PECO ENERGY

PECO Energy Company
Nuclear Group Headquarters
965 Chesterbrook Boulevard
Wayne, PA 19087-5691

April 26, 2000

Docket Nos. 50-277
50-278
License Nos. DPR-44
DPR-56

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: Peach Bottom Atomic Power Station, Units 2 and 3
Revision to the Specimen Capsule Withdrawal Schedule

Dear Sir/Madam:

PECO Energy Company is requesting a revision to the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3 reactor vessel material surveillance program schedule. As required by 10CFR50, Appendix H, Section III.B.3, Licensees are required to have developed a reactor vessel material surveillance program schedule. This request proposes a change to the withdrawal schedule as currently defined in the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3 Updated Final Safety Analysis Report (UFSAR), Section 4.2.6.

Administrative Letter (AL) 97-04 ("NRC Staff Approval for Changes to 10 CFR Part 50, Appendix H, Reactor Vessel Surveillance Specimen Withdrawal Schedules") was issued to "inform licensees that changes to facilities' reactor vessel surveillance specimen capsule withdrawal schedules as specified in Appendix H to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR) that do not conform to the required ASTM standard referenced in Appendix H will be treated as license amendments requiring public notice and opportunity for a hearing." Conversely, AL 97-04 continues "...as long as the plant's withdrawal schedule change meets the applicable ASTM standard, the plant will not be exceeding the operating authority already granted in its license. Therefore, a license amendment would not be required, although prior NRC approval to verify conformance with the ASTM standard is required by Appendix H." The proposed change to the PBAPS, Units 2 and 3 surveillance capsule withdrawal schedule meets the applicable ASTM standard requirements as described below and therefore, NRC approval to verify this conformance is requested.

BACKGROUND

Nuclear power plant licensees are required by 10 CFR Part 50, Appendix H, to implement RPV surveillance programs to "monitor changes in the fracture toughness properties of ferritic materials in the reactor vessel beltline region...which result from exposure of these materials to neutron irradiation and the thermal environment". Regarding RPV surveillance program design and specimen testing, 10 CFR Part 50, Appendix H, incorporates by reference the editions of the American Society for Testing and Materials (ASTM) E 185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," through the 1982 edition. Under 10 CFR Part 50, Appendix H, the licensee's RPV surveillance program design and withdrawal schedule is required to meet the requirements of the edition of ASTM E 185 that is current on the issue date of the ASME Code to which the RPV was purchased, although later editions may be used, up to and including the 1982 edition. The test procedures and reporting requirements must, however, meet the requirements of the 1982 edition of ASTM E 185, to the extent practical for the configuration of the specimens in the capsules.

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The PBAPS surveillance program was originally designed to meet the requirements of the standard surveillance program described in the GE-APED Topical Report, NEDO-10115, "Mechanical Property Surveillance of General Electric BWR Vessels." PBAPS UFSAR Appendix K, Exhibit VII, reconciles the surveillance program requirements of NEDO-10115 with the 1970 version of ASTM E 185 (E 185-70).

The current PBAPS, Units 2 and 3 capsule withdrawal schedule as defined by the PBAPS, Units 2 and 3 UFSAR, Section 4.2 is as follows:

	Unit 2	**Unit 3**	
1.	7-9 EFPY (7.53 EFPY Actual)	1.	7-9 EFPY (7.57 EFPY Actual)
2.	15-18 EFPY	2.	15-18 EFPY
3.	Standby	3.	Standby

Section 4.6 of ASTM E 185-70 states the following with regard to specimen withdrawal: "It is recommended that sets of specimens be withdrawn at three or more separate times. One of the data points obtained shall correspond to the neutron exposure of the reactor vessel at no greater than 30 percent of its design life. One other data point obtained shall correspond to the neutron exposure of the reactor vessel near the end of its design life".

