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

January 31, 2011

Mr. David A. Heacock
President and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: SURRY POWER STATION, UNIT NOS. 1 AND 2 - SAFETY EVALUATION FOR REVISION TO REACTOR VESSEL SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE (TAC NOS. ME4133 AND ME4134)

Dear Mr. Heacock:

By letter dated October 26, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092990570), Virginia Electric and Power Company (VEPCO) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review, a request for revising the withdrawal schedule for the reactor pressure vessel surveillance capsules for Surry Power Station (Surry), Units 1 and 2. Additional supplemental information was submitted on September 13, 2010 (ADAMS Accession No. ML102570804), and January 3, 2011 (ADAMS Accession No. ML110040077). The purpose of the licensee's submittal was to align the withdrawal schedule with the current projections of neutron fluence for the two units at the end of the extended license period and still satisfy the requirements of the American Society for Testing and Materials (ASTM) Standard E185-82, "Standard Practice for Conducting Surveillance Test for Light-Water Cooled Nuclear Power Reactor Vessels."

The NRC staff has completed its review of the information that was provided by VEPCO and concludes that the proposed withdrawal schedule for the Surry, Unit Nos. 1 and 2 mentioned above, meets the requirements of ASTM E185-82 and Appendix H "Reactor Vessel Material Surveillance Program Requirements" to Title 10 of the *Code of Federal Regulations* Part 50.

Sincerely,

for

Karen Cotton, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REVISION TO REACTOR VESSEL SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE

FOR SURRY POWER STATION, UNIT NOS. 1 AND 2

TAC NOS. ME4133 AND ME4134

DOCKET NOS. 50-280 AND 50-281

1.0 INTRODUCTION

By letter dated October 26, 2009,[1] Virginia Electric and Power Company (VEPCO, the licensee) submitted for staff review a request for revising the withdrawal schedule (WS) for the reactor pressure vessel (RPV) surveillance capsules for Surry Power Station (Surry), Unit Nos. 1 and 2. Additional supplemental information was submitted by letter from VEPCO on September 13, 2010,[2] and January 3, 2011.[3] The purpose of the licensee's submittal was to align the WS with the projections of neutron fluence for the two units at the end of life extended (EOLE) and still satisfy the requirements of the American Society for Testing and Materials (ASTM) Standard E185-82, "Standard Practice for Conducting Surveillance Test for Light-Water Cooled Nuclear Power Reactor Vessels."

2.0 REGULATORY REQUIREMENTS

The surveillance programs for Surry, Unit Nos. 1 and 2, were established in accordance with Appendix H to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Reactor Vessel Material Surveillance Program Requirements," to require licensees to monitor changes in the toughness properties of ferritic materials in the RPV beltline region of light-water nuclear power reactors. Appendix H states that the design of the surveillance program and the WS must meet the requirements of the edition of the ASTM E185 that was current on the issue date of the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME B&PV) Code to which the RPV was purchased; however, the licensee may choose to use later editions through 1982 of the ASTM specification. For these two units, the RPVs were designed to Section III of the 1968 ASME B&PV Code through Winter 1968 Addenda. The current surveillance programs at Surry have been developed in accordance with ASTM E185-82, as allowed by 10 CFR Part 50, Appendix H.

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1. Request from licensee, October 26, 2009, Agencywide Documents and Access Management System (ADAMS) Accession No. ML092990570.
2. Letter from licensee, September 13, 2010, ADAMS Accession No. ML102570804.
3. Letter from licensee, January 3, 2011, ADAMS Accession No. ML110040077.

ENCLOSURE

In December 2002, both Unit Nos. 1 and 2 at Surry were granted an extended license for operation.[4] NUREG-1801, Revision 1, "Generic Aging Lessons Learned Report,"[5] provides additional guidance for the surveillance program during the extended period of operation, a total of 60 years at Surry.

3.0 TECHNICAL EVALUATION

3.1 Evaluation Criteria of ASTM E 185-82

For Surry, Unit Nos. 1 and 2, the licensee is using the requirements of ASTM E 185-82 as its basis for meeting the RPV surveillance capsule withdrawal requirements of Appendix H to 10 CFR Part 50. Table 1 of ASTM E-185-82 requires that either a minimum of three, four, or five surveillance capsules be removed from each of the vessels, as based on the limiting amount of RT_{NDT} shift (ΔRT_{NDT}) that is projected to occur at the clad-vessel interface location of the RPV at the end of life (EOL). ASTM E 185-82 establishes the following criteria for determining the minimum number of capsules that are to be removed in accordance with a WS and the number of capsules that are to be tested:

- For plants with projected ΔRT_{NDT} less than 100 °F (56 °C)), three capsules are required to be removed from the RPV 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 RPV 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 RPV and the first four capsules are required to be tested.

For the 60-year extended periods of operation, the Surry, Unit No. 1 RPV has a limiting ΔRT_{NDT} value above 200 °F (111 °C). Therefore, the licensee is required to remove a minimum of five capsules from Surry, Unit No. 1 during the 60-year extended periods of operation. For Surry, Unit No. 2, the licensee has taken a more conservative approach and based the WS on five capsules as well. The first four capsules have already been withdrawn from each reactor and now the licensee has proposed an appropriate WS for the 5th capsule in each reactor.

