

Duke Energy Company Oconee 1, 2, 3
Entergy Operations, Inc. ANO-1
Florida Power Corporation Crystal River 3



AmerGen Energy Company, LLC
FirstEnergy Nuclear Operating Company
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TMI-1
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Working Together to Economically Provide Reliable and Safe Electrical Power

April 10, 2001
BWOOG-01-1808

Project No: 693

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: B&W Owners Group Master Integrated Reactor Vessel Surveillance Program (Project No. 693)

Reference: NRC Letter to D. L. Howell dated October 26, 1999. Subject: Safety Evaluation of BAW-1543 Revision 4 Supplement 3 (TAC No. MA5053)

Attachment: BAW-1543 Revision 4, Supplement 4 – “Supplement to the Master Integrated Reactor Vessel Surveillance Program”

Gentlemen:

Fifteen copies of BAW-1543, Revision 4, Supplement 4 are submitted for your approval on behalf of the B&W Owners Group Reactor Vessel Working Group. This document has been revised as indicated in the summary of revisions. This revision incorporates the disposal plan for archive specimens and outdated capsules, updates the status for various capsules, and incorporates current license fluence values. Previous capsule withdrawal schedules are not affected by this revision.

We request your approval of this submittal by September 1, 2001. The reference letter previously approved Supplement 3.

If you should require assistance with your review, please call me at 804-832-3293.

Sincerely,

D. L. Howell
Project Manager
B&W Owners Group Services

DO45 1/15

c: B. J. Elliott – NRC
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THE OWNERS GROUP

B&W

Reactor Vessel Working Group

**SUPPLEMENT TO THE
MASTER INTEGRATED REACTOR VESSEL
SURVEILLANCE PROGRAM**

SUPPLEMENT TO THE
MASTER INTEGRATED REACTOR VESSEL
SURVEILLANCE PROGRAM

by

M. J. DeVan

B&W Document No. 43-1543S-07
(See Section 2 for document signatures)

Prepared for

B&W Owners Group Reactor Vessel Working Group

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SUMMARY

The Master Integrated Reactor Vessel Surveillance Program (MIRVP) was initiated in 1977 for the B&W 177-FA Plants. Its purpose was to augment the existing reactor vessel surveillance programs and to provide a basis for sharing information between plants. All of the early vintage B&W manufactured reactor vessels were fabricated using the submerged arc welding process and particular consumables which resulted in welds that are sensitive to fast neutron exposures. The welds in these early vintage B&W manufactured reactor vessels are referred to as the Linde 80 class of materials. In 1988, the MIRVP was further modified to include a series of plants with the Westinghouse Nuclear Steam Supply System (NSSS) for which B&W manufactured the reactor vessels. These vessels have virtually identical welds as were used in the B&W 177-FA plants. The overall objective of the MIRVP is to provide the data necessary to assure compliance with Federal Regulations.^(a)

This document is a supplement to the base document, "Master Integrated Reactor Vessel Surveillance Program," BAW-1543.^(b) Both the base document and the various supplements are used to document the progress of the MIRVP and especially the withdrawal schedules of the RVSP capsules. The last full revision to the base document reviewed and approved by the NRC is Revision 4.^(c) This document further serves to provide disposition plan for archive specimens and outdated RVSP capsules. The specific details of this plan are also included in a memorandum transmitted from the B&W Owners Group to the U.S. Nuclear Regulatory Commission on March 17, 2000.^(d) The last supplement to this document reviewed and approved by the NRC is BAW-1543, Revision 4, Supplement 3.^(e)

^(a) Title 10, Code of Federal Regulations, Part 50, "Domestic Licensing of Production and Utilization Facilities", Vol. II, U.S. Nuclear Regulatory Commission, Washington, D.C.

^(b) L.S. Harbison, "Master Integrated Reactor Vessel Surveillance Program," BAW-1543, Revision 4, B&W Nuclear Technologies, Inc., Lynchburg, Virginia, February 1993.

^(c) Nuclear Regulatory Commission Safety Evaluation Report, "Babcock & Wilcox Owners Group (B&WOG) Reactor Vessel Working Group Report," BAW-1543, Revision 4, Supplement 2, "Supplement to the Master Integrated Reactor Vessel Surveillance Program" (TAC No. M98089), July 11, 1997.

^(d) Memorandum, D. L. Howell, Project Manager, B&W Owners Group Services to Document Control Desk, U. W. Nuclear Materials by the B&W Owners Group Reactor Vessel Working Group," OG-1783, Project No. 693, March 17, 2000.

^(e) Nuclear Regulatory Commission Safety Evaluation Report, "Safety Evaluation of BAW-1543, Master Integrated Reactor Vessel Surveillance Program," Revision 4, Supplement 3 (TAC No. MA5053), October 26, 1999.

SUMMARY OF REVISIONS

Change Section	Description
Section 1	Included revision statement for Supplement 4 changes.
Table I	Added column for Capsule Irradiation Site.
Table II	Updated status of Surry Unit 2 Capsule S.
Table III	Lists the capsules to be disposed. Updated information to reflect withdrawal of OC2-F and TMI1-D Capsules.
Table IV	Updated status of B&WOG Supplemental Capsule A5. Updated information to reflect withdrawal of B&WOG Supplemental Capsules A3, L1 and L2. The plan to test Capsule A3 and L1 is provided. The plan to dispose of B&WOG supplemental Capsules DB1-LG2 and L2 is also provided. The removal of two "bolting" capsules at the end of cycle 12 is also noted.
Table V	Updated status of Point Beach Unit 1 Capsule P, Point Beach Unit 2 Capsule P, and Surry Unit 2 Capsule S. Updated status B&WOG Supplemental Capsule W1.
Table VI	This table summarizes plan to dispose of particular plant specific capsules and B&WOG Supplemental Capsule DB1-LG2. Also noted is the status of the testing performed on B&WOG Supplemental Capsule A5 (refer to note at Table IV also.) Added expected/received capsule fluences.
Table VII	Updated status of Point Beach Unit 2 Capsule P and Surry Unit 2 Capsule S. Updated status on B&WOG Supplemental Capsule W1.
Table VIII	Updated status of OC2-F and TMI1-D Capsules. Updated status of Point Beach Unit 2 Capsule P and Surry Unit 2 Capsule S.

