



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 12, 2010

Mr. George H. Gellrich, Vice President
Calvert Cliffs Nuclear Plant, LLC
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1 - REACTOR
VESSEL SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE CHANGE
(TAC NO. ME3499)

Dear Mr. Gellrich:

By letter dated March 10, 2010, Calvert Cliffs Nuclear Power Plant, LLC, the licensee, requested approval of proposed changes to the reactor vessel surveillance capsule withdrawal schedule for the Calvert Cliffs Nuclear Power Plant, Unit No. 1. The proposed changes were submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H, Section III.B.3, which requires that: (1) withdrawal schedules be submitted, as specified in 10 CFR 50.4, and (2) the proposed schedule must be approved by the Nuclear Regulatory Commission (NRC) prior to implementation.

The NRC staff has reviewed the proposed changes and finds that the changes to the reactor pressure vessel surveillance capsule withdrawal schedule are consistent with the recommendations specified in American Society for Testing and Materials Standard Practice E185-82, as referenced by the requirements of 10 CFR Part 50, Appendix H, Section III.B.3. Therefore, the proposed changes are acceptable and are approved. The NRC staff's evaluation is enclosed.

Please contact Douglas Pickett at (301) 415-1364 if you have any questions on this issue.

Sincerely,

A handwritten signature in black ink that reads "Nancy L. Salgado".

Nancy L. Salgado, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-317

Enclosure:
As stated

cc w/encl: Distribution via Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO THE REACTOR VESSEL MATERIALS SURVEILLANCE PROGRAM

CALVERT CLIFFS NUCLEAR POWER PLANT, LLC

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-317

1.0 INTRODUCTION

By letter dated March 10, 2010, Calvert Cliffs Nuclear Power Plant, LLC, the licensee, requested approval of proposed changes to the reactor vessel surveillance capsule withdrawal schedule for the Calvert Cliffs Nuclear Power Plant, Unit No. 1 (Calvert Cliffs). The proposed changes were submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H, Section III.B.3, which requires that: (1) withdrawal schedules be submitted, as specified in 10 CFR 50.4, and (2) the proposed schedule must be approved by the Nuclear Regulatory Commission (NRC) prior to implementation.

2.0 REGULATORY EVALUATION

2.1 Section 50.60 of Part 50 of Title 10 of the Code of Federal Regulations (10 CFR 50.60) and Appendix H to 10 CFR Part 50

The NRC has established requirements and criteria in 10 CFR 50.60 for protecting the reactor vessels of light-water reactors (LWRs) against fracture. The rule requires light-water nuclear power reactors to meet the reactor vessel (RV) materials surveillance program requirements set forth in Appendix H to 10 CFR Part 50.

Appendix H to 10 CFR Part 50 provides the NRC staff's criteria for the design and implementation of RV material surveillance programs for operating LWRs. The rule, in Section III.B.1, requires RV surveillance program designs and withdrawal schedules to meet the requirements of the edition of American Society for Testing and Materials (ASTM) Standard Practice E185 that is current on the issue date of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) to which the RV was purchased, although later editions of ASTM E185 may be used inclusive of the 1982 Edition of ASTM E185 (ASTM E185-82). The rule, in Section III.B.3, also requires proposed RV surveillance programs to be submitted to the NRC and approved prior to implementation. The applicable criteria in ASTM E185-82 are discussed in Section 3.1 of this safety evaluation (SE).

2.2 NRC Administrative Letter (AL) 97-004 and NRC Memorandum and Order CLI-96-13

On September 30, 1997, the NRC issued AL 97-004, "NRC Staff Approval for Changes to 10 CFR Part 50, Appendix H, Reactor Vessel Surveillance Specimen Withdrawal Schedules," to all holders of operating licenses for domestic nuclear power plants (with the exception of those who have ceased operations of their facilities or have certified that fuel has been permanently removed from the reactor). In this AL, the NRC staff summarized the Commission's decision promulgated in Commission Memorandum and Order which was issued In the Matter of the Cleveland Electric Illuminating Company (Perry Nuclear Power Plant, Unit 1), CLI-96-13, 44 NRC 315 (1996). In this Memorandum and Order, the Commission found that, while 10 CFR Part 50, Appendix H requires prior NRC approval for all withdrawal schedule changes, only certain changes require the NRC staff to review and approve the changes through the NRC's license amendment (10 CFR 50.90) process. Specifically, only those changes that are not in conformance with the ASTM standard referenced in 10 CFR Part 50, Appendix H (ASTM E-185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels") are required to be approved through the license amendment process, whereas changes that are determined to conform to the ASTM standard only require that the NRC staff document its review and verification of such conformance.