The NRC staff notes that there are three standby surveillance capsules for Surry, Unit No. 1, and two standby capsules in Surry, Unit No. 2 that have the potential of being removed for storage. However, there currently is no detailed guidance regarding the treatment of standby capsules that are removed but are not tested. Therefore, the NRC staff requested the licensee to provide additional information[6] on how they intend to ensure that any surveillance capsules removed from the Surry, Unit Nos. 1 and 2 RPVs, without the intent to test them, are maintained in a condition that would permit their future use, if necessary. This information concerning the storage of these

4. License renewal at Surry, Unit Nos. 1 and 2, December 2002, ADAMS Accession No. ML030160853.
5. NUREG-1801, Rev. 1, "Generic Aging Lessons Learned Report, September 27, 2005, ADAMS Accession No. ML052110005.
6. NRC RAI, dated July 26, 2010, ADAMS Accession No. ML102070381.

standby capsules should be included in the SURRY, Unit Nos. 1 and 2 Updated Final Safety Analysis Report (UFSAR).

In the licensee's letter dated September 13, 2010, the licensee stated that the following would be included in the applicable section of the Surry, Unit Nos. 1 and 2 UFSAR:

> All surveillance capsules placed in storage will be maintained for possible future insertion. If one or more capsules will not be maintained in such a way as to permit future insertion, then the NRC staff will be notified of this change.

The NRC staff concludes that the inclusion of these requirements in the applicable Surry, Unit Nos. 1 and 2 UFSAR sections provides the necessary guidance to ensure that any surveillance capsules removed from the Surry, Unit Nos. 1 and 2 RPVs, without the intent to test them, are maintained in a condition that would permit their future use, if necessary.

3.2 Changes Proposed to Schedule for Surry, Unit No. 1

The licensee's letter of October 26, 2009, and email of September 28, 2010, provides the updated history of the RPV surveillance capsules for Surry, Unit No. 1. The pertinent information is summarized in Table 1 below.

Table 1. Summary of Surveillance Capsule Withdrawal at SP, Unit 1.

ID	Withdrawal EFPY / year	Withdrawal Neutron Fluence (E > 1.0 MeV)
T	1.1 / 1974	0.281×10^{19} n/cm^2
W	3.5 / 1978	0.431×10^{19} n/cm^2
V	8.2 /1986	1.94×10^{19} n/cm^2
X	16.3/ 1997	1.60×10^{19} n/cm^2
Z	43.2 / 2025[A]	6.31×10^{19} n/cm^2

[A] Proposed withdrawal date for 5th capsule.

The staff compared updated withdrawal data for Surry, Unit No. 1 surveillance Capsules T, W, V, X, and Z with the criteria of ASTM E-185-82 for a required five capsule WS. The staff confirmed that the withdrawals were consistent with the criteria in ASTM E 185-82 for the five-capsule WS.

The 5th capsule, Capsule Z, was to be withdrawn in 2012 when the neutron fluence on capsule Z was expected to exceed the maximum neutron fluence on the clad-vessel interface at EOL, 32 effective full power years (EFPY). Now that the license has been renewed for an additional 20 years, the maximum neutron fluence expected on the clad-vessel interface of the RPV beltline materials at EOLE is 5.66×10^{19} n/cm^2 (E > 1.0 MeV). The licensee has decided to remove Capsule Z in 2026, when the capsule will have been exposed to a total neutron dose of 6.31×10^{19} n/cm^2 (E > 1.0 MeV) to meet the ASTM E185-82 requirements.

3.3 Changes Proposed to Schedule for Surry, Unit 2

The licensee's letters of October 26, 2009, and January 3, 2011, provides the updated history of the RPV surveillance capsules for Surry, Unit No. 2. The pertinent information is summarized in Table 2 below.

Table 2. Summary of Surveillance Capsule Withdrawal at SURRY, Unit 2.

ID	Withdrawal EFPY / year	Withdrawal Neutron Fluence (E > 1.0 MeV)
X	1.2 / 1975	0.297×10^{19} n/cm^2
W	3.8 / 1979	0.636×10^{19} n/cm^2
V	8.7 /1986	1.89×10^{19} n/cm^2
Y	20.8 / 2002	2.73×10^{19} n/cm^2
U	45.0 / 2027[A]	5.95×10^{19} n/cm^2

[A] Proposed withdrawal date for 5th capsule.

The NRC staff compared updated withdrawal data for Surry, Unit No. 2 surveillance Capsules X, W, V, Y, and U with the criteria of ASTM E-185-82 for a required five capsule WS. The NRC staff confirmed that the withdrawals were consistent with the criteria in ASTM E-185-82 for the five capsule WS.

The 5th capsule, Capsule U, was to be withdrawn in 2008, when the neutron fluence on capsule U was expected to exceed the maximum neutron fluence on the clad-vessel interface at EOL, 32 EFPY. Now that the license has been renewed for an additional 20 years, the maximum neutron fluence expected on the clad-vessel interface of the RPV beltline materials at EOLE is 5.38×10^{19} n/cm^2 (E > 1.0 MeV). To meet the ASTM E185-82 requirements, the licensee has decided to remove Capsule U in 2027 when the capsule will have been exposed to a total neutron dose of 5.95×10^{19} n/cm^2 (E > 1.0 MeV).

4.0 CONCLUSION

Based on the NRC's staff's review of the licensee's October 26, 2009, submittal, and supplemented by the licensee's September 13, 2010, and January 3, 2011, letters, the NRC staff found that the revised surveillance capsule WSs for Surry, Unit Nos. 1 and 2 satisfy the requirements of ASTM E 185-82. Therefore, the NRC staff concludes that the licensee's modified surveillance capsule WSs for Surry, Unit Nos. 1 and 2 are acceptable for implementation and satisfy the requirements of Appendix H to 10 CFR Part 50 for the 60-year extended license period.

Principal Contributor: Patrick T. Purtscher

Date: January 31, 2011

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Sincerely,

/RA by VSreenivas for/
Karen Cotton, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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