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1.0 INTRODUCTION

The B&W Owners Group (B&WOG) document, BAW-1543, Revision 4, reports the essential features of a Master Integrated Reactor Vessel Surveillance Program (MIRVP) for all operating B&W 177-FA plants and those Westinghouse-designed plants having B&W-fabricated reactor vessels.⁽¹⁾ This supplementary document to BAW-1543, Revision 4, contains surveillance capsule insertion and withdrawal schedules for the B&W 177-FA plants and the Westinghouse-designed plants participating in the B&WOG Reactor Vessel Working Group (RVWG). In addition, the insertion and withdrawal schedules for the B&WOG supplementary capsules are provided. This document, Supplement 4, is a revision to and replaces Supplement 3 in its entirety. Tables I through IX are revised by introducing current information. Capsules and tested specimens are designated for disposal in accordance with Reference 2.

Table I and Table II are listings of plant-specific surveillance capsules and directs the reader to the appendices of BAW-1543, Revision 4, where additional information can be found on material and capsule specifications. These tables also provide a listing of surveillance capsule reports. Table I provides information for the B&W plant-specific capsules and Table II provides information for the Westinghouse plant-specific capsules. Table I was previously listed at Table 3-5 in BAW-1543, Revision 3,⁽³⁾ and Table II was previously listed as Table 3-9.

Table III and Table IV provide capsule insertion and withdrawal schedules for B&W host plants Crystal River Unit 3 and Davis-Besse, respectively. The tables were previously listed as Tables 3-19 and 3-20 in BAW-1543, Revision 3.

Table V provides capsule insertion and withdrawal schedules for the Westinghouse-designed plants participating in the RVWG. The table was previously listed as Table 3-21 in BAW-1543, Revision 3.

Table VI and Table VII summarize the status of all MIRVP capsules for B&W and Westinghouse-designed plants, respectively. The tables were previously listed as Tables E-1 and E-2 in BAW-1543, Revision 3. These tables state whether the capsules have been withdrawn or are still being irradiated. For capsules that have been withdrawn and tested, the appropriate surveillance capsule report number has been listed. For those capsules that are being irradiated, the target and expected fluences are listed along with the insertion and/or withdrawal date.

Table VIII shows the conformance of the RVWG member plant-specific surveillance programs to the requirements of ASTM E 185-82.⁽⁴⁾ The table was previously listed as Table E-3 in BAW-1543, Revision 3.

Table IX lists licensing dates and anticipated reactor vessel peak end-of-life fluences. Table IX was previously located on page F-3 of BAW-1543, Revision 3.

**Table I. B&W 177-FA Plant-Specific Reactor Vessel
Surveillance Program - Detailed Summary**

Capsule	Type	Table of Material Specifications ^(a)	Table of Capsule Specifications ^(b)	Irradiation Site	Report Date	Report
Oconee Unit 1 Topical Report BAW-10006A, Revision 3 ⁽⁵⁾						
A	I	A-1	D-1	OC1/CR3	Aug. 84	BAW-1837 ⁽⁶⁾
B	II	A-1	D-1	OC1/CR3	----	----
C	I	A-1	D-1	OC1/CR3	Oct. 88	BAW-2050 ⁽⁷⁾
D	II	A-1	D-1	OC1/CR3	----	----
E	I	A-1	D-1	OC1	Sept. 77	BAW-1436 ⁽⁸⁾
F	II	A-1	D-1	OC1	Sept. 75	BAW-1421, Rev. 1 ⁽⁹⁾
Oconee Unit 2 Topical Report BAW-10006A, Revision 3						
A	I	A-2	D-2	OC2/CR3	Dec. 81	BAW-1699 ⁽¹⁰⁾
B	II	A-2	D-2	OC2/CR3	----	----
C	I	A-2	D-2	OC2	May 77	BAW-1437 ⁽¹¹⁾
D	II	A-2	D-2	OC2/CR3	----	----
E	I	A-2	D-2	OC2/CR3	Oct. 88	BAW-2051 ⁽¹²⁾
F	II	A-2	D-2	OC2/CR3	----	----
Oconee Unit 3 Topical Report BAW-10100A ^{(c)(13)}						
A	V	A-3	D-3	OC3	Jul. 77	BAW-1438 ⁽¹⁴⁾
B	VI	A-3	D-3	OC3/CR3	Oct. 81	BAW-1697 ⁽¹⁵⁾
C	V	A-3	D-3	OC3/CR3	----	----
D	VI	A-3	D-3	OC3/CR3	May 92	BAW-2128, Rev. 1 ⁽¹⁶⁾
E	V	A-3	D-3	OC3/CR3	----	----
F	VI	A-3	D-3	OC3/CR3	----	----
Three Mile Island Unit 1 Topical Report BAW-10006A, Revision 3						
A	I	A-4	D-4	TMI1/TMI2	---- ^(d)	BAW-2042 ⁽¹⁷⁾
B	II	A-4	D-4	TMI1/CR3	----	----
C	I	A-4	D-4	TMI1/CR3	Mar. 86	BAW-1901 ⁽¹⁸⁾
D	II	A-4	D-4	TMI1/CR3	----	----
E	I	A-4	D-4	TMI1	Jan. 77	BAW-1439 ⁽¹⁹⁾
F	II	A-4	D-4	TMI1/CR3	----	----

^(a) Refer to BAW-1543, Revision 4, Appendix A.

^(b) Refer to BAW-1543, Revision 4, Appendix D.

^(c) The Oconee Unit 3 capsules were fabricated before BAW-10100A was published; however, it is the Oconee Unit 3 program that is described in BAW-10100A.

^(d) Capsule used for Three Mile Island Unit 2 capsule requalification.

