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Windsor, Connecticut 06095

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December 15, 2017

OG-17-329 Rev. 1

U.S. Nuclear Regulatory Commission  
Document Control Desk  
11555 Rockville Pike  
Rockville, MD 20852

Subject: PWR Owners Group  
**Submittal of BAW-2192-P, Revision 0, Supplement 1 and BAW-2178-P, Revision 0, Supplement 1 (PA-MS-C-1481)**

References: Transmittal of the PWROG Meeting Materials from the November 8, 2017 NRC/PWROG Pre-Submittal Meeting for BAW-2192-P Supplement 1 and BAW-2178-P Supplement 1 (PA-MS-C-1481), OG-17-332, dated December 11, 2017

The purpose of this letter is to submit the following Topical Report (TR) Supplements developed by the Pressurized Water Reactor Owners Group (PWROG) in program PA-MS-C-1481 for Linde 80 Weld Low Upper-Shelf Toughness Fracture Mechanics Analysis:

1. BAW-2192-P, Supplement 1, Revision 0, Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads
2. BAW-2178-P, Supplement 1, Revision 0, Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads

As discussed at the pre-submittal meeting with the NRC on November 8, 2017, the purpose of BAW-2192, Supplement 1, and BAW-2178, Supplement 1 is to provide the NRC with 80-year equivalent margins analyses (EMA) for Linde 80 and applicable Rotterdam welds associated with reactor vessels fabricated by the Babcock & Wilcox Company for the applicable units. The EMA is reported for all reactor vessel welds that are expected to receive neutron fluence  $> 1.0E17$  n/cm<sup>2</sup> ( $E > 1.0$  MeV) at 80 years. The EMA is in direct support of future subsequent license renewal applications.

The EMA utilizes the B&WOG J-integral resistance (J-R) Model 4B reported in BAW-2192PA, Appendix B. Model 4B was developed based on fracture toughness test data obtained through approximately 1990 to support 40-years of operation. Eighty-year fluence estimates for the participating plants exceed 40-year fluence and use of Model 4B to estimate J-integral resistance values, including the associated model uncertainty, for 80-years is made by extrapolation of the model. To assess the model extrapolation uncertainty, Model 4B is compared to new fracture toughness test data (1990 to 2017) irradiated to fluence expected at 80-years. The majority of test data fell above the Model 4B mean and all of the test data fell above the Model 4B mean minus 2 standard error band. Therefore, use of Model 4B and associated uncertainty to extrapolate J-integral resistance for 80-year fluence applications was determined to be appropriate. This assessment is reported in BAW-2192, Supplement 1, Appendix A.

To further substantiate the use of Model 4B, all of the original fracture toughness data used to develop Model 4B was combined with new fracture toughness data, assuming the same model form, and a new Model 6B was generated. Model 6B was found to be essentially equivalent to Model 4B with respect to model mean and 2 standard errors. The EMA results reported herein using Model 4B were reconciled to Model 6B, with little or no change to the EMA results. Model 6B development and the EMA reconciliation to Model 4B are reported in BAW-2192, Supplement 1, Appendix A.

The PWROG requests the following from the NRC relative to review of these topical reports.

- For the Linde 80 and Rotterdam welds in scope of the reports--finding that the equivalent margins analyses have been projected to the end of the subsequent period of extended operation in accordance with 10 CFR 54.21 (c)(1)(ii)
- NRC approval of EMA--Japplied and use of B&WOG J-integral resistance Model 4B for fluence levels expected at 80-years for the participating plants.
- NRC to identify license renewal application applicant action items for use of the TRs by the participating utilities (see NRC SER of BAW-2251A)

The enclosed TR Supplements (Enclosures 1 and 3) contain information proprietary to AREVA Inc; which is supported by an affidavit signed by AREVA, owner of the information. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b) (4) of Section 2.390 of the Commission's regulations. The affidavit is included as Enclosure 5.

Accordingly, it is respectfully requested that this information which is proprietary to AREVA be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the proprietary aspects of the information or supporting AREVA affidavit should reference this letter and should be addressed to Mr. Philip Opsal, Manager, Product Licensing, AREVA Inc., 3315 Old Forest Road, Lynchburg, Virginia 24506-0935.

**TR Classification:** As discussed above, these TR Supplements address low upper-shelf toughness fracture mechanics analyses of B&W fabricated reactor vessels, that will be used for evaluating the upper shelf energy (equivalent margins analyses), on a plant-specific basis.

