

February 1, 2005

Mr. Jerald S. Holm  
Director, Regulatory Affairs  
Framatome ANP  
3815 Old Forest Road  
Lynchburg, VA 24501

SUBJECT: DRAFT SAFETY EVALUATION FOR BABCOCK AND WILCOX OWNERS  
GROUP TOPICAL REPORT BAW-1543(NP), REVISION 4, SUPPLEMENT 5,  
"SUPPLEMENT TO THE MASTER INTEGRATED REACTOR VESSEL  
SURVEILLANCE PROGRAM" (TAC NO. MC1762)

Dear Mr. Holm:

By letter dated December 19, 2003, Babcock and Wilcox Owners Group (B&WOG) submitted BAW-1543(NP), Revision 4, Supplement 5, "Supplement to the Master Integrated Reactor Vessel Surveillance Program" to the staff for review. Enclosed for B&WOG review and comment is a copy of the staff's draft safety evaluation (SE) for topical report BAW-1543(NP), Revision 4, Supplement 5.

Twenty working days are provided to you to comment on any factual errors or clarity concerns contained in the SE. The final SE will be issued after making any necessary changes and will be made publicly available. The staff's disposition of your comments on the draft SE will be discussed in the final SE.

To facilitate the staff's review of your comments, please provide a marked-up copy of the draft SE showing proposed changes and provide a summary table of the proposed changes. Number the lines in the marked up SE sequentially and provide a summary table of the proposed changes.

In the event of any comments or questions, please contact Drew Holland at (301) 415-1436.

Sincerely,

**/RA/**

Robert A. Gramm, Chief, Section 2  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Project No. 693

Enclosure: Draft Safety Evaluation

February 1, 2005

Mr. Jerald S. Holm  
Director, Regulatory Affairs  
Framatome ANP  
3815 Old Forest Road  
Lynchburg, VA 24501

SUBJECT: DRAFT SAFETY EVALUATION FOR BABCOCK AND WILCOX OWNERS  
GROUP TOPICAL REPORT BAW-1543(NP), REVISION 4, SUPPLEMENT 5,  
"SUPPLEMENT TO THE MASTER INTEGRATED REACTOR VESSEL  
SURVEILLANCE PROGRAM" (TAC NO. MC1762)

Dear Mr. Holm:

By letter dated December 19, 2003, Babcock and Wilcox Owners Group (B&WOG) submitted BAW-1543(NP), Revision 4, Supplement 5, "Supplement to the Master Integrated Reactor Vessel Surveillance Program" to the staff for review. Enclosed for B&WOG review and comment is a copy of the staff's draft safety evaluation (SE) for topical report BAW-1543(NP), Revision 4, Supplement 5.

Twenty working days are provided to you to comment on any factual errors or clarity concerns contained in the SE. The final SE will be issued after making any necessary changes and will be made publicly available. The staff's disposition of your comments on the draft SE will be discussed in the final SE.

To facilitate the staff's review of your comments, please provide a marked-up copy of the draft SE showing proposed changes and provide a summary table of the proposed changes. Number the lines in the marked up SE sequentially and provide a summary table of the proposed changes.

In the event of any comments or questions, please contact Drew Holland at (301) 415-1436.

Sincerely,

**/RA/**

Robert A. Gramm, Chief, Section 2  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Project No. 693

DISTRIBUTION:  
PUBLIC

RidsAcrcAcnwM  
ailCenter  
RidsOgcRp

Enclosure: Draft Safety Evaluation

PDIV-2 Reading  
RidsNrrDlpmPdiv(HBerkow) MKhanna  
RidsNrrDlpmPdiv2 (RGramm) RidsNrrLADJohnson  
SCoffin RidsNrrPMDHolland

**ACCESSION NO: ML050130501**

**NRR-106**

OFFICE	PDIV-1/PM	PDIV-1/LA	EMCB	PDIV-2/SC
NAME	DHolland:sp	DJohnson	SCoffin*	RGramm
DATE	1/31/05	1/31/05	1/6/05	2/1/05

OFFICIAL RECORD COPY \*SE Input

DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

MASTER INTEGRATED REACTOR VESSEL SURVEILLANCE PROGRAM

TOPICAL REPORT BAW-1543, REVISION 4, SUPPLEMENT 5

1.0 INTRODUCTION

By letter dated December 19, 2003, the Babcock and Wilcox (B&W) Owners Group (B&WOG) Reactor Vessel Working Group submitted, for NRC approval, topical report (TR) BAW-1543(NP), Revision 4, Supplement 5, "Supplement to the Master Integrated Reactor Vessel Surveillance Program." The revisions contained in this supplement were necessary due to a commitment not being met in Supplement 4, because capsules OC1-D and OC3-F could not be removed from Crystal River Unit 3.

