner</i>
8:10am	1	Internals Focus Group Report	<i>R. Doss / J. Spanner [Inform]</i>
8:40am	2	Review Status of Internals Projects (~10 min. per project): <ul style="list-style-type: none"> <li>- Internals Visual Examination Support Task</li> <li>- IVI Course Development</li> <li>- Develop NDE Techniques for Plate and Weld Inspection Task</li> <li>- Develop Field of View Remote VT Technique</li> </ul>	<i>J. Spanner</i>
9:45am	3	PWROG Report	<i>E. Fernandez</i>
10:00am	-	Break	<i>All</i>
10:20am	4	Head Penetration Focus Group Report	<i>E. Fernandez [Inform]</i>
10:50am	5	Review Status of RVUHP Tasks <ul style="list-style-type: none"> <li>- RVUHP Qualification Program Status</li> <li>- RVUHP Mockup Development</li> </ul>	<i>B. Grizzi / M. McAllum</i>
11:20am	6	<ul style="list-style-type: none"> <li>- Guideline for Preparing for an Upper Head NDE Examination and Resolving Indications</li> <li>- Update Upper Head BMV Guide Report</li> <li>- Technology Enhancements for ID Piping Examinations</li> </ul>	<i>J. Spanner</i>
12:00pm		Lunch	<i>All</i>
1:00pm	7	Mitigation NDE Focus Group Report –	<i>R. Hall [Inform]</i>
1:15pm	8	<ul style="list-style-type: none"> <li>- Demonstration for New Mitigation Techniques</li> </ul>	<i>M. McAllum / Grizzi</i>
1:45am	9	<ul style="list-style-type: none"> <li>- NDE Capability for Peening Mitigation</li> <li>- NRC VT Round Robin Support</li> <li>- Update on BMN Code Case</li> </ul>	<i>J. Spanner</i>
2:05pm	10	<ul style="list-style-type: none"> <li>- Small Bore Socket Weld Examination</li> </ul>	<i>P. Lara</i>
2:30pm		Break	<i>All</i>
2:45pm	11	OE Discussions – <ul style="list-style-type: none"> <li>- OE Round Table</li> </ul>	<i>All [Inform]</i>
3:50pm	12	<ul style="list-style-type: none"> <li>- McGuire Small Bore Pipe Update</li> </ul>	<i>J. Shuping</i>
4:10pm	13	<ul style="list-style-type: none"> <li>- RMSE Project Status</li> </ul>	<i>J. Spanner</i>

## Materials Reliability Program Inspection TAC Meetings

November 13-14, 2014 • Fort Lauderdale, FL

WEDNESDAY, NOVEMBER 12, 2014

TIME	#	TOPIC	PRESENTER
4:45pm	-	Review Action Items	<i>M. McAllum / All</i>
5:00pm	-	<b>Adjourn</b>	<i>All</i>

### CLOSED PORTION of Inspection TAC Meeting

THURSDAY, NOVEMBER 13, 2014

TIME	#	TOPIC	PRESENTER
8:00am	-	Introductions & Review Objectives of <b>CLOSED</b> Meeting	<i>E. Fernandez / J. Spanner [Inform]</i>
8:10am	14	Tasks, Budget, and Program Adjustments - 2015 2016 Greybook Project Prioritizations <ul style="list-style-type: none"> <li>- Discussion (adjustments?)</li> <li>- Scoring of Proposed New Tasks - 2016</li> <li>- Final Rank Order of Projects - 2016</li> </ul> Committee Membership and Changes	<i>E. Fernandez / J. Spanner [Vote]</i>
10:00am	-	Break	<i>All</i>
10:15am	15	MRP / NRC Interactions (Recent & Planned) <ul style="list-style-type: none"> <li>- Status on MRP-227A Revision</li> <li>- Plan for NDE Meeting with NRC Jan 13-15</li> </ul>	<i>J. Spanner [Inform] E. Fernandez [Discuss]</i>
11:00am	16	Develop MRP-228 Site Specific Training - Delivery	<i>J. Spanner [Discuss]</i>
11:30am	-	Review of Action Items	<i>M. McAllum / All</i>
12:00pm	-	<b>Adjourn</b>	<i>All</i>