DESCRIPTION OF THE PROPOSED CHANGES

This request proposes a change to the current surveillance capsule withdrawal schedule that is contained within the PBAPS, Units 2 and 3 Updated Final Safety Analysis Report (UFSAR), Section 4.2. The following changes are proposed for this withdrawal schedule. These changes will be made for both PBAPS, Unit 2 and 3 to provide for consistency, and to ensure alignment with the applicable ASTM standard:

	Unit 2	**Unit 3**	
1.	7-9 EFPY (7.53 EFPY Actual)	1.	7-9 EFPY (7.57 EFPY Actual)
2.	20 EFPY	2.	20 EFPY
3.	Standby	3.	Standby

As indicated, the first surveillance capsule for each unit has already been withdrawn in accordance with the ASTM E185-70 and UFSAR withdrawal schedules. The withdrawal schedule for the second surveillance capsule as specified in the PBAPS, Units 2 and 3 UFSAR is currently 15-18 EFPY. The withdrawal schedule change being proposed is a one-cycle (2 EFPY) deferral which will extend this second capsule withdrawal to 20 EFPY.

JUSTIFICATION FOR PROPOSED CHANGES

The Boiling Water Reactor Vessel and Internals Program (BWRVIP) was organized to address reactor vessel and internals issues affecting U.S. BWR's. The BWRVIP Assessment Committee recently developed a plan to address the requirements in 10 CFR 50, Appendix H, for surveillance of reactor vessel material related to monitoring radiation embrittlement. The BWRVIP Integrated Surveillance Program (ISP) Plan (BWRVIP-78) was submitted to the NRC on December 22, 1999. Based on criteria delineated in the program plan (e.g. chemistry match, excellent baseline data, and fabricator details), the PBAPS, Unit 2 capsules were selected as representative of several reactor vessels and were included in the proposed

schedule for withdrawal, test, and analysis under the ISP. The PBAPS, Unit 3 capsules were not selected for withdrawal based on the current ISP. PECO Energy Company is participating in the BWRVIP and intends to participate in the ISP described in BWRVIP-78.

As discussed in BWRVIP letter dated January 31, 2000, the BWRVIP recommended that utilities submit requests to the NRC to defer for one cycle any BWR reactor pressure vessel material surveillance capsule withdraws scheduled for the year 2000. Some changes to the ISP recommendations may occur during the NRC review cycle, which could change the withdrawal timing or eliminate the PBAPS, Unit 2 specimen withdrawal entirely. This could result in unnecessary effort and expense, as well as the reduction of capsule data (e.g. if a capsule is withdrawn based on the current version of the ISP, and is later deselected, data will be lost for the time frame between capsule withdrawal and replacement into the RPV at the next available opportunity).

The current withdrawal schedule of 15-18 EFPY would require removal of the second capsule during 2R13, in September 2000 for PBAPS, Unit 2 and during 3R13, in September 2001 for PBAPS Unit 3. A deferral of this second capsule to 20 EFPY will allow adequate time for finalization of the ISP and for planning the appropriate actions relative to the PBAPS, Units 2 and 3 specimens.

Changing the second capsule withdrawal schedule to 20 EFPY is in full conformance with the ASTM standard applicable for use at Peach Bottom Atomic Power Station, ASTM E 185-70.

Additional technical justification further demonstrating the acceptability of this proposed revised withdrawal schedule prepared by General Electric is included as Attachment 1 to this request. In accordance with NRC Administrative Letter 97-04, the NRC is requested to review this proposed surveillance capsule withdrawal schedule revision to verify conformance with ASTM E 185-70.

We request your approval by September 8, 2000.

If you have any questions, please do not hesitate to contact us.

Very truly yours,

James A. Hutton
Director - Licensing

cc: H. J. Miller, Administrator, Region I, USNRC
A. C. McMurtray, USNRC Senior Resident Inspector, PBAPS
R. R. Janati, Commonwealth of Pennsylvania

Attachment 1

GE Nuclear Energy Letter

GE Nuclear Energy

Engineering & Technology
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B13-02066-00-012-01R1
April 18, 2000

cc: DJ Robare
BJ Branlund

Mr. Bob McCall
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Wayne, PA 19087-5691

SUBJECT: Deferral of Peach Bottom Units 2 & 3 Second Capsule Withdrawal Schedule

SUMMARY

The second reactor pressure vessel (RPV) surveillance capsules for Peach Bottom Units 2 & 3 are currently scheduled to be removed during the Fall 2000 and Fall 2001 outages, respectively. PECO Energy Company would like to defer withdrawal of these specimen capsules for one operating cycle (until Fall 2002 and Fall 2003). The purpose of this letter is to provide a justification for such a deferral.