3.0 TECHNICAL EVALUATION

3.1 Evaluation Criteria of ASTM Standard Practice E185-82

The Calvert Cliffs reactor vessel surveillance program is required to conform to ASTM E185-70 which was the current version when the program was designed. Improvements to ASTM E185 have resulted in the E185-82 version which is currently approved for incorporation by reference in Appendix H to 10 CFR Part 50. The guidance provided in ASTM E185-82 is consistent with, but more specific than, the guidance provided in earlier versions including ASTM E185-70. Therefore, compliance with the ASTM E185-82 withdrawal schedule guidance ensures compliance with the ASTM E185-70 withdrawal schedule.

Table 1 of ASTM E185-82 requires that either a minimum of three, four, or five surveillance capsules be removed from the vessels, based on the limiting amount of the shift in the reference transition of the nil-ductility temperature (limiting ΔRT_{NDT}) that is projected to occur at the clad-vessel interface location of the RV at the end-of-licensed plant life. ASTM E185-82 establishes the following criteria for determining the minimum number of capsules that are to be removed in accordance with a withdrawal schedule and the number of capsules that are to be tested:

- For plants with projected RT_{NDT} shifts (i.e., ΔRT_{NDT}) less than 100 °F (56 °C), three capsules are required to be removed from the RV and the first two capsules are required to be tested (for dosimetry, tensile-ductility, Charpy-V impact toughness, and alloying chemistry).
- For plants with projected ΔRT_{NDT} between 100 °F (56 °C) and 200 °F (111 °C), four surveillance capsules are to be removed from the RV and the first three capsules are required to be tested.
- For plants with projected ΔRT_{NDT} above 200 °F (111 °C), five surveillance capsules are required to be removed from the RV and the first four capsules are required to be tested.

- Standard Practice ASTM E185-82 permits the last scheduled surveillance capsules in three, four, or five capsule withdrawal schedules to be removed without the implementation of testing. However, licensees who opt to pull their final required capsules without the implementation of testing are required by the Standard Practice to hold the capsules in storage.

Table 1 of ASTM Standard Practice E185-82 also provides specific criteria for removal of surveillance capsules. The removal times are based on criteria that the surveillance capsules be removed after a certain amount of power operation has elapsed or at various times when the RV shell is projected to achieve certain levels of neutron fluence. The intent of the Standard Practice is to achieve a set of testing data over a range of neutron fluences for the RV that bounds the current life of the plant.

3.2 Changes Proposed to the Withdrawal Schedule for Calvert Cliffs

Table 1 below shows the currently approved withdrawal schedule for Calvert Cliffs, Unit No. 1.

Table 1 – Current Approved Schedule

Capsule Azimuthal Position	Target Fast Neutron Fluence ($\times 10^{19}$ n/cm ²)	Projected End-of-Cycle Date
263°	0.62 ^a	Withdrawn, 1979
97°	2.64 ^b	Withdrawn, 1992
104°	3.06 ^c	2010
83°	5.26 ^d	2020
277°	6.59 ^e	2032
284°	Standby	

Notes:

- ^a Actual capsule fluence [Perin, J.S., et al., "Calvert Cliffs Unit No. 1 Nuclear Plant Reactor Pressure Vessel Surveillance Program: Capsule 263," Battelle Columbus Laboratories, December 1980].
- ^b Actual capsule fluence: [Lowe, A.L. Jr., et al., "Analysis of Capsule 97° Baltimore Gas and Electric Company Calvert Cliffs Nuclear Power Plant Unit No. 1," B&W Nuclear Service Company, BAW-2160, June 1993].
- ^c Withdrawal criteria – Capsule fluence that corresponds to the projected fluence at the vessel ¼ T location at end of extended life.
- ^d Withdrawal criteria – Capsule fluence that corresponds to the projected fluence at the vessel inner wall location at end of extended life.
- ^e Withdrawal criteria – Not less than once or greater than twice the peak end of extended life vessel fluence at the vessel inner wall ($5.09 \times 10^{19} < \text{fluence in n/cm}^2 < 10.18 \times 10^{19}$). Note: This capsule also satisfies the requirement of the Nuclear Regulatory Commission safety evaluation report for Calvert Cliffs license renewal, that one capsule containing dosimetry is to be removed during the final 5 years of the extended license.

As indicated in Table 1, the licensee was scheduled to remove the capsule in azimuthal position 104° during the current 2010 refueling outage. However, as indicated in the licensee's letter, the licensee was unable to remove this capsule. During the current refueling outage, several attempts were made to remove the capsule using enhanced tooling. These attempts were unsuccessful even with the enhanced tooling, which included an increased load capacity of the tooling.

The licensee reviewed the other remaining capsules and determined that the 284° location was an appropriate substitute for the 104-degree capsule. The licensee stated that the 284° capsule is isofluent to the 104° capsule and meets the requirements of ASTM E185-82 to withdraw the third capsule at a time when the accumulated neutron fluence on the capsule corresponds to the approximate end-of-life fluence at the reactor vessel ¼ T(thickness) location.