# AGENDA

## Materials Reliability Program Integration Committee Meeting

November 13-14, 2014 • Fort Lauderdale, FL

THURSDAY, NOVEMBER 13, 2014			
TIME	#	TOPIC	PRESENTER
01:00 pm	-	Review Agenda & Action Items	<i>B. Rudell</i>
01:10 pm	1	Assessment TAC Report (Including Update on MRP-227, Revision 1 and CASS Projects on Piping and Internals)	<i>W. Sims / K. Amberge</i>
01:40 pm	2	Inspection TAC Report	<i>E. Fernandez / J. Spanner</i>
02:10 pm	3	Mitigation & Testing TAC Report (Including Lithium Effects on IASCC Initiation Update)	<i>J. Gobell / J. Smith</i>
02:40 pm	4	Technical Support TAC Report (Including Mc Guire-1 OE and Potential MRP-146 Implications)	<i>M. Hoehn / M. McDevitt</i>
03:20 pm	-	Break	
03:30 pm	5	BTP 5-3 and Doel 3 Issues Update	<i>T. Hardin</i>
04:10 pm	6	BMN Inspection Strategy Summary	<i>C. Harrington</i>
04:40 pm	7	Peening Update	<i>P. Crooker</i>
05:00 pm	-	<b>Adjourn for the day</b>	

Each TAC will report on:

- 1) 2015 Budget
  - a) Highlight any changes from 2015 Budget sent to TACs for November TAC Meetings
  - b) Overview of your highest priority task for 2015
- 2) 2016 Budget request (in priority order by TAC ranking, include task scores)
  - a) Indicate the TAC likely "cut line" and discuss two tasks above and two tasks below the likely cut line
- 3) Status of Participation and Succession Planning for each TAC
- 4) Overview of major activities for 1<sup>st</sup> quarter 2015
- 5) Planned communications with NRC in 2015-16 including planned meetings and reports to be submitted to the NRC for evaluation or information
- 6) PMMP Executive Committee Items (optional)
  - a) Support needed during 2015 (especially 1<sup>st</sup> quarter items)
  - b) Products that will require PMMP EC approval in 2015

## MATERIALS RELIABILITY PROGRAM INTEGRATION COMMITTEE MEETING

November 13-14, 2014 • Fort Lauderdale, FL

FRIDAY, NOVEMBER 14, 2014			
TIME	#	TOPIC	PRESENTER
08:00 am	8	2015 Budget <i>Commission 2015 Work</i>	<i>A. Demma</i> <i>IC Members</i>
08:30 am	9	2016 Budget Request <i>Approve 2016 Rev. 0 Budget for PMMP</i> <i>Presentation in January</i>	<i>A. Demma</i> <i>IC Members</i>
10:00 am	-	Break	
10:15 am	10	2014 Deliverables and Executive Roadmaps Status	<i>A. Demma</i>
10:30 am	11	TAG Transition Plan	<i>M. McDevitt</i>
11:00 am	12	PWROG MSC Update	<i>C. Koehler</i>
11:20 am	13	INPO Update	<i>R. Crane</i>
11:40 am	-	Other Business: Review Deviations, PMMP Executive Committee Items, etc.	
12:00 pm	-	<b>Adjourn for the day</b>	

# AGENDA

## Materials Reliability Program Assessment TAC Meeting

November 12-13, 2014 • Fort Lauderdale, FL

WEDNESDAY, NOVEMBER 12, 2014

TIME	#	TOPIC	PRESENTER
<b>Discussions of 2014+2015 Deliverables, Completed Projects, and Emergent Issues</b>			
8:00 am	-	Introductions, Review Objectives, Agenda, and Highlights	<i>William Sims</i>
<b>2014-2016 – New, Modified, and Ongoing Project Tasks</b>			
8:30 am	1	Latest results / Update for Irradiated Materials Testing  Project 2 – Materials Degradation Modeling for Reactor Internals <ul style="list-style-type: none"> <li>– Task 2.2 Improvement of the Void Swelling Model</li> <li>– Cluster Dynamics (ongoing)</li> <li>– Task 2.6 IASCC Bolt Failure using Westinghouse Model (New)</li> <li>– Task 2.7 Cluster Dynamics Prediction of Irradiation Creep (ongoing)</li> </ul>	<i>Jean Smith [Inform]</i>
10:00 am	-	Break	
10:15 am	2	Project 1 – Materials Degradation Assessment and Guidance for Reactor Internals  MRP-227 Status Update, including REVISION 1 <ul style="list-style-type: none"> <li>– Task 1.1 Reactor Internals I&amp;E Guidelines Support</li> <li>– Task 1.2 Collection and Tracking of Industry Reactor Internals Inspection and Evaluation Results (ongoing)</li> <li>– Task 1.4 Technical Basis for Examination Frequency and Coverage Requirements for Expansion Components (New)</li> <li>– Task 1.5 Evaluation of Reactor Internals Management Strategy Beyond 60 Years of Operation</li> </ul>	<i>Kyle Amberge [Inform]</i>
12:00 pm	-	Lunch	
1:00 pm	3	T <sub>cold</sub> Status and OE <ul style="list-style-type: none"> <li>– PV3 BMN OE – Discussion and Actions</li> <li>– RV Upper Heads</li> </ul>	<i>Craig Harrington [Inform]</i>