**Table I (cont'd). B&W 177-FA Plant-Specific Reactor Vessel
Surveillance Program - Detailed Summary**

Capsule	Type	Table of Material Specifications ^(a)	Table of Capsule Specifications ^(b)	Irradiation Site	Report Date	Report
Crystal River Unit 3 Topical Report BAW-10100A						
A	III	A-5	D-5	CR3	-----	-----
B	IV	A-5	D-5	CR3	Jun. 82	BAW-1679, Rev. 1 ⁽²⁰⁾
					Mar. 82	BAW-1718 ⁽²¹⁾
C	III	A-5	D-5	CR3	Mar. 86	BAW-1898 ⁽²²⁾
D	IV	A-5	D-5	CR3	Mar. 86	BAW-1899 ⁽²³⁾
					Apr. 86	BAW-1914 ⁽²⁴⁾
E	III	A-5	D-5	CR3	-----	-----
F	IV	A-5	D-5	CR3	Sept. 88	BAW-2049 ⁽²⁵⁾
					Oct. 93	BAW-2172 ⁽²⁶⁾
Arkansas Nuclear One Unit 1 Topical Report BAW-10006A, Revision 3						
A	I	A-6	D-6	ANO1/DB1	Jul. 84	BAW-1836 ⁽²⁷⁾
B	II	A-6	D-6	ANO1/DB1	Nov. 81	BAW-1698 ⁽²⁸⁾
C	I	A-6	D-6	ANO1/DB1	Oct. 89	BAW-2075, Rev. 1 ⁽²⁹⁾
D	II	A-6	D-6	ANO1/DB1	-----	-----
E	I	A-6	D-6	ANO1	Apr. 77	BAW-1440 ⁽³⁰⁾
F	II	A-6	D-6	ANO1/DB1	-----	-----
Davis-Besse Topical Report BAW-10100A						
A	III	A-8	D-8	DB1	Jun. 89	BAW-1882, Rev. 1 ⁽³¹⁾
B	IV	A-8	D-8	DB1	May 84	BAW-1834 ⁽³²⁾
					Jun. 85	BAW-1867 ⁽³³⁾
C	III	A-8	D-8	DB1	-----	-----
D	IV	A-8	D-8	DB1	Dec. 90	BAW-2125 ⁽³⁴⁾
					Oct. 93	BAW-2208 ⁽³⁵⁾
E	III	A-8	D-8	DB1	-----	-----
F	IV	A-8	D-8	DB1	Jan. 82	BAW-1701 ⁽³⁶⁾
					Mar. 82	BAW-1719 ⁽³⁷⁾

^(a) Refer to BAW-1543, Revision 4, Appendix A.

^(b) Refer to BAW-1543, Revision 4, Appendix D.

**Table II. Westinghouse Plant-Specific Reactor Vessel
Surveillance Program - Detailed Summary**

Capsule	Type	Table of Material Specifications ^(a)	Table of Capsule Specifications ^(b)	Report Date	Report
Point Beach Unit 1 WCAP-7513 ⁽³⁸⁾					
N	IV	A-10	D-10	----	----
P	IV	A-10	D-10	----	----
R	III	A-10	D-10	Aug. 78	WCAP-9357 ⁽³⁹⁾
S	IV	A-10	D-10	Nov. 76	WCAP-8739 ⁽⁴⁰⁾
T	III	A-10	D-10	Dec. 84	WCAP-10736 ⁽⁴¹⁾
V	III	A-10	D-10	Jun. 73	BCL Report ⁽⁴²⁾
Point Beach Unit 2 WCAP-7712 ⁽⁴³⁾					
N	IV	A-11	D-11	----	----
P	IV	A-11	D-11	----	----
R	V	A-11	D-11	Dec. 79	WCAP-9635 ⁽⁴⁴⁾
S	V	A-11	D-11	Aug. 91	BAW-2140 ⁽⁴⁵⁾
T	IV	A-11	D-11	Aug. 78	WCAP-9331 ⁽⁴⁶⁾
V	V	A-11	D-11	Jun. 75	BCL Report ⁽⁴⁷⁾
Surry Unit 1 WCAP-7723 ⁽⁴⁸⁾					
S	VI	A-12	D-12	----	----
T	VII	A-12	D-12	Jun. 75	BCL Report ⁽⁴⁹⁾
U	VI	A-12	D-12	----	----
V	VII	A-12	D-12	Feb. 87	WCAP-11415 ⁽⁵⁰⁾
W	VI	A-12	D-12	Mar. 79	BCL-585-8R ⁽⁵¹⁾
X	VII	A-12	D-12	Apr. 98	BAW-2324 ⁽⁵²⁾
Y	VI	A-12	D-12	----	----
Z	VII	A-12	D-12	----	----
Surry Unit 2 WCAP-8085 ⁽⁵³⁾					
S	VIII	A-13	D-13	----	WCAP-14810 ⁽⁵⁴⁾
T	VIII	A-13	D-13	----	----
U	VIII	A-13	D-13	----	----
V	VIII	A-13	D-13	Jun. 87	WCAP-11499 ⁽⁵⁵⁾
W	VIII	A-13	D-13	Feb. 81	BCL-585-026 ⁽⁵⁶⁾
X	VIII	A-13	D-13	Sept. 75	BCL Report ⁽⁵⁷⁾
Y	IX	A-13	D-13	----	----
Z	IX	A-13	D-13	----	----

^(a) Refer to BAW-1543, Revision 4, Appendix A.

^(b) Refer to BAW-1543, Revision 4, Appendix D.

**Table II (cont'd). Westinghouse Plant-Specific Reactor Vessel
Surveillance Program - Detailed Summary**

Capsule	Type	Table of Material Specifications ^(a)	Table of Capsule Specifications ^(b)	Report Date	Report
Turkey Point Unit 3 WCAP-7656 ⁽⁵⁸⁾					
S	VI	A-14	D-14	May 79	SwRI-02-5131 ⁽⁵⁹⁾
T	VII	A-14	D-14	Dec. 75	WCAP-8631 ⁽⁶⁰⁾
U	VI	A-14	D-14	----	----
V	VII	A-14	D-14	Aug. 86	SwRI-06-8575 ⁽⁶¹⁾
W	VI	A-14	D-14	----	----
X	VII	A-14	D-14	----	----
Y	VI	A-14	D-14	----	----
Z	VI	A-14	D-14	----	----
Turkey Point Unit 4 WCAP-7660 ⁽⁶²⁾					
S	VI	A-15	D-15	May 79	SwRI-02-5380 ⁽⁵⁹⁾
T	VII	A-15	D-15	Jun. 76	SwRI-02-4221 ⁽⁶³⁾
U	VI	A-15	D-15	----	----
V	VII	A-15	D-15	----	----
W	VI	A-15	D-15	----	----
X	VII	A-15	D-15	----	----
Y	VI	A-15	D-15	----	----
Z	VI	A-15	D-15	----	----

^(a) Refer to BAW-1543, Revision 4, Appendix A.