2.0 BACKGROUND

By letter dated April 10, 2001, the B&WOG submitted, for staff approval, report BAW-1543, Revision 4, Supplement 4, "Supplement to the Master Integrated Reactor Vessel Surveillance Program." BAW-1543, Revision 4, reported the essential features of the master integrated reactor vessel surveillance program (MIRVSP) for all operating B&W 177-fuel assembly (FA) plants and those Westinghouse plants having B&W-fabricated reactor vessels. These reactor vessels include seven B&W-designed 177- FA plants and nine Westinghouse-designed plants with B&W-fabricated reactor vessels. The program was built upon the integrated surveillance program developed by the B&WOG for the B&W 177-FA plants. All 16 reactors are of the same basic design concept: pressurized water reactor, operating at 550 EF and 2250 psi nominal inlet temperature and pressure, and with low enrichment fuel (approximately 2% to 4% enrichment).

The irradiation schedules for the B&WOG MIRVSP include the plant-specific capsules for the B&W- and Westinghouse-designed vessels, and the supplementary weld metal surveillance capsules and higher fluence supplementary weld metal surveillance capsules. All the irradiations, with the exception of Capsule W1 and the Westinghouse plant-specific capsules, are performed in the B&W host reactors, Crystal River Unit 3 and Davis-Besse. Capsule W1, an irradiation capsule of the Westinghouse-design, is being irradiated in Surry Unit 2. The Westinghouse plant-specific capsules are irradiated in their respective plants. An updated list of the status of the Westinghouse and B&W plant-specific/integrated surveillance capsules is provided in Attachment 1.

The staff evaluated the B&WOG's basis for the integrated program concept. The criterion as provided by Appendix H to 10 CFR Part 50, "Reactor Vessel Material Surveillance Program Requirements," were met; therefore, the staff determined the MIRVSP to be acceptable. By letter dated June 11, 1991, BAW-1543, Revision 3, was approved by the NRC. The staff noted that the discussions of BAW-1543, Revision 4, were essentially the same as those found in BAW-1543, Revision 3, except for an update of some of the units' withdrawal schedules. BAW-1543, Revision 4, Supplement 1, contained quantitative information which was, in general, fluence dependent and, therefore, subject to change. This revision reflected revised fluence values for some units and revised some withdrawal schedules to comply with American Society for Testing and Materials (ASTM) Standard E 185-73, "Standard Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels." It was anticipated that future revisions to BAW-1543 would only involve the Revision 4 Supplement. BAW-1543, Revision 4, Supplement 2, reflected the revised fluence values and the revised withdrawal schedules, and, therefore, replaced BAW-1543, Revision 4, Supplement 1.

The B&WOG later revised and replaced Supplement 2 of Revision 4 of the subject report with Supplement 3. In Supplement 3, the B&WOG deleted Rancho Seco, R.E. Ginna, and Zion Units 1 and 2 from the program. In addition, the B&WOG updated the capsule status and the peak end-of-license fluences for several plants. In Supplement 4, the B&WOG incorporated the disposal plan for archive specimens, updated the status for various capsules, and incorporated current fluence levels. The B&WOG submitted Supplement 5 because the last supplement included a commitment regarding Capsules OC1-D and OC3-F; however, that commitment could not be met because these capsules could not be removed from Crystal River Unit 3.