## MATERIALS RELIABILITY PROGRAM ASSESSMENT TAC MEETING

November 12-13, 2014 • Fort Lauderdale, FL

WEDNESDAY, NOVEMBER 12, 2014			
TIME	#	TOPIC	PRESENTER
1:45 pm	4	Project 5 - Alloy 600/690 Management	<i><b>Craig Harrington</b></i> <i><b>[Inform]</b></i>
	5	<ul style="list-style-type: none"> <li>- Task 5.1 Support for A600 Issues (ongoing)</li> <li>- Task 5.2 BMN Flaw Indication Response Handbook (ongoing)</li> <li>- Task 5.3 Alloy 690 RV Head Inspection Period Optimization (ongoing)</li> <li>- Task 5.5 Update of MRP-55 and -115 (New)</li> <li>- Task 5.8 A690 Inspection Optimization – Inlay/Onlay (New)</li> <li>- Task 5.9 Visual inspection for Leakage defense Strategy Development (New)</li> <li>- Task 5.10 Updated Compilation of A600 PWSCC Experience (New)</li> </ul>	<i><b>Paul Crooker</b></i> <i><b>[Inform/Close]</b></i>
2:45 pm	-	Break	
3:00 pm	6	Welding Residual Stress FEA Model Validation - Task 9.2 Improving WRS FEA Model Predictions	<i><b>Paul Crooker</b></i> <i><b>[Inform/Close]</b></i>
3:15 pm	7	Project 6 Alloy 600 PWSCC Mitigation - Task 6.3 Peening Technical Documentation (ongoing) - ASME Code Case for PWSCC Mitigation by Peening - NRC Review status and schedule	<i><b>Paul Crooker [Inform]</b></i>
3:30 pm	8	Project 9 – Leak Before Break Evaluation (xLPR) - Task 9.1 xLPR Project Development & Support (Ongoing) - Task 9.5 LBB PWSCC Resolution Using xLPR V2.0 Analysis Planning & Data Collection - What's next?	<i><b>Craig Harrington</b></i> <i><b>[Inform]</b></i>
4:15 pm	-	Open Forum Discussion of Recent Plant OE / Inspections	<i><b>All [Inform]</b></i>
5:00 pm	-	Adjourn	

## MATERIALS RELIABILITY PROGRAM ASSESSMENT TAC MEETING

November 12-13, 2014 • Fort Lauderdale, FL

THURSDAY, NOVEMBER 13, 2014			
TIME	#	TOPIC	PRESENTER
<b>2015-2016 R&amp;D Program Planning (Open Session)</b>			
<b>8:00 am</b>	-	Preliminary 2015 Deliverables, 2015 Meeting Dates, and 1-2Q2015 R&D and Priorities – Open Discussion	<b><i>All [Inform/Decision]</i></b>
<b>9:30 am</b>	-	Break	
<b>2015-2016 R&amp;D Program Planning / Budgets (Closed Session)</b>			
<b>9:45 am</b>	-	<ul style="list-style-type: none"> <li>- Tasks, Budget, and Program Adjustments - 2015</li> <li>- Scoring of Proposed New Tasks - 2016</li> <li>- Final Rank Order of Projects - 2016</li> <li>- Committee Membership and Changes</li> </ul>	<b><i>MRP Utilities [Vote]</i></b>
<b>12:00 pm</b>	-	<b>Adjourn</b>	

# AGENDA

## Materials Reliability Program Mitigation and Testing TAC Meetings

November 10-11, 2014 • Fort Lauderdale, FL

NOVEMBER 10, 2014			
#	TIME	TOPIC	PRESENTER
01	1:00 pm	Introductions, Review Meeting Objectives, Agenda, and Highlights	<i>Jamie GoBell [Inform]</i>
02	1:30 pm	Review and Discussion of 2014 Deliverables	<i>Jean Smith [Inform]</i>
03	2:00 pm	Project 10: Stainless Steel Degradation Mechanism Studies	<i>Al Ahluwalia [Inform]</i>
04	2:30 pm	Project 5: Alloy 600/690 Management – 5.3 Alloy 690 RV Head Inspection Period Optimization	<i>Paul Crooker [Inform]</i>
	3:00 pm	Break	
05	3:15 pm	Project 4: Reactor Internals Irradiated Materials Testing – 4.1 Zorita Internals Research Project	<i>Jean Smith [Inform]</i>
06	4:00 pm	Project 4: Reactor Internals Irradiated Materials Testing – 4.4 Thermal and Irradiation Embrittlement and Environmental Effect Testing of SS – 4.6 CGR Testing of Irradiated Stainless Steel Weld and HAZ Materials – 4.7 Determination of IASCC in Zorita after Post-Reactor Irradiation	<i>Jean Smith [Inform]</i>
07	4:15 pm	New project discussions	<i>All [Inform]</i>
	4:45 pm	Discussion	<i>All</i>
	5:00 pm	Adjourn	<i>All</i>