^(b) Refer to BAW-1543, Revision 4, Appendix D.

**Table III. Capsule Insertion and Withdrawal Schedule
for Crystal River Unit 3**

Holder Tube	Location in Holder Tube	Insert	Withdraw	Capsule Status ^(a)
Installed at Initial Fuel Load				
XW	Top	CR3-B (WC ^(b))		
XW	Bottom	CR3-D (WC)		
End of First Fuel Cycle (1A)				
WZ	Top	CR3-LG1 (WC)	CR3-B (WC)	Tested
WZ	Bottom	CR3-LG2 (WC)		
ZY	Top	CR3-C (W ^(c))		
ZY	Bottom	CR3-A (W)		
YZ	Top	OC2-A (W)		
YZ	Bottom	OC1-A (W)		
YX	Top	OC2-E (W)		
YX	Bottom	OC3-D (W)		
XW	Top	CR3-E (W)		
WX	Top	OC3-B (W)		
WX	Bottom	CR3-F (WC)		
End of First Fuel Cycle (1B)				
No changes.				
End of Second Fuel Cycle				
YZ	Top	OC1-C (W)	OC2-A (W)	Tested
WX	Top	TMI1-C (W)	OC3-B (W)	Tested
End of Third Fuel Cycle				
No changes.				
End of Fourth Fuel Cycle				
YZ	Bottom	OC1-B	OC1-A (W)	Tested
WZ	Top	None	CR3-LG1 (WC)	Tested
WZ	Bottom	None	CR3-LG2 (WC) (WZ now empty)	Stored

**Table III (cont'd). Capsule Insertion and Withdrawal Schedule
for Crystal River Unit 3**

Holder Tube	Location in Holder Tube	Insert	Withdraw	Capsule Status ^(a)
End of Fifth Fuel Cycle				
WX	Top	OC3-C (W)	TMI1-C (W)	Tested
XW	Bottom	TMI1-B	CR3-D (WC)	Tested
ZY	Top	OC3-F (W)	CR3-C (W)	Tested
WZ	Top	OC2-B	None	
WZ	Bottom	CR3-LG2 (WC) (WZ no longer empty)	None	
End of Sixth Fuel Cycle				
YX	Top	TMI2-D ^(d)	OC2-E (W)	Tested
WX	Bottom	TMI1-F	CR3-F (WC)	Tested
YZ	Top	TMI2-LG1 (WC)	OC1-C (W)	Tested
YZ	Bottom	TMI2-LG2 (WC)	OC1-B	1
End of Seventh Fuel Cycle				
XW	Bottom	TMI2-D ^(d) from YX top	TMI1-B	1
YX	Top	A2 (WC)	TMI2-D ^(d) to XW bottom	---
YX	Bottom	A4 (WC)	OC3-D (W)	Tested
WZ	Top	OC3-E (W)	OC2-B	1
End of Eighth Fuel Cycle				
ZY	Bottom	OC1-D	CR3-A (W)	1
XW	Top	None	CR3-E (W)	1
XW	Bottom	None	TMI2-D ^(d) (XW now empty)	---
WX	Top	OC2-F	OC3-C (W)	1
WX	Bottom	TMI1-D	TMI1-F	1
End of Ninth Fuel Cycle				
YZ	Top	OC2-D	TMI2-LG1 (WC)	Tested
WZ	Bottom	TMI2-D ^(d)	CR3-LG2 (WC)	Tested
End of Tenth Fuel Cycle				
No changes.				
End of Eleventh Fuel Cycle				
WX	Top	None	OC2-F	1
WX	Bottom	None	TMI1-D (WX now empty)	1

**Table III (cont'd). Capsule Insertion and Withdrawal Schedule
for Crystal River Unit 3**

Holder Tube	Location in Holder Tube	Insert	Withdraw	Capsule Status ^(a)
End of Twelfth Fuel Cycle				
YZ	Top	None	OC2-D	2
YZ	Bottom	None	TMI2-LG2 (WC) (YZ now empty)	3
WZ	Top	None	OC3-E (W)	2
WZ	Bottom	None	TMI2-D ^(d) (WZ now empty)	1
End of Thirteenth Fuel Cycle				
ZY	Top	None	OC3-F (W)	2
ZY	Bottom	None	OC1-D (ZY now empty)	2
End of Fourteenth through Sixteenth Fuel Cycles				
No changes.				
End of Seventeenth Fuel Cycle				
YX	Top	None	A2 (WC)	3
YX	Bottom	None	A4 (WC) (all holder tubes empty)	3

- (a) 1 = Capsule will be disposed of in accordance with Reference 2.
2 = Capsule to be removed and will be disposed of in accordance with Reference 2. Dosimetry may be evaluated at this time.
3 = Capsule to be removed, specimens will be tested, dosimetry evaluated, and thermal monitors evaluated.
- (b) (WC) = Capsule contains weld metal and compact fracture toughness specimens.
- (c) (W) = Capsule contains weld metal specimens.
- (d) Dummy capsule.

**Table IV. Capsule Insertion and Withdrawal Schedule
for Davis-Besse**

Holder Tube	Location in Holder Tube	Insert	Withdraw	Capsule Status ^(a)
Installed at Initial Fuel Load				
WZ	Top	AN1-B		
WZ	Bottom	RS1-B (WC ^(b))		
ZY	Top	TE1-B (WC)		
ZY	Bottom	TE1-F (WC)		
YZ	Top	AN1-A (W ^(c))		
YZ	Bottom	AN1-C (W)		
YX	Top	RS1-D (WC)		
YX	Bottom	TE1-C (W)		
XW	Top	TE1-D (WC)		
XW	Bottom	RS1-C (W)		
WX	Top	TE1-A (W)		
WX	Bottom	RS1-F (WC)		
End of First Fuel Cycle				
WZ	Top	DB1-LG1 (WC)	AN1-B	Tested
WZ	Bottom	RS1-E (W)	RS1-B (WC)	Tested
ZY	Bottom	DB1-LG2 (WC)	TE1-F (WC)	Tested
End of Second Fuel Cycle				
YX	Top	RS1-A (W)	RS1-D (WC)	Tested
End of Third Fuel Cycle				
YZ	Top	AN1-D	AN1-A (W)	Tested
ZY	Top	TE1-E (W)	TE1-B (WC)	Tested
End of Fourth Fuel Cycle				
YX	Top	AN1-F	RS1-A (W)	1
WZ	Top	RS1-F from WX bottom	DB1-LG1 (WC)	Tested
WX	Top	None	TE1-A (W)	Tested
WX	Bottom	None	RS1-F to WZ top (WX now empty)	---
End of Fifth Fuel Cycle				
WZ	Top	None	RS1-F (WC)	Tested
WZ	Bottom	None	RS1-E (W) (WZ now empty)	1
YZ	Top	TMI2-C ^(d)	AN1-D to XW bottom	---
YZ	Bottom	TMI2-E ^(d)	AN1-C (W)	Tested
XW	Bottom	AN1-D from YZ top	RS1-C (W)	1