### 3.0 EVALUATION

Appendix H to 10 CFR Part 50 includes criteria to monitor changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline region of light-water nuclear power reactors which result from exposure of these materials to neutron irradiation and the thermal environment. Appendix H to 10 CFR Part 50 endorses ASTM E 185-73. Appendix H states that "[t]he design of the surveillance program and the withdrawal schedule must meet the requirements of the edition of ASTM E 185 that is current on the issue date of the ASME [American Society of Mechanical Engineers] Code [Boiler and Pressure Vessel Code] to which the reactor vessel was purchased. Later editions of ASTM E 185 may be used, but including only those editions through 1982."

ASTM E 185-82, "Standard Practice for Conducting Surveillance Tests for Light Water Cooled Nuclear Power Reactor Vessels" and ASTM E 185-66, "Recommended Practice for Surveillance Tests on Structural Materials in Nuclear Reactors" cover procedures for monitoring the radiation-induced changes in the mechanical properties of ferritic materials in the beltline of light-water cooled nuclear power reactor vessels. These practices include guidelines for designing a minimum surveillance program, selecting materials, and evaluating test results.

The staff evaluated the withdrawal schedule for each of the B&W and Westinghouse plant-specific reactor vessel surveillance programs, as provided in BAW-1543(NP), Revision 4, Supplement 5, and determined that the withdrawal schedules were prepared in accordance with ASTM E 185-82 for each of the subject units except for Turkey Point Units 3 and 4. Additional details of the staff's assessment are provided below. It should be noted that this evaluation will

1 focus on the staff's review of the B&WOG's revised withdrawal schedules, as provided in  
2 BAW-1543 (NP), Revision 4, Supplement 5.

3 As stated previously, capsules OC1-D and OC3-F could not be removed; therefore, credit for  
4 these two capsules could no longer be taken for Oconee Unit 1 and Oconee Unit 3,  
5 respectively. The staff independently reviewed the surveillance capsule withdrawal schedules  
6 for Oconee Unit 1 and Oconee Unit 3, to ensure that the subject units' surveillance capsule  
7 program would still comply with the requirements of ASTM E 185-82.

8 The staff found that the capsule withdrawal schedule for Oconee Unit 1 adequately met the  
9 requirements of ASTM E 185-82, in that four capsules have been withdrawn and tested, and  
10 the last capsule that was tested, OC1-C, had a fluence of 1 to 2 times the end-of-life fluence.  
11 Therefore, the staff determined that the inability to withdraw and test capsule OC1-D had no  
12 impact on the ability of the Oconee Unit 1 surveillance capsule program to meet the Appendix H  
13 requirements.

14 The staff found that the capsule withdrawal schedule for Oconee Unit 3 adequately met the  
15 requirements of ASTM E 185-82, in that three capsules have been tested and an additional  
16 capsule, capsule CR3-LG2, which contains the limiting beltline material for Oconee Unit 3 (heat  
17 number 72442), was tested and had a fluence of 1 to 2 times the end-of-life fluence for Oconee  
18 Unit 3. Therefore, the staff determined that the inability to withdraw and test capsule OC3-F  
19 had no impact on the ability of the Oconee Unit 3 surveillance capsule program to meet the  
20 Appendix H requirements.

21 The staff noted that the B&WOG added a supplemental capsule, to be removed and tested, to  
22 the Point Beach Unit 2 surveillance program. Also, the B&WOG updated the status of capsules  
23 Y and X of Surry Unit 2 and Turkey Point Unit 3, respectively, to indicate that they had been  
24 tested. The staff found that these revisions were enhancements or updates to the program and  
25 are, therefore, acceptable to the staff.  
26

27 On May 26, 2004, the staff requested that the B&WOG remove or address the relevance of the  
28 statement, "The owners of plants that have been granted license renewal have made no  
29 commitments to test or use information from the capsules that continue to be irradiated under  
30 the MIRVSP," because future applicants may wish to take credit for information obtained from  
31 the MIRVSP, as opposed to using plant-specific information in order to meet the requirements  
32 of 10 CFR Part 50, Appendix H. By letter dated July 7, 2004, the B&WOG indicated that the  
33 statement will be removed upon issuance of the approved version of BAW-1543, Revision 4,  
34 Supplement 5. The staff found this acceptable.