Deferring the Peach Bottom Units 2 & 3 second capsules is acceptable for the following reasons: (1) The first capsule measured shift results were within the Regulatory Guide 1.99, Revision 2 (Reg. Guide 1.99) [1] predicted shift range and therefore, the second capsule results are expected to be within the predicted range. (2) It is GE's experience that measured results for both first and second capsules are within the Reg. Guide 1.99 predicted values when including the margin term. (3) The projected difference in measured shift between an 18 EFPY withdrawal and the requested deferred withdrawal (20 EFPY) is small and will not affect the operating capability of the plants. This includes the vessel circumferential welds which have been analyzed and found acceptable for up to 32 EFPY of operation [6]. (4) The current P-T curves will remain conservative and acceptable to ensure against brittle fracture even taking into consideration a one-cycle deferral. This is true because the Peach Bottom Units 2 & 3 P-T curves are not

limited by the beltline shift. In addition, use of the recently NRC approved 1995 Edition of the ASME Boiler and Pressure Vessel Code and Code Case N-640 would result in a reduction of conservatism inherent in the current P-T curves. Therefore, it is reasonable to extend the capsule withdrawal schedule for the Peach Bottom Units 2 & 3 second capsules at least until the NRC review of the Integrated Surveillance Program (ISP) [5] has been completed. Although not yet finalized, in the current version of the ISP [5], the Peach Bottom Unit 2 surveillance capsule represents its own vessel and three other BWR vessels. Upon acceptance of the ISP, an implementation schedule will be created for the Peach Bottom Unit 2 second capsule in order to maximize the data obtained from capsule measurements. Early withdrawal may negatively impact the ISP by reducing the value of the Peach Bottom Unit 2 results. Peach Bottom Unit 3 is represented in the ISP by Duane Arnold for its plate material and River Bend for its weld material. Duane Arnold's second capsule has already been removed and tested. While River Bend has yet to remove its first capsule, its weld material is also represented in the Supplemental Surveillance Program (SSP) Capsule H which has been removed and will be tested during the year 2000. Therefore, representative material information will be available for Peach Bottom Unit 3 should the need arise.

INTRODUCTION/BACKGROUND

In response to requirements set forth in 10CFR50 Appendix H [2], nuclear plants must perform surveillance testing at periodic intervals to address issues relating to RPV fracture toughness. The key issue addressed by this testing is RPV embrittlement as a result of irradiation.

Surveillance testing is routinely performed by testing Charpy samples of base, weld, and heat affected zone (HAZ) metal which were installed in the RPV in surveillance capsules during vessel fabrication. Typically, a BWR vessel has three such capsules which are removed for testing at periodic intervals throughout the operating life of the plant. The specimens are removed and destructively tested at each of these intervals, and the results are used in conjunction with Reg. Guide 1.99 methodology [1] to adjust operating limits (pressure-temperature) curves as necessary to ensure protection from brittle fracture.

The BWRVIP is currently developing an Integrated Surveillance Program (ISP) that has been submitted to the NRC for review this year. The purpose of the ISP is to monitor radiation embrittlement of the U.S. BWR fleet reactor pressure vessels. As described above, currently each U.S. BWR has a surveillance program for monitoring the changes in RPV material properties due to neutron irradiation. Each BWR has its own surveillance program and the specimen selection, testing, analysis, and monitoring is conducted on a plant-specific basis.

Although each plant has an existing program that meets 10CFR50 Appendix H [2], the materials for the ISP are specifically chosen to best represent the limiting plate and weld material for each plant using specimens from the BWR fleet and the Supplemental Surveillance Program (SSP).

Although not yet finalized, in the current revision of the ISP design, the Peach Bottom Unit 2 surveillance capsules have been selected as representative specimens for their own RPV and three (3) other U.S. BWR RPVs. Peach Bottom Unit 3 is currently represented by Duane Arnold for its plate material and River Bend for its weld material.