**Table IV (cont'd). Capsule Insertion and Withdrawal Schedule
for Davis-Besse**

Holder Tube	Location in Holder Tube	Insert	Withdraw	Capsule Status ^(a)
End of Sixth Fuel Cycle				
XW	Top	None	TE1-D (WC)	Tested 1
XW	Bottom	None	AN1-D (XW now empty)	
YZ	Top	A3 (WC)	TMI2-C ^(d)	---
YZ	Bottom	A1 (WC)	TMI2-E ^(d)	---
WZ	Top	L2 (WC)		
WZ	Bottom	L1 (WC)		
End of Seventh Fuel Cycle				
YX	Top	EPRI Capsule ^(d)	AN1-F	1
YX	Bottom	A5	TE1-C (W)	1
WX	Top	IBSP-2 ^(d)		
WX	Bottom	IBSP-1 ^(d) (WX no longer empty)		
End of Eighth through Tenth Fuel Cycles				
No changes.				
End of Eleventh Fuel Cycle				
ZY	Top	None	TE1-E (W)	1
ZY	Bottom	None	DB1-LG2 (WC) (ZY now empty)	1
YX	Top	None	EPRI Capsule ^(d)	---
YX	Bottom	None	A5 (WC) (YX now empty)	Tested
End of Twelfth Fuel Cycle				
YZ	Top	Dummy-L2 (WC)	A3 (WC)	2
WZ	Top	None	L2 (WC) to YZ top	---
WZ	Bottom	None	L1 (WC) (WZ now empty)	4
WX	Top	None	IBSP-2 ^(d)	---
WX	Bottom	None	IBSP-1 ^(d) (WX now empty)	---
End of Thirteenth through Sixteenth Fuel Cycles				
No changes.				

**Table IV (cont'd). Capsule Insertion and Withdrawal Schedule
for Davis-Besse**

Holder Tube	Location in Holder Tube	Insert	Withdraw	Capsule Status ^(a)
End of Seventeenth Fuel Cycle				
YZ	Top	None	Dummy-L2 (WC)	1
YZ	Bottom	None	A1 (WC) (all holder tubes empty)	3

- (a) 1 = Capsule will be disposed of in accordance with Reference 2.
2 = Capsule removed, dosimetry and thermal monitors have been evaluated. Specimens to be tested.
3 = Capsule to be removed, specimens will be tested, dosimetry evaluated, and thermal monitors evaluated.
4 = Capsule removed, specimens to be tested.
- (b) (WC) = Capsule contains weld metal and compact fracture toughness specimens.
- (c) (W) = Capsule contains weld metal specimens.
- (d) Not part of the B&WOG MIRVP.

**Table V. Capsule Insertion and Withdrawal Schedule for
the Westinghouse Plant-Specific RVSPs**

Nuclear Plant	Capsule Location ^(a)	Capsule Identification ^(b)	Insert	Withdraw	Capsule Status ^(c)
Point Beach Unit 1	13°	V (WC)	----	EOC-1	Tested
	13°	R (WC)	----	EOC-5	Tested
	23°	T (WC)	----	EOC-11	Tested
	33°	S (W)	----	EOC-3	Tested
	23°	P (W)	----	EOC-21	Removed/Stored
	33°	N (W)	----	EOL	2, 4, 5
Point Beach Unit 2	13°	V (WC)	----	EOC-1	Tested
	13°	R (WC)	----	EOC-5	Tested
	23°	T (W)	----	EOC-3	Tested
	33°	S (WC)	----	EOC-16	Tested
	23°	P (W)	----	EOC-22	Removed/Stored
	33°	N (W)	----	EOL	2, 4, 5
Surry Unit 1	15°	T (WC)	----	EOC-1	Tested
	15°	V (WC)	----	EOC-8	Tested
	35°	W	----	EOC-4	Tested ^(d)
	25°	S	----	EOL	2, 4
	25°	X (WC)	----	EOC-12	----
	15°	X (WC)	EOC-12	EOC-14	Tested
	25°	Z (WC)	----	EOC-12	3a
	15°	Z (WC)	EOC-12	EOL	2, 4, 5
	35°	Y	----	EOC-14	3b
	15°	Y	EOC-14	EOL	4, 5
	45°	U	----	EOC-12	3a
	25°	U	EOC-12	EOL	4, 5
Surry Unit 2	15°	X (W)	----	EOC-1	Tested
	15°	V (W)	----	EOC-8	Tested
	25°	W (W)	----	EOC-4	Tested ^(d)
	25°	Y (WC)	----	EOC-12	3a
	25°	Y (WC)	EOC-12	EOC-17	1
	25°	U (W)	----	EOC-22	2, 5
	35°	Z (WC)	----	EOC-12	3a
	25°	Z (WC)	EOC-12	EOL	4, 5
	35°	T (W)	----	EOC-17	3b
	15°	T (W)	EOC-17	EOL	4, 5
	45°	S (W)	----	EOC-13	6
	15°	W1 (WC) ^(e)	EOC-10	EOC-14	Tested

**Table V (cont'd). Capsule Insertion and Withdrawal Schedule for
the Westinghouse Plant-Specific RVSPs**

Nuclear Plant	Capsule Location ^(a)	Capsule Identification ^(b)	Insert	Withdraw	Capsule Status ^(c)
Turkey Point Unit 3	0°	T (WC)	----	EOC-1	Tested
	10°	S	----	EOC-4	Tested
	20°	V (WC)	----	EOC-9	Tested
	0°	X (WC)	----	EOC-21	1
	30°	U	----	EOL	4
	30°	Y	----	EOL	4
	40°	W	----	EOL	4
	40°	Z	----	EOL	4
Turkey Point Unit 4	0°	T (WC)	----	EOC-1	Tested
	10°	S	----	EOC-3	Tested
	0°	X (WC)	----	EOC-27	2, 5
	20°	V (WC)	----	EOL	4
	30°	U	----	EOL	4
	30°	Y	----	EOL	4
	40°	W	----	EOL	4
	40°	Z	----	EOL	4