35 The staff determined that the withdrawal schedules for Oconee Unit 2, Three Mile Island Unit 1  
36 (TMI-1), Crystal River Unit 3, Arkansas Nuclear One Unit 1, Davis-Besse, Point Beach Unit 2,  
37 Surry Unit 1, Turkey Point Unit 4, as provided in Tables VI and VII of BAW-1543(NP), Revision  
38 4, Supplement 5, did not change from Supplement 4 and, therefore, still comply with the  
39 requirements of ASTM E 185-82, as stated in the staff's safety evaluation dated July 31, 2001.  
40 However, the staff noted that the information in Table VIII, of the subject topical report, did not  
41 accurately list the capsules to be withdrawn and tested for Oconee Units 1, 2 and 3, and TMI-1.  
42 The B&WOG listed capsules for these subject plants that were no longer going to be withdrawn  
43 and tested, i.e., Capsule OC1-D for Oconee Unit 1, Capsule OC2-F for Oconee Unit 2,  
44 Capsule OC3-F for Oconee Unit 3, and Capsules F and D for TMI-1.

During a conference call that was held on November 23, 2004, the staff discussed this issue with the B&WOG, who indicated that it would revise Table VIII of the report to accurately list the capsules that were going to replace those that were no longer going to be withdrawn and tested. The staff noted that the withdrawal schedule for Oconee Unit 1 already met the requirements of ASTM E185-82; however, the table still needed revision, because the capsules listed were not correct. The B&WOG indicated that Oconee Unit 2's limiting material is contained in Capsule A5 (which was irradiated in Davis Besse), which was tested and satisfied the fourth capsule requirement of ASTM E185-82 for Oconee Unit 2. For Oconee Unit 3, the limiting material is contained in Capsule CR3-LG2, which was tested and satisfied the fourth capsule requirement of ASTM E185-82, for Oconee Unit 3. And for TMI-1 the limiting material is contained in Capsule TMI2-LG2, which was tested and satisfied the fourth capsule requirement of ASTM E185-82.

By supplemental letter dated January 5, 2005, the B&WOG revised Table VIII to the BAW-1543(NP), Revision 4, Supplement 5 report. The staff found that the revised table accurately listed the withdrawal schedules for Oconee Units 1, 2, and 3, and TMI-1. As stated above, the staff found that each of these plants met the capsule withdrawal schedule requirements of ASTM E185-82, even though the original capsules were not going to be withdrawn and tested for Oconee Units 2 and 3 and TMI-1, because there are other capsules in the MIRVSP that contain the same limiting material for the subject plants that will be withdrawn and tested, and, therefore, will satisfy the requirements of ASTM E185-82.

Turkey Point Units 3 and 4 were prepared in accordance with ASTM E 185-66. The Turkey Point Units 3 and 4 reactor vessels were purchased to the Summer 1966 Addenda to the 1965 ASME Code. ASTM E 185-66 was the surveillance capsule standard in effect at the time the Turkey Point Units 3 and 4 reactor vessels were purchased. Since the Turkey Point Units 3 and 4 capsule withdrawal schedules meet the ASTM E 185 edition that was current at the time the reactor vessels were purchased, the withdrawal schedules meet the requirements of Appendix H to 10 CFR Part 50.

It should also be noted that, by letter dated February 8, 1985, a safety evaluation report (SER) was submitted to Florida Power & Light Company, which indicated that the NRC approved an integrated surveillance program for Turkey Point Units 3 and 4. The SER indicated that the only capsules to be tested at Turkey Point Units 3 and 4 in accordance with ASTM E 185 requirements, are those that contain weld metal specimens.

#### 4.0 CONCLUSION

Based on the staff's review of the B&WOG MIRVSP, the staff found that the revised withdrawal schedules, as indicated in Report BAW-1543(NP), Revision 4, Supplement 5, are acceptable for the B&W-designed 177-FA plants and the Westinghouse-designed plants with B&W-fabricated reactor vessels. The proposed withdrawal schedules satisfy the ASTM E 185-82 Standard for all plants participating in the B&WOG MIRVSP except for Turkey Point Units 3 and 4. Turkey Point Units 3 and 4 satisfy the ASTM E 185-66 Standard. Since this edition of the standard was current at the time the reactor vessels were purchased, the Turkey Point Units 3 and 4 surveillance capsule withdrawal schedules satisfy the requirements of Appendix H to 10 CFR Part 50. Also, it should be noted that the NRC previously approved an integrated surveillance program for Turkey Point Units 3 and 4.