METHODS AND ASSUMPTIONS

The fluences used for the currently licensed P-T curves are based upon the measurements and calculated lead factors from the first capsule for each unit [3]. The first cycle dosimetry fluence values for peak ID at 32 EFPY are 7.1×10^{17} n/cm^2 and 4.8×10^{17} n/cm^2 for Units 2 and 3, respectively. The first capsule dosimetry fluence values for peak ID at 32 EFPY are 8.0×10^{17} n/cm^2 and 7.2×10^{17} n/cm^2 for Units 2 and 3, respectively. Upon implementation of 110% power rerate, peak ID 32 EFPY fluences were recalculated to be 8.8×10^{17} n/cm^2 and 7.9×10^{17} n/cm^2 for Units 2 and 3, respectively. At that time, it was determined that the P-T curves for both units were non-beltline limited, and that the slight increase in shift due to power rerate would not impact the P-T curves. Further evaluation has shown that a significant increase in shift (75°F and 13°F for Units 2 and 3, respectively) is required to cause the beltline curve to be bounding. Peak ID 32 EFPY fluence values significantly higher than those expected would be required in order to cause such a shift. It is therefore demonstrated that the 110% power uprate fluences used in generating the currently licensed P-T curves for both units are sufficient for use in the following considerations.

The Peach Bottom Units 2 & 3 first capsule results demonstrate that the RPV materials are behaving well within the bounds set forth by Reg. Guide 1.99. The following tables provide a comparison of the first capsule measured results [3] versus the Reg. Guide 1.99 predictions, both with and without the Margin term ($2\sigma_\Delta$, which equals 34°F for plate material and 56°F for weld material).

Peach Bottom Unit 2

Specimen	Measured Shift[(1)] (°F)	Predicted Shift[(2)] (°F)	Predicted Shift + Margin[(2)] (°F)
Plate	-5	10.5	44.5
Weld	17	14	70

(1) based upon the 1st capsule fluence of 1.8×10^{17} n/cm^2

(2) calculated per Regulatory Guide 1.99, Revision 2 [1]

Peach Bottom Unit 3

Specimen	Measured Shift[1] (°F)	Predicted Shift[2] (°F)	Predicted Shift + Margin[2] (°F)
Plate	16	14	48
Weld	16	15	71

[1] based upon the 1st capsule fluence of 1.6×10^{17} n/cm^2

[2] calculated per Regulatory Guide 1.99, Revision 2 [1]

The second capsule results for Peach Bottom Units 2 & 3 are expected to fall within the bounds set forth by Reg. Guide 1.99. The following tables present second capsule plate and weld material results from other BWRs to demonstrate typical BWR material behavior versus the Reg. Guide 1.99 predictions, both with and without the Margin term.

Plate Materials

Plant	Measured Shift (°F)	EFPY	Capsule Fluence ($\times 10^{17}$ n/cm^2)	Predicted Shift[1] (°F)	Predicted Shift + Margin[1] (°F)
BWR3	12	6	0.7	8	42
BWR3	78	15	6.6	48	82
BWR3	2	16	12.6	31	65
BWR4	53	11	2.8	35	69
BWR4	77	15	11.0	72	106
BWR4	15	13	5.0	22	56
BWR4	62	14	4.6	69	103

[1] calculated per Regulatory Guide 1.99, Revision 2 [1]

Weld Materials

Plant	Measured Shift (°F)	EFPY	Capsule Fluence ($\times 10^{17}$ n/cm^2)	Predicted Shift[1] (°F)	Predicted Shift + Margin[1] (°F)
BWR3	4	6	0.3	5	61
BWR3	76	15	6.6	77	133
BWR3	95	16	12.6	64	120
BWR4	62	11	2.8	41	97
BWR4	16	15	11.0	13	69

[1] calculated per Regulatory Guide 1.99, Revision 2 [1]

The Peach Bottom Units 2 & 3 first capsule predicted values can be extrapolated to both 18 EFPY which represents the current withdrawal schedule, and 20 EFPY which represents the requested interval of the one cycle deferral. This extrapolation conservatively uses peak ID power uprate fluences previously calculated for Peach Bottom Units 2 & 3 [4] rather than the capsule fluence.