Notes:

- (a) Capsule locations are relative with regard to quadrant; e.g., 0° is equivalent to 90°, 180°, or 270°.
- (b) W = Capsule contains weld metal specimens.
WC = Capsule contains weld metal and WOL specimens.
- (c) 1 = Capsule to be removed, specimens will be tested, dosimetry evaluated, and thermal monitors evaluated.
2 = Capsule to be removed and placed in storage. Dosimetry may be evaluated at this time.
3a = Capsule reinserted in higher lead factor location.
3b = Capsule to be reinserted in higher lead factor location.
4 = Capsule to be maintained in location to EOL.
5 = Standby capsule to be removed at 1-2 times the vessel EOL fluence.
6 = Capsule was evaluated for dosimetry and placed in storage.
- (d) Only dosimetry was evaluated.
- (e) HUPCAP, not a plant-specific capsule.

Table VI. Summary Status of the B&W Surveillance Capsules

Capsule ID	Capsule Contents		Status/ Location	Fluence, n/cm ² (x10 ¹⁹)		Time of Removal	Comments
	Weld Metal	Fracture Toughness Specimens		Target	Expected/ Received		
OC1-F	---	---	Tested	----	0.057	----	Reported in BAW-1421, Rev. 1 ⁽⁹⁾ , fluence corrected in BAW-1436 ⁽⁸⁾
OC1-E	X	---	Tested	----	0.150	----	Reported in BAW-1436 ⁽⁸⁾
OC1-B	---	---	Removed	----	0.700 ^(a)	----	Will be disposed ⁽²⁾
OC1-A	X	---	Tested	----	0.895	----	Reported in BAW-1837 ⁽⁶⁾
OC1-C	X	---	Tested	----	0.986	----	Reported in BAW-2050 ⁽⁷⁾
OC1-D	---	---	CR3-ZY	0.900	1.163 ^(b)	End of Cycle 13	Will be disposed ⁽²⁾
OC2-C	X	---	Tested	----	0.102 ^(c)	----	Reported in BAW-1437 ⁽¹¹⁾
OC2-A	X	---	Tested	----	0.337	----	Reported in BAW-1699 ⁽¹⁰⁾
OC2-B	---	---	Removed	----	0.562 ^(d)	----	Will be disposed ⁽²⁾
OC2-E	X	---	Tested	----	1.210	----	Reported in BAW-2051 ⁽¹²⁾
OC2-D	---	---	CR3-YZ	0.960	0.803 ^(b)	End of Cycle 12	Will be disposed ⁽²⁾
OC2-F	---	---	Removed	----	0.803 ^(b)	----	Will be disposed ⁽²⁾
OC3-A	X	---	Tested	----	0.081 ^(c)	----	Reported in BAW-1438 ⁽¹⁴⁾
OC3-B	X	---	Tested	----	0.312	----	Reported in BAW-1697 ⁽¹⁵⁾
OC3-C	X	---	Removed	----	0.783 ^(b)	----	Will be disposed ⁽²⁾
OC3-D	X	---	Tested	----	1.45	----	Reported in BAW-2128, Rev. 1 ⁽¹⁶⁾
OC3-E	X	---	CR3-WZ	1.600	1.262 ^(b)	End of Cycle 12	Will be disposed ⁽²⁾
OC3-F	X	---	CR3-ZY	1.600	1.723 ^(b)	End of Cycle 13	Will be disposed ⁽²⁾
TMI1-E	X	---	Tested	----	0.107	----	Reported in BAW-1439 ⁽¹⁹⁾
TMI1-B	---	---	Removed	----	0.444 ^(d)	----	Will be disposed ⁽²⁾
TMI1-C	X	---	Tested	----	0.866	----	Reported in BAW-1901 ⁽¹⁸⁾
TMI1-A	X	---	Removed	----	Unknown	----	Held in storage - reported in BAW-2042 ⁽¹⁷⁾
TMI1-D	---	---	Removed	----	0.816 ^(b)	----	Will be disposed ⁽²⁾
TMI1-F	---	---	Removed	----	0.631 ^(b)	----	Will be disposed ⁽²⁾

Table VI (cont'd). Summary Status of the B&W Surveillance Capsules

Capsule ID	Capsule Contents		Status/ Location	Fluence, n/cm ² (x10 ¹⁹)		Time of Removal	Comments
	Weld Metal	Fracture Toughness Specimens		Target	Expected/Received		
CR3-B	X	X	Tested	----	0.117	----	Reported in BAW-1679, Rev. 1 ⁽²⁰⁾ and BAW-1718 ⁽²¹⁾
CR3-C	X	---	Tested	----	0.656	----	Reported in BAW-1898 ⁽²²⁾
CR3-D	X	X	Tested	----	0.750	----	Reported in BAW-1899 ⁽²³⁾ and BAW-1914 ⁽²⁴⁾
CR3-F	X	X	Tested	----	1.08	----	Reported in BAW-2049 ⁽²⁵⁾ and BAW-2172 ⁽²⁶⁾
CR3-A	X	---	Removed	----	1.240 ^(b)	----	Will be disposed ⁽²⁾
CR3-E	X	---	Removed	----	1.240 ^(b)	----	Will be disposed ⁽²⁾
AN1-E	X	---	Tested	----	0.0727	----	Reported in BAW-1440 ⁽³⁰⁾
AN1-B	---	---	Tested	----	0.428	----	Reported in BAW-1698 ⁽²⁸⁾
AN1-A	X	---	Tested	----	1.03	----	Reported in BAW-1836 ⁽²⁷⁾
AN1-C	X	---	Tested	----	1.46	----	Reported in BAW-2075, Rev. 1 ⁽²⁹⁾
AN1-D	---	---	Removed	----	0.760 ^(d)	----	Will be disposed ⁽²⁾
AN1-F	---	---	Removed	----	0.783 ^(b)	----	Will be disposed ⁽²⁾
TE1-F	X	X	Tested	----	0.196	----	Reported in BAW-1701 ⁽³⁶⁾ and BAW-1719 ⁽³⁷⁾
TE1-B	X	X	Tested	----	0.592	----	Reported in BAW-1834 ⁽³²⁾ and BAW-1867 ⁽³³⁾
TE1-A	X	---	Tested	----	1.29	----	Reported in BAW-1882, Rev. 1 ⁽³¹⁾
TE1-D	X	X	Tested	----	0.962	----	Reported in BAW-2125 ⁽³⁴⁾ and BAW-2208 ⁽³⁵⁾
TE1-C	X	---	Removed	----	1.593 ^(d)	----	Will be disposed ⁽²⁾
TE1-E	X	---	Removed	----	1.267 ^(b)	----	Will be disposed ⁽²⁾

