Mr. Gordon Bischoff, Manager
Owners Group Program Management Office
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355

June 28, 2007

SUBJECT: FINAL SAFETY EVALUATION FOR PRESSURIZED WATER REACTOR OWNERS GROUP (PWROG) TOPICAL REPORT (TR) BAW-1543(NP), REVISION 4, SUPPLEMENT 6, "SUPPLEMENT TO THE MASTER INTEGRATED REACTOR VESSEL SURVEILLANCE PROGRAM" (TAC NO. MC9608)

Dear Mr. Bischoff:

By letter dated December 20, 2005, the Babcock and Wilcox (B&W) Owners Group Reactor Vessel Working Group, now a part of the PWROG, submitted TR BAW-1543(NP), Revision 4, Supplement 6, "Supplement to the Master Integrated Reactor Vessel Surveillance Program," to the U.S. Nuclear Regulatory Commission (NRC) staff. By letter dated May 11, 2007, an NRC draft safety evaluation (SE) regarding our approval of TR BAW-1543(NP), Revision 4, Supplement 6, was provided for your review and comments. By letter dated June 4, 2007, the PWROG commented on the draft SE. The NRC staff's disposition of PWROG's comments on the draft SE are discussed in the attachment to the final SE enclosed with this letter.

The NRC staff has found that TR BAW-1543(NP), Revision 4, Supplement 6, is acceptable for referencing in licensing applications for seven B&W designed 177-fuel assembly plants and six Westinghouse Electric Company designed plants having B&W-fabricated reactor vessels to the extent specified and under the limitations delineated in the TR and in the enclosed final SE. The final SE defines the basis for our acceptance of the TR.

Our acceptance applies only to material provided in the subject TR. We do not intend to repeat our review of the acceptable material described in the TR. When the TR appears as a reference in license applications, our review will ensure that the material presented applies to the specific plant involved. License amendment requests that deviate from this TR will be subject to a plant-specific review in accordance with applicable review standards.

In accordance with the guidance provided on the NRC website, we request that the PWROG publish an accepted version of this TR within three months of receipt of this letter. The accepted version shall incorporate this letter and the enclosed final SE after the title page. Also, they must contain historical review information, including NRC requests for additional information and your responses. The accepted version shall include an "-A" (designating accepted) following the TR identification symbol.

If future changes to the NRC's regulatory requirements affect the acceptability of this TR, the PWROG and/or licensees referencing it will be expected to revise the TR appropriately, or justify its continued applicability for subsequent referencing.

Sincerely,

/RA/

Ho K. Nieh, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 694

Enclosure: Final SE

cc w/encl: See next page

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Sincerely,

/RA/

Ho K. Nieh, Deputy Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 694

Enclosure: Final SE

cc w/encl:

Mr. James A. Gresham, Manager
Regulatory Compliance and Plant Licensing
Westinghouse Electric Company
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Pittsburgh, PA 15230-0355

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ADAMS ACCESSION NO.: ML071770640 *No major changes to SE input. NRR-043

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FINAL SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT (TR) BAW-1543(NP), REVISION 4, SUPPLEMENT 6,

"SUPPLEMENT TO THE MASTER INTEGRATED REACTOR VESSEL

SURVEILLANCE PROGRAM"

PRESSURIZED WATER REACTOR OWNERS GROUP

PROJECT NO. 694

1.0 INTRODUCTION AND BACKGROUND

By letter dated December 20, 2005, the Babcock and Wilcox (B&W) Owners Group (B&WOG) Reactor Vessel Working Group, now a part of the Pressurized Water Reactor Owners Group (PWROG), submitted for U.S. Nuclear Regulatory Commission (NRC) approval, TR BAW-1543(NP), Revision 4, Supplement 6, "Supplement to the Master Integrated Reactor Vessel Surveillance Program." The revisions contained in this supplement were necessary to show updates to neutron fluence values and to the surveillance capsule insertion and withdrawal schedules.

TR BAW-1543(NP), Revision 4, Supplement 6, 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 participating Westinghouse Electric Company (Westinghouse) plants having B&W-fabricated reactor vessels. These reactor vessels include seven B&W-designed 177-FA plants and six 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 13 reactors are of the same basic design concept: pressurized water reactor, operating at about 550 °F and 2250 pounds per square inch (psi) nominal inlet temperature and pressure, and with low enrichment fuel (approximately 2 percent to 4 percent enrichment).