Peach Bottom Unit 2

Plate:	Copper Content	0.10%
	Nickel Content:	0.54%
	Chemistry Factor:	65
	32 EFPY peak ID fluence including 110% power uprate	8.8×10^{17} n/cm^2
	7.53 EFPY capsule fluence:	1.8×10^{17} n/cm^2
	7.53 EFPY predicted shift:	10.5°F
	7.53 EFPY predicted shift + margin:	44.5°F
	18 EFPY peak ID fluence:	5×10^{17} n/cm^2
	18 EFPY predicted shift:	19°F
	18 EFPY predicted shift + margin:	53°F
	20 EFPY peak ID fluence:	5.5×10^{17} n/cm^2
	20 EFPY predicted shift:	20°F
	20 EFPY predicted shift + margin:	54°F

Peach Bottom Unit 2

Weld:	Copper Content	0.10%
	Nickel Content:	0.32%
	Chemistry Factor:	84.2
	32 EFPY peak ID fluence including 110% power uprate	8.8×10^{17} n/cm^2
	7.53 EFPY capsule fluence:	1.8×10^{17} n/cm^2
	7.53 EFPY predicted shift:	14°F
	7.53 EFPY predicted shift + margin:	70°F
	18 EFPY peak ID fluence:	5×10^{17} n/cm^2
	18 EFPY predicted shift:	24.5°F
	18 EFPY predicted shift + margin:	80.5°F
	20 EFPY peak ID fluence:	5.5×10^{17} n/cm^2
	20 EFPY predicted shift:	26°F
	20 EFPY predicted shift + margin:	82°F

For Peach Bottom Unit 2, it can be seen from the tables above that the difference in predicted shift between 18 EFPY representing the current capsule withdrawal schedule and 20 EFPY representing the proposed deferred capsule withdrawal schedule is small (approximately 1°F and 1.5°F for plate and weld materials, respectively).

Peach Bottom Unit 3

Plate:	Copper Content	0.13%
	Nickel Content:	0.64%
	Chemistry Factor:	92
	32 EFPY peak ID fluence including 110% power uprate	$7.9x10^{17}$ n/cm^2
	7.57 EFPY capsule fluence:	$1.6x10^{17}$ n/cm^2
	7.57 EFPY predicted shift:	14°F
	7.57 EFPY predicted shift + margin:	48°F
	18 EFPY peak ID fluence:	$4.4x10^{17}$ n/cm^2
	18 EFPY predicted shift:	25°F
	18 EFPY predicted shift + margin:	59°F
	20 EFPY peak ID fluence:	$4.9x10^{17}$ n/cm^2
	20 EFPY predicted shift:	27°F
	20 EFPY predicted shift + margin:	61°F

Peach Bottom Unit 3

Weld:	Copper Content	0.11%
	Nickel Content:	0.41%
	Chemistry Factor:	102.5
	32 EFPY peak ID fluence including 110% power uprate	$7.9x10^{17}$ n/cm^2
	7.57 EFPY capsule fluence:	$1.6x10^{17}$ n/cm^2
	7.57 EFPY predicted shift:	15°F
	7.57 EFPY predicted shift + margin:	71°F
	18 EFPY peak ID fluence:	$4.4x10^{17}$ n/cm^2
	18 EFPY predicted shift:	28°F
	18 EFPY predicted shift + margin:	84°F
	20 EFPY peak ID fluence:	$4.9x10^{17}$ n/cm^2
	20 EFPY predicted shift:	30°F
	20 EFPY predicted shift + margin:	86°F

For Peach Bottom Unit 3, it can be seen from the tables above that the difference in predicted shift between 18 EFPY representing the current capsule withdrawal schedule and 20 EFPY representing the proposed deferred capsule withdrawal schedule is small (approximately 2°F for plate and weld materials).