The staff concluded that the proposed withdrawal schedules of BAW-1543(NP), Revision 4, Supplement 5, comply with Appendix H to 10 CFR Part 50. Therefore, the staff approves the revised withdrawal schedule for each of the plants included in the B&WOG MIRVSP.

#### 5.0 REFERENCES

1. BAW-1543, Revision 4, Supplement 4, "Supplement to the Master Integrated Reactor Vessel Surveillance Program," April 2001.
2. NRC letter to A. Mendiola, from K. Wichman, NRC, "Safety Evaluation of BAW-1543, Master Integrated Reactor Vessel Surveillance Program, Revision 4, Supplement 4," July 31, 2001.
3. Code of Federal Regulations, Title 10, Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements."
4. American Society for Testing and Materials, "Recommended Practice for Surveillance Tests on Structural Materials in Nuclear Reactors," ASTM E 185-66.
5. American Society for Testing and Materials, "Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels," ASTM E 185-70.
6. American Society for Testing and Materials, "Standard Practice for Conducting Surveillance Tests for Light Water Cooled Nuclear Power Reactor Vessels," ASTM E 185-82.
7. NUREG-1511, Supplement 2, "Reactor Pressure Vessel Status Report," October 2000.

# STATUS OF WESTINGHOUSE PLANT-SPECIFIC SURVEILLANCE CAPSULES

PLANT	CAPSULE ID	TARGET FLUENCE	STATUS	NOTES
POINT BEACH 1	N P R,S,T,V	4.5E19	STANDBY REMOVED TESTED	1 3
POINT BEACH 2	N P R,S,T,V W	5.0E19	STANDBY REMOVED TESTED SUPPL CAPSULE	1 3 2
SURRY 1	S U W Y Z T,V,X	3.9E19 3.0E19 4.3E19 5.2E19	STANDBY STANDBY TESTED STANDBY STANDBY TESTED	4 4 5 4 1
SURRY 2	V,X,Y S T U W Z	3.8E19 3.6E19 3.4E19	TESTED TESTED STANDBY STANDBY TESTED STANDBY	5 1 1 5 4
TURKEY POINT 3	S,T,V,X U,W,Y,Z		TESTED STANDBY	*
TURKEY POINT 4	S,T X U,V,W,Y,Z	3.85E19	TESTED STANDBY STANDBY	* *

## NOTES:

1. TO BE WITHDRAWN AND STORED
2. TO BE WITHDRAWN AND TESTED
3. WITHDRAWN AND STORED
4. WILL REMAIN FOR LIFE EXTENSION
5. DOSIMETRY

\* During the Turkey Point license renewal review, the applicant stated that the standby capsules can be used to gather data on fluence, spectrum, temperature, and neutron flux during the license renewal period.



STATUS OF BABCOCK AND WILCOX PLANT-SPECIFIC (INTEGRATED)  
SURVEILLANCE CAPSULES

PLANT	CAPSULE ID	TARGET FLUENCE	STATUS	NOTES
OCONEE 1	F,E,A,C B		TESTED REMOVED	1
OCONEE 2	C,A,E B,D,F TMI2-LG1 A5		TESTED REMOVED TESTED TESTED	1  3
OCONEE 3	A,B,D C,E,F L1 CR3-LG2		TESTED REMOVED TESTED TESTED	1 3
TMI 1	E, C B,D,F A CR3-LG1 TMI2-LG2		TESTED REMOVED NOT TESTED TESTED TESTED	1 2
CRYSTAL RIVER 3	B,C,D,F A, E		TESTED REMOVED	1
ANO 1	E,B,A,C D, F		TESTED REMOVED	1
DAVIS-BESSE 1	F,B,A,D C, E		TESTED REMOVED	1

NOTES:

- Capsule contains only base metal specimens, or weld data already exists at the expected/received capsule fluences or data is available at fluences greater than the expected/received capsule fluences, so will be disposed of in accordance with the March 17, 2000, letter from D.L. Howell to the USNRC Document Control Desk.
- Withdrawn and Stored
- Irradiated in Davis Besse