NOVEMBER 11, 2014			
#	TIME	TOPIC	PRESENTER
<i>2014-2015 R&amp;D Program Planning (Open Session)</i>			
	8:00 am	Review Agenda and Objectives	<i>Jamie GoBell</i>
08	8:10 am	Project 4: Reactor Internals Irradiated Materials Testing	<i>Jean Smith [Inform]</i>

## Materials Reliability Program Mitigation and Testing TAC Meetings

November 10-11, 2014 • Fort Lauderdale, FL

NOVEMBER 11, 2014			
#	TIME	TOPIC	PRESENTER
		– 4.5 Effect of Li on the SCC Initiation in Irradiated Stainless Steel	
09	8:45 am	Project 12: Replacement Materials	<i>Al Ahluwalia [Inform]</i>
10	9:15 am	Project 4: Reactor Internals Irradiated Materials Testing – 4.8 Dynamic Strain Effects on IASCC Initiation Rates – 4.9 IASCC Testing Program for Baffle-Former Bolts	<i>Jean Smith [Inform]</i>
	10:00 am	Break	
11	10:15 am	Project 4: Reactor Internals Irradiated Materials Testing – 4.2 Gondole Void Swelling Irradiation and Testing – 4.3 Halden Research Program	<i>Jean Smith [Inform]</i>
12	10:30 am	Project 17: Environmentally-Assisted Fatigue – 17.2 Evaluation of Environmentally-Assisted Fatigue Degradation – Long Term Activities	<i>Jean Smith [Inform]</i>
13	11:30 am	M&T TAC Roadmap Management for 2015 Preliminary 2015 Deliverables, Meeting Dates, and 1&2Q R&D Priorities – Open Discussion	<i>All [Inform]</i>
	12:00 pm	Lunch	
<b>2015 – 2016 R&amp;D Program Planning/Budgets (Closed Session)</b>			
14	1:00 pm	<b>2015</b> – Tasks – Budget <b>2016</b> – Scoring of Proposed New Tasks – Budget – Program Adjustments – Final Rank Order of Projects  Planned Contracts, Priorities and Schedule in 1Q 2015  Committee Membership and Changes	<i>MRP Utilities [Vote]</i>
	5:00 pm	Adjourn	





## Materials Reliability Program Technical Support TAC Meetings

November 10-11, 2014 • Fort Lauderdale, FL

MONDAY, NOVEMBER 10, 2014			
TIME	#	TOPIC	PRESENTER
4:40 pm	05	NEI 03-08 Guideline & Deviation Review	<i>McDevitt</i>
4:50 pm	06	2015 Inspection Survey: Proposed Changes for MRP-219	<i>McDevitt</i>
5:00 pm		<b>Day 1 Summary &amp; Adjourn</b>	

TUESDAY, NOVEMBER 11, 2014			
TIME	#	TOPIC	PRESENTER
8:00 am	-	Day 2 Agenda review	<i>Hoehn / Childress</i>
8:10 am	07	RPV Integrity Projects Overview and Status	<i>Hardin</i>
10:15 am		Break	
10:30 am	08	ASME XI Appendix G P-T Curve Small Flaw Issue	<i>Hardin</i>
11:00 am	09	Potential Emergent Issue: Non-conservatism of Branch Technical Position 5-3 Alternate Methods for Determining Initial RT <sub>NDT</sub>	<i>Hardin</i>
12:00 pm		Lunch	
1:00 pm	10	RPV Roadmap	<i>Hardin / All</i>
<b>CLOSED PORTION of Technical Support TAC Meeting</b>			
1:30 pm	11	2015-2016 Ranking Results Review, Final Project Ranking	<i>McDevitt / Hardin</i>
2:30 pm		Break	
2:45 pm	-	2015-2016 Ranking Results Review, Final Project Ranking (continued)	<i>McDevitt / Hardin</i>
4:00 pm		Summary and Future Planning	<i>All</i>
4:45 pm		Action Item Review	
5:00 pm		<b>Adjourn</b>	