The irradiation schedules for this 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, was irradiated in Surry, Unit 2 and was subsequently tested. 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 attached.

2.0 REGULATORY EVALUATION

The NRC staff evaluated the PWROG's basis for the integrated program concept. The criteria, as provided by Appendix H to Title 10 to the *Code of Federal Regulations* (10 CFR), Part 50, "Reactor Vessel Material Surveillance Program Requirements," were met; therefore, the NRC staff determined the MIRVSP to be acceptable. By letter dated June 11, 1991, TR BAW-1543(NP), Revision 3, was approved by the NRC. TR BAW-1543(NP), Revision 4, was essentially the same as the approved Revision 3 except for an update of some of the units' withdrawal schedules. TR BAW-1543(NP), 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 the 1973 Edition of American Society for Testing and Materials (ASTM) Standard E 185, "Standard Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels" (ASTM E 185-73). It was anticipated that future updates to TR BAW-1543(NP) would only involve changes to the Revision 4 Supplement. Replacing Supplement 1, BAW-1543(NP), Revision 4, Supplement 2, reflected the revised fluence values and the revised withdrawal schedules.

Revising Supplement 2 with Revision 4, 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 stored capsules, updated the status for various capsules, and incorporated current fluence levels.

The B&WOG submitted Supplement 5 because the previous 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. The NRC staff approved the revised withdrawal schedules for Oconee, Units 1, 2, and 3, and Three Mile Island, Unit 1 (TMI-1), in Supplement 5. The NRC staff also found that each of these plants met the capsule withdrawal schedule requirements of the 1982 Edition of ASTM Standard E185 (ASTM E 185-82), even though the original capsules were not going to be withdrawn and tested for Oconee, Units 2 and 3, and TMI-1, because there were other capsules within the MIRVSP that contained the same limiting material for the subject plants that would be withdrawn and tested and, therefore, would satisfy the requirements of ASTM Standard E185-82.

The B&WOG submitted Supplement 6 to show updates that have been made to fluence values and to the surveillance capsule withdrawal schedules.

3.0 TECHNICAL 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 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 ASTME 185 may be used, but including only those editions through 1982." Each edition of ASTM Standard E 185 covers 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 NRC staff evaluated the withdrawal schedules for each of the B&W and Westinghouse plant-specific reactor vessel surveillance programs, as provided in BAW-1543(NP), Revision 4, Supplement 6, and determined that the withdrawal schedules were prepared in accordance with ASTM Standard E 185-82 for each of the subject units, except for Turkey Point, Units 3 and 4. The Turkey Point, Units 3 and 4 surveillance capsule withdrawal schedules were prepared in accordance with ASTM Standard E 185-66, which 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 Standard 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.

The NRC staff's evaluation focused on the revised withdrawal schedules, as provided in BAW-1543(NP), Revision 4, Supplement 6. The NRC staff's dispositions on the revisions made between Supplement 5 and 6 are listed in the attached table "Summary of Revisions." In a request for additional information, the NRC staff asked B&WOG about the significance of changing the withdrawal schedules of capsules A2 and A4 from the end of the 17th fuel cycle to the end of the 29th fuel cycle. In its response dated February 15, 2007, the PWROG explained that the data produced from withdrawal of capsules A2 and A4 (which are contained in the same capsule holder tube) at the end of the 17th cycle would contain specimens with a fluence that would be minimally useful. The PWROG noted that capsules A2 and A4 will provide supplemental data for limiting Linde 80 heats with fluences corresponding to 60 and 80 years of operation. Also, the PWROG stated that information about the heats associated with these capsules is available to plants in the MIRVSP from other sources. The NRC staff finds that this change will not adversely affect the plants participating in the program and is, therefore, acceptable.

The NRC staff determined that the relevant information in Tables VI, VII and VIII of BAW-1543(NP), Revision 4, Supplement 6, did not change from Supplement 5 and, therefore, the NRC staff's capsule status tables, from the safety evaluation dated May 16, 2005 (Agencywide Documents Access and Management System Accession No. ML051380565), remain valid. One change was made to the table for Westinghouse plant-specific capsules and it is shown in the attachment. The designation of Turkey Point, Unit 4, capsules X and V was changed to "to be tested" from "standby" to more accurately differentiate them from other standby capsules which are not needed to meet surveillance requirements for extended periods of plant operation.

The NRC staff found that all of these revisions were enhancements or updates to the program and are, therefore, acceptable to the staff.