**Specialized Resource Availability:** These TR Supplements are being submitted to the NRC for review and approval so that the NRC approved version can be utilized for performing plant-specific evaluations of the equivalent margins analyses for the applicable units. NRC approval of the generic TR Supplements will provide a common approach that will be utilized to address the low upper-shelf toughness fracture mechanics analyses of B&W fabricated reactor vessels.

This letter transmits BAW-2192-P, Supplement 1, Revision 0 (Enclosure 1), BAW-2192-NP, Supplement 1, Revision 0 (Enclosure 2), BAW-2178-P, Supplement 1, Revision 0 (Enclosure 3), and BAW-2178-NP, Supplement 1, Revision 0, (Enclosure 4). A notarized Affidavit is provided as Enclosure 5.

**Applicability:** These TR Supplements are applicable to B&W fabricated Nuclear Steam Supply System (NSSS) plants that are participating in the PWROG program, PA-MS-1481.

### **Request for Review Fee Waiver**

The PWROG will be requesting that a fee waiver be considered for BAW-2192-P Supplement 1 and BAW-2178-P Supplement.

- This is the first submittal in industry that supports operation to 80 years. Review of these topical reports will permit the NRC to review an industry first evaluation of time-limited aging analyses (TLAA) in accordance with 54.21 C (1) (ii) for subsequent license renewal.
- The B&WOG J-R model has historically been compared to the Linde 80 J-R model reported in NUREG/CR-5729. The NUREG/CR-5729 model is based on data that does not cover the subsequent period of operation. If interested, the NRC may request the additional test data for use to update the NUREG/CR-5729 model.

### **NRC Review Schedule**

The PWROG requests that the NRC complete their review of the TR by December 31, 2018.

Correspondence related to the non-proprietary transmittal should be addressed to:

Mr. W. Anthony Nowinowski, Program Manager  
PWR Owners Group, Program Management Office  
Westinghouse Electric Company  
1000 Westinghouse Drive, Suite 380  
Cranberry Township, PA 16066

If you have any questions, please do not hesitate to contact me at (434) 832-2382 or Mr. W. Anthony Nowinowski, Program Manager of the PWR Owners Group, Program Management Office at (412) 374-6855.

Sincerely yours,

D. Page Blair Approving for J. Stringfellow

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

NJS:DRPB:am

- Enclosure 1: BAW-2192-P, Supplement 1, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads" (Proprietary)
- Enclosure 2: BAW-2192-NP, Supplement 1, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads"
- Enclosure 3: BAW-2178-P, Supplement 1, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads" (Proprietary)
- Enclosure 4: BAW-2178-NP, Supplement 1, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads"
- Enclosure 5: Affidavit for Withholding Proprietary Information

cc with enclosures:

B. Benney, US NRC

cc with non-proprietary enclosures:

PWROG Materials Committee Representatives in MSC-1481

cc without enclosures:

PWROG Steering and Management Committee

PWROG Licensing Committee

PWROG PMO

E. Dorman, AREVA

J. Fleck, AREVA

B. Haibach, AREVA

P. Thallapragada, AREVA

M. Rinckel, AREVA

P. Opsal, AREVA

B. Watson, AREVA

G. Elliott, AREVA

D. Page Blair, AREVA



5. These Documents has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in these Documents be withheld from public disclosure. The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by AREVA to determine whether information should be classified as proprietary:

- (a) The information reveals details of AREVA's research and development plans and programs or their results.
- (b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.
- (c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA.
- (d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA in product optimization or marketability.
- (e) The information is vital to a competitive advantage held by AREVA, would be helpful to competitors to AREVA, and would likely cause substantial harm to the competitive position of AREVA.

The information in these Documents is considered proprietary for the reasons set forth in paragraphs 6(b), 6(c) and 6(d) above.

7. In accordance with AREVA's policies governing the protection and control of information, proprietary information contained in these Documents has been made available, on

a limited basis, to others outside AREVA only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

*Regina O'Neil*

SUBSCRIBED before me this 15<sup>th</sup>  
day of December, 2017.

*Sherry L. McFaden*

Sherry L. McFaden  
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA  
MY COMMISSION EXPIRES: 10/31/18  
Reg. # 7079129