RESULTS AND CONCLUSIONS

The BWRVIP is currently in the process of developing an Integrated Surveillance Program (ISP) for the BWR fleet. Although each plant has an existing program that meets 10CFR50 Appendix H [2], the materials for the ISP are specifically chosen to best

represent the limiting plate and weld material for each plant using specimens from the BWR fleet and the Supplemental Surveillance Program (SSP). The Peach Bottom Unit 2 capsules are currently included in the ISP. The Peach Bottom Unit 3 vessel is represented by Duane Arnold and River Bend for its plate and weld materials, respectively. However, it will still be prudent to defer capsule removal of both Peach Bottom Units 2 & 3 second capsules until the NRC completes its review the ISP.

Deferring the Peach Bottom Units 2 & 3 second capsules is acceptable for the following reasons: (1) The first capsule measured shift results were within the Reg. Guide 1.99 predicted shift range and therefore, the second capsule results are expected to be within the predicted range. (2) It is GE's experience, in general, that measured results for both first and second capsules are within the predicted Reg. Guide 1.99 predicted values when including the margin term. (3) The difference in expected measured shift between an 18 EFPY withdrawal and the requested deferred withdrawal is small and will not affect the operating capability of the plants. This includes the vessel circumferential welds which have been analyzed and found acceptable for up to 32 EFPY of operation [6]. (4) The current P-T curves will remain conservative and acceptable to ensure against brittle fracture even taking into consideration a one-cycle deferral. This is true because the Peach Bottom Units 2 & 3 P-T curves are not limited by the beltline shift. In addition, use of the recently NRC approved 1995 Edition of the ASME Boiler and Pressure Vessel Code and Code Case N-640 would result in a reduction of conservatism inherent in the current P-T curves. Therefore, it is reasonable to extend the capsule withdrawal schedules for the Peach Bottom Units 2 & 3 second capsules at least until the NRC review of the ISP has been completed. Upon acceptance of the ISP, an implementation schedule will be created for the Peach Bottom Unit 2 second capsule in order to maximize the data obtained from capsule measurements. Peach Bottom Unit 3 is represented in the ISP by Duane Arnold for its plate material and River Bend for its weld material. Duane Arnold's second capsule has already been removed and tested. While River Bend has yet to remove its first capsule, its weld material is also represented in the SSP Capsule H which has been removed and will be tested during the year 2000. Therefore, representative material information will be available for Peach Bottom Unit 3 should the need arise.

REFERENCES

[1] "Radiation Embrittlement of Reactor Vessel Materials", USNRC Regulatory Guide 1.99, Revision 2, May 1988.

[2] "Reactor Vessel Material Surveillance Program Requirements", Appendix H to Part 50 of Title 10 of the Code of Federal Regulations", December 1995.

[3] (a) B.J. Branlund, "Peach Bottom Atomic Power Station Unit 2 Vessel Surveillance Materials Testing and Fracture Toughness Analysis", GENE, San Jose, CA, December 1991, (GE Report SASR 88-24, Revision 1).

(b) T.A. Caine, "Peach Bottom Atomic Power Station Unit 3 Vessel Surveillance Materials Testing and Fracture Toughness Analysis", GENE, San Jose, CA, June 1990, (GE Report SASR 90-50).

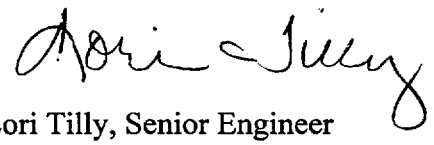
[4] T.A. Caine, "Peach Bottom 2 & 3 110% Power Rerate Impact on Vessel Fracture Toughness", GENE, San Jose, CA, February 12, 1993 (GE Letter GENE-523-171-1292).

[5] "BWR Vessel and Internals Project BWR Integrated Surveillance Program Plan (BWRVIP-78)", EPRI, December 1999 (EPRI Report TR-114228).

[6] Letter from JA Hutton (PECO) to the USNRC, "Peach Bottom Atomic Power Station, Units 2 & 3, Request for Permanent Relief from Circumferential Shell Weld Inspection Requirements", February 7, 2000.

If you have any questions, please call me at (408) 925-5945 or Betty Branlund at (408) 925-1472. Our FAX number is (408) 925-1150.

Sincerely,



Lori Tilly, Senior Engineer
Structural Assessment & Mitigation