Table VI (cont'd). Summary Status of the B&W Surveillance Capsules

Capsule ID	Capsule Contents		Status/ Location	Fluence, n/cm ² (x10 ¹⁹)		Time of Removal	Comments
	Weld Metal	Fracture Toughness Specimens		Target	Expected/ Received		
CR3-LG1	X	X	Tested	----	0.500-0.779	----	Reported in BAW-1910P ⁽⁶⁴⁾
CR3-LG2	X	X	Tested	----	1.19-1.95	----	Reported in BAW-2254P ⁽⁶⁵⁾
DB1-LG1	X	X	Tested	----	0.661-1.03	----	Reported in BAW-1920P ⁽⁶⁶⁾
DB1-LG2	X	X	Removed	----	1.621 ^(b)	----	Will be disposed ⁽²⁾
TMI2-LG1	X	X	Tested	----	0.585-0.992	----	Reported in BAW-2253P ⁽⁶⁷⁾
TMI2-LG2	X	X	CR3-YZ	1.700	1.520 ^(b)	End of Cycle 12	----
A1	X	X	DB1-YZ	3.000	2.441 ^(b)	End of Cycle 17	----
A2	X	X	CR3-YX	3.000	2.370 ^(b)	End of Cycle 17	----
A3	X	X	Removed	----	1.345 ^(b)	End of Cycle 12	Currently being tested and evaluated.
A4	X	X	CR3-YX	3.000	2.370 ^(b)	End of Cycle 17	----
A5	X	X	Tested	----	0.637-1.042	----	Reported in BAW 2360P ⁽⁶⁸⁾
L1	X	X	Removed	----	1.345 ^(b)	End of Cycle 12	Currently being tested and evaluated.
L2	X	X	DB1-YZ	1.700	2.441 ^(b)	End of Cycle 17	----

^(a) BAW-1543, Revision 3⁽³⁾

^(b) BAW-2108, Revision 1⁽⁶⁹⁾

^(c) NUREG CR-4816, Volumes 1 & 2⁽⁷⁰⁾

^(d) BAW-2108⁽⁷¹⁾

Table VII. Summary Status of the Westinghouse Surveillance Capsules

Capsule ID	Capsule Contents		Status/ Location ^(a)	Fluence, n/cm ² (x10 ¹⁹)		Time of Removal	Comments
	Weld Metal	Fracture Toughness Specimens		Target	Expected		
PB1-N	X	X	33°	4.500	4.500	End of Life	Standby
PB1-P	X	---	Removed	----	----	----	Held in Storage
PB1-R	X	X	Tested	----	----	----	Reported in WCAP-9357 ⁽³⁹⁾
PB1-S	X	---	Tested	----	----	----	Reported in WCAP-8739 ⁽⁴⁰⁾
PB1-T	X	X	Tested	----	----	----	Reported in WCAP-10736 ⁽⁴¹⁾
PB1-V	X	X	Tested	----	----	----	Reported in BCL report dated 6/73 ⁽⁴²⁾
PB2-N	X	---	33°	5.000	5.000	End of Life	Standby
PB2-P	X	---	Removed	----	----	----	Held in storage
PB2-R	X	X	Tested	----	----	----	Reported in WCAP-9635 ⁽⁴⁴⁾
PB2-S	X	X	Tested	----	----	----	Reported in BAW-2140 ⁽⁴⁵⁾
PB2-T	X	---	Tested	----	----	----	Reported in WCAP-9331 ⁽⁴⁶⁾
PB2-V	X	X	Tested	----	----	----	Reported on BCL report dated 6/75 ⁽⁴⁷⁾
S1-S	---	---	25°	3.900	3.900	Remain for Lifex	Standby ^(b)
S1-T	X	X	Tested	----	----	----	Reported in BCL reported dated 6/75 ⁽⁴⁹⁾
S1-U	---	---	45°/25°	3.000	3.000	Remain for Lifex	Standby, transferred to 25° at EOC-12
S1-V	X	X	Tested	----	----	----	Reported in WCAP-11415 ⁽⁵⁰⁾
S1-W	---	---	Dosimetry	----	----	----	Reported in BCL-585-8R ⁽⁵¹⁾
S1-X	X	X	Tested	----	----	----	Reported in BAW-2324 ⁽⁵²⁾
S1-Y	---	---	35°	4.300	4.300	Remain for Lifex	Standby, transferred to 15° at EOC-14
S1-Z	X	X	25°/15°	5.200	5.200	End of Life	Standby, transferred to 15° at EOC-12