Therefore, the licensee has proposed withdrawing the 284° capsule during the 2010 refueling outage and designating the 104° capsule as the standby capsule. As a result, the licensee has proposed a revised capsule withdrawal schedule as indicated in Table 2 below:

Table 2 – Proposed Removal Schedule

Capsule Azimuthal Position	Target Fast Neutron Fluence (x10 ¹⁹ n/cm ²)	Projected End-of-Cycle Date
263°	0.62 ^a	Withdrawn, 1979
97°	2.64 ^b	Withdrawn, 1992
284°	3.06 ^c	2010
83°	5.26 ^d	2020
277°	6.59 ^e	2032
104°	Standby	

Notes:

- ^a Actual capsule fluence [Perin, J.S., et al., "Calvert Cliffs Unit No. 1 Nuclear Plant Reactor Pressure Vessel Surveillance Program: Capsule 263," Battelle Columbus Laboratories, December 1980].
- ^b Actual capsule fluence: [Lowe, A.L. Jr., et al., "Analysis of Capsule 97° Baltimore Gas and Electric Company Calvert Cliffs Nuclear Power Plant Unit No. 1," B&W Nuclear Service Company, BAW-2160, June 1993].
- ^c Withdrawal criteria – Capsule fluence that corresponds to the projected fluence at the vessel ¼ T location at end of extended life.
- ^d Withdrawal criteria – Capsule fluence that corresponds to the projected fluence at the vessel inner wall location at end of extended life.
- ^e Withdrawal criteria – Not less than once or greater than twice the peak end of extended life vessel fluence at the vessel inner wall ($5.09 \times 10^{19} < \text{fluence in n/cm}^2 < 10.18 \times 10^{19}$). Note: This capsule also satisfies the requirement of the Nuclear Regulatory Commission safety evaluation report for Calvert Cliffs license renewal, that one capsule containing dosimetry is to be removed during the final 5 years of the extended license.

3.3 Summary

The NRC staff finds that the revised withdrawal schedule conforms to the guidance of ASTM E185-82. Therefore, the staff finds that the licensee's proposed withdrawal schedule is acceptable.

4.0 CONCLUSION

The NRC staff has reviewed the licensee's proposed withdrawal schedule for Calvert Cliffs and has determined that the changes to the schedule will continue to meet the RV surveillance capsule withdrawal schedule criteria in ASTM E185-82 and the proposed schedule is in compliance with 10 CFR Part 50, Appendix H, for the current operating period for Calvert Cliffs. The NRC staff, therefore, concludes that the RV withdrawal schedule, as proposed in the licensee's letter dated March 10, 2010, and recited in Section 3.2 above, is acceptable for implementation.

Principal Contributors: M. Mitchell, NRR/DCI
D. Pickett, NRR/DORL

Date: March 12, 2010

Mr. George H. Gellrich, Vice President
Calvert Cliffs Nuclear Plant, LLC
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1 - REACTOR
VESSEL SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE CHANGE
(TAC NO. ME3499)

Dear Mr. Gellrich:

By letter dated March 10, 2010, Calvert Cliffs Nuclear Power Plant, LLC, the licensee, requested approval of proposed changes to the reactor vessel surveillance capsule withdrawal schedule for the Calvert Cliffs Nuclear Power Plant, Unit No. 1. The proposed changes were submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H, Section III.B.3, which requires that: (1) withdrawal schedules be submitted, as specified in 10 CFR 50.4, and (2) the proposed schedule must be approved by the Nuclear Regulatory Commission (NRC) prior to implementation.

The NRC staff has reviewed the proposed changes and finds that the changes to the reactor pressure vessel surveillance capsule withdrawal schedule are consistent with the recommendations specified in American Society for Testing and Materials Standard Practice E185-82, as referenced by the requirements of 10 CFR Part 50, Appendix H, Section III.B.3. Therefore, the proposed changes are acceptable and are approved. The NRC staff's evaluation is enclosed.

Please contact Douglas Pickett at (301) 415-1364 if you have any questions on this issue.

Sincerely,

/RA/

Nancy L. Salgado, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-317

Enclosure:
As stated

cc w/encl: Distribution via Listserv

DISTRIBUTION:

PUBLIC	LPL1-1 R/F	RidsNrrDorlLpl1-1	RidsNrrPMCalvertCliffs
RidsOGCRp	RidsNrrLASLittle	RidsAcrcAcnw_MailCTR	RidsNrrDorIDpr
RidsRgn1MailCenter	RidsNrrDciCvib	MMitchell, NRR	

ADAMS ACCESSION NO.: ML100690393

*Concurrence via e-mail

OFFICE	LPL1-1/PM	LPL1-1/LA	CVIB/BC	OGC/NLO	LPL1-1/BC
NAME	DPickett (RGuzman for)	SLittle*	MMitchell	STurk (w/ changes)	NSalgado
DATE	03/11/10	03/11/10	03/12/10	03/12/10	03/12/10

OFFICIAL RECORD COPY