4.0 CONCLUSION

Based on its review of this MIRVSP, the NRC staff found that the revised withdrawal schedules, as indicated in TR BAW-1543(NP), Revision 4, Supplement 6, 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 Standard E 185-82 for

all plants participating in this PWROG MIRVSP except for Turkey Point, Units 3 and 4. Turkey Point, Units 3 and 4, satisfy the ASTM Standard E 185-66. Since this edition of the standard was current at the time the Turkey Point, Units 3 and 4 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.

The NRC staff concluded that the proposed withdrawal schedules of BAW-1543(NP), Revision 4, Supplement 6 comply with Appendix H to 10 CFR Part 50. Therefore, the NRC staff approves the revised withdrawal schedule for each of the plants included in this PWROG MIRVSP.

Attachments: 1. Status of Capsules
2. Resolution of Comments

Principle Contributor: Allison K. Black

Date:

STATUS OF WESTINGHOUSE PLANT-SPECIFIC SURVEILLANCE CAPSULES

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

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	NOTE
OCONEE 1	F,E,A,C		TESTED	
	B		REMOVED	1
OCONEE 2	C,A,E		TESTED	
	B,D,F		REMOVED	1
	TMI2-LG1		TESTED	
	A5		TESTED	
OCONEE 3	A,B,D		TESTED	
	C,E		REMOVED	1
	L1		TESTED	
	CR3-LG2		TESTED	
TMI 1	E, C, W1*		TESTED	
	B,D,F,A		REMOVED	1
	CR3-LG1		TESTED	
	TMI2-LG2		TESTED	
CRYSTAL RIVER 3	B,C,D,F		TESTED	
	A, E		REMOVED	1
ANO 1	E,B,A,C		TESTED	
	D, F		REMOVED	1
DAVIS-BESSE 1	F,B,A,D		TESTED	
	C, E		REMOVED	1

NOTE:

1. 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 U.S. NRC Document Control Desk.

* Irradiated in Surry and subsequently tested.

SUMMARY OF REVISIONS

SECTION	PROPOSED CHANGE	STAFF'S DISPOSITION
Summary	Updated to reflect current revision.	Accepted
Section 1	Included revision statement for Supplement 6 changes. References to changes made in Supplement 5 were deleted. Descriptions of Supplement 6 changes were added.	Accepted
Table III	Updated status of capsules OC2-D, CR3-E, and TMI2-LG2. Changed “End of Seventeenth Fuel Cycle” to “End of Twenty-ninth Fuel Cycle” for capsules A2 and A4. Changed note (a) 2 from “B&WOG” to “capsule owner.”	Accepted *See response to RAI, dated February 15, 2007
Table IV	Updated status of capsules RS1-A, RS1-E, RS1-C, and DB1-LG2. Changed “End of Seventeenth Fuel Cycle” to “Withdrawal Not Planned” for capsules A1 and L2. Changed footnote (a) 4, which now refers to A1 as a standby capsule. Footnote (e) was added for TE1-C.	Accepted
Table VI	Updated status of capsules OC2-D and CR3-E. Fluence values were revised for CR3-A, TE1-C and TE1-E. Footnote (f) was added for TE1-C. Changed status of capsules TMI2-LG2 and DB1-LG2 to “Tested.” Changed Time of Removal from “End of Cycle 17” to “End of Cycle 29” for capsules A2 and A4 and updated the target and expected fluence. A1 and L2 were changed to standby capsules.	Accepted *See response to RAI, dated February 15, 2007
References	References 80 and 81 were added.	Accepted

RESOLUTION OF COMMENTS ON DRAFT SAFETY EVALUATION FOR

PRESSURIZED WATER REACTOR OWNERS GROUP (PWROG)

TOPICAL REPORT (TR) BAW-1543(NP), REVISION 4, SUPPLEMENT 6,

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PWROG Comment 1 (Page 2, Last Paragraph of Section 2.0)

Remove "insertion and" since only the withdrawal schedule was changed.

NRC Response

The NRC staff agrees with this comment. It has been incorporated.

PWROG Comment 2 (Attachment Page 1, Table titled "Status of Westinghouse Plant Specific Surveillance Capsules)

Under STATUS column in the first row, move "REMOVED" to the next line. This will fix all the subsequent items in the column which are one line too high in the table.

NRC Response

The NRC staff does not agree with this comment. The text is already in the proper row. This comment was not incorporated.