Table VII (cont'd). Summary Status of the Westinghouse Surveillance Capsules

Capsule ID	Capsule Contents		Status/ Location ^(a)	Fluence, n/cm ² (x10 ¹⁹)		Time of Removal	Comments
	Weld Metal	Fracture Toughness Specimens		Target	Expected		
S2-S	X	---	Dosimetry	----	----	----	Evaluated for dosimetry only. Results reported in WCAP-14810 ⁽⁵⁴⁾
S2-T	X	---	35°	3.800	3.800	End of Life	Standby, transfer to 15° at EOC-17
S2-U	X	---	25°	3.600	3.600	End of Cycle 22	Standby
S2-V	X	---	Tested	----	----	----	Reported in WCAP-11499 ⁽⁵⁵⁾
S2-W	X	---	Dosimetry	----	----	----	Reported in BCL-585-026 ⁽⁵⁶⁾
S2-X	X	---	Tested	----	----	----	Reported in BCL report dated 9/75 ⁽⁵⁷⁾
S2-Y	X	X	25°/15°	3.200	3.200	End of Cycle 17	Transferred to 15° at EOC-12
S2-Z	X	X	35°/25°	3.400	3.400	Remain for Lifex	Standby, transferred to 25° at EOC-12
S2-W1	X	X	Tested	----	----	----	Reported in BAW-2350P ⁽⁷²⁾
TP3-S	---	---	Tested	----	----	----	Reported in SwRI-02-5131 ⁽⁵⁹⁾
TP3-T	X	X	Tested	----	----	----	Reported in WCAP-8631 ⁽⁶⁰⁾
TP3-U	---	---	30°	----	----	End of Life	Standby
TP3-V	X	X	Tested	----	----	----	Reported in SwRI-06-8575 ⁽⁶¹⁾
TP3-W	---	---	40°	----	----	End of Life	Standby
TP3-X	X	X	0°	2.600	2.600	End of Cycle 21	----
TP3-Y	---	---	30°	----	----	----	Standby
TP3-Z	---	---	40°	----	----	----	Standby
TP4-S	---	---	Tested	----	----	----	Reported in SwRI-02-5380 ⁽⁵⁹⁾
TP4-T	X	X	Tested	----	----	----	Reported in SwRI-02-4221 ⁽⁶³⁾
TP4-U	---	---	30°	----	----	End of Life	Standby
TP4-V	X	X	20°	----	----	End of Life	Standby
TP4-W	---	---	40°	----	----	End of Life	Standby
TP4-X	X	X	0°	3.700	3.700	End of Cycle 27	Standby
TP4-Y	---	---	30°	----	----	End of Life	Standby
TP4-Z	---	---	40°	----	----	End of Life	Standby

^(a) All locations are relative with regard to quadrant; e.g., 0° is equivalent to 90°, 180°, or 270°.

^(b) To be withdrawn at EOC-17 if cavity dosimetry is not installed.

Table VIII. Comparison of the Plant-Specific Surveillance Capsules with ASTM E 185 Requirements

Plant	ASTM E 185-82 5 Capsule Program Requirement					
	1.5 EFPY or Fluence > 5E18 $\rho RT_{NDT} \approx 50^\circ F$	3 EFPY or Fluence Midway Between First and Third Capsule	6 EFPY or T/4 EOL Fluence	15 EFPY or IS EOL Fluence	EOL or 1-2 Times EOL Fluence (Capsule may be held w/o testing)	Standby (1-2 Times IS EOL Fluence)
Oconee-1	F-I/T	E-I/T	A-I/T	C-I/T	B-I/NT	D-R
Oconee-2	C-I/T	A-I/T	B-I/NT	E-I/T	D-R	F-I/NT
Oconee-3	A-I/T	B-I/T	C-I/NT	D-I/T	E-R	F-R
TMI-1	E-I/T	C-I/T	F-I/NT	D-I/NT	A-I/NT	B-I/NT
Crystal River-3	B-I/T	C-I/T	D-I/T	F-I/T	A-I/NT	E-I/NT
ANO-1	E-I/T	B-I/T	A-I/T	C-I/T	D-I/NT	F-I/NT
Davis-Besse	F-I/T	B-I/T	A-I/T	D-I/T	C-I/NT	E-I/NT
Point Beach-1	V-I/T	S-I/T	T-I/T	R-I/T	P-I/NT	N-R
Point Beach-2	V-I/T	T-I/T	R-I/T	S-I/T	P-I/NT	N-R
Surry-1	T-I/T	W-I/T*	V-I/T	X-I/T	S,U-R	Y,Z-R
Surry-2	X-I/T	W-I/T*	V-I/T	Y-R	S-I/T*,T-R	U,Z-R
Turkey Point-3	T-I/T	V-I/T	S-I/T	X-R	U,W-R	Y,Z-R
Turkey Point-4	T-I/T	S-I/T	X-R	V-R	U,W-R	Y,Z-R

Legend: I/T = Irradiated and tested

I/NT = Irradiated and not tested

R = In reactor

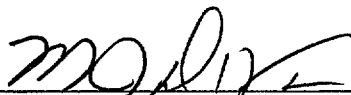
* Only dosimetry evaluated.

Table IX. Peak End-of-Life Inside Surface Fluences and Significant Licensing Dates

Plant	Date Construction Permit Issued	Date Operating License Issued	License Expiration	Peak EOL IS Fluence, n/cm ² (E > 1 MeV)
Oconee-1	November 6, 1967	February 6, 1973	February 5, 2013	9.32E+18
Oconee-2	November 6, 1967	October 6, 1973	October 5, 2013	9.02E+18
Oconee-3	November 6, 1967	July 19, 1974	July 18, 2014	8.90E+18
TMI-1	May 18, 1968	April 19, 1974	April 19, 2014	8.16E+18
Crystal River-3	September 25, 1968	December 3, 1976	December 2, 2016	8.03E+18
ANO-1	December 6, 1968	May 21, 1974	May 20, 2014	8.71E+18
Davis-Besse	March 24, 1971	April 22, 1977	April 22, 2017	1.07E+19
Point Beach-1	July 19, 1967	October 5, 1970	October 5, 2010	2.85E+19
Point Beach-2	July 25, 1968	March 8, 1973	January 7, 2013	3.12E+19
Surry-1	June 25, 1968	May 25, 1972	May 24, 2012	3.74E+19
Surry-2	June 25, 1968	January 29, 1973	January 28, 2013	3.52E+19
Turkey Point-3	April 27, 1967	July 19, 1972	July 19, 2012	2.74E+19
Turkey Point-4	April 27, 1967	April 10, 1973	April 10, 2013	2.74E+19


2.0 CERTIFICATION

This supplement to BAW-1543, Revision 4, is an accurate description of the capsule irradiation plan for the Master Integrated Reactor Vessel Surveillance Program.


M. J. DeVan
Materials and Structural Analysis Unit


3/14/01
Date

This report has been reviewed and is an accurate description of the revised master integrated reactor vessel surveillance program.


K. E. Moore
Materials and Structural Analysis Unit


3-14-01
Date

Verification of independent review.


A. D. McKim, Manager
Materials and Structural Analysis Unit

3-14-01
Date

This report has been approved for release.


D. L. Howell
Program Manager

3/27/2001
Date

3.0 REFERENCES

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