NRR-DMPSPEm Resource

From: Wengert, Thomas
Sent: Tuesday, February 20, 2018 10:59 AM
To: PYLE, STEPHENIE L
Cc: CLARK, ROBERT W; BICE, DAVID B (ANO); Pascarelli, Robert
Subject: ANO-2 - Final RAI RE: Request to Revise RV Materials Surveillance Program Withdrawal Schedule (CAC No. MG0244; EPID L-2017-LLL-0020)
Attachments: ANO-2 Final RAI - Rev to Surv Capsule Withdrawal Schedule.pdf

On February 15, 2018, the U.S. Nuclear Regulatory Commission (NRC) staff sent Entergy Operations, Inc. (Entergy or the licensee) the draft Request for Additional Information (RAI) identified below. This RAI relates to the licensee's request to revise the reactor vessel surveillance capsule withdrawal schedule for Arkansas Nuclear One, Unit 2 (ANO-2)

Entergy subsequently informed the NRC staff that the information requested by the staff was understood and that no additional clarification of the RAI was necessary. A publicly available version of this final RAI (attached with "Draft" removed) will be placed in the NRC's Agencywide Documents Access and Management System (ADAMS). Entergy agreed to provide a response to this RAI within 30 days of the date of this request (i.e., March 22, 2018).

From: Wengert, Thomas
Sent: Thursday, February 15, 2018 11:22 AM
To: 'PYLE, STEPHENIE L'
Cc: 'CLARK, ROBERT W' ; 'BICE, DAVID B (ANO)' ; Pascarelli, Robert
Subject: ANO-2 - Draft RAI RE: Request to Revise RV Materials Surveillance Program Withdrawal Schedule (CAC No. MG0244; EPID L-2017-LLL-0020)

By letter dated September 24, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17257A121), as supplemented by letter dated November 1, 2017 (ADAMS Accession No. ML17035B616), Entergy Operations, Inc. (Entergy, the licensee) submitted a proposed revision to the reactor vessel surveillance capsule withdrawal schedule for Arkansas Nuclear One, Unit 2 (ANO-2) for U.S. Nuclear Regulatory Commission (NRC) approval. The NRC staff has determined that additional information, as described in the attached request for additional information (RAI), is required for the staff to complete its review of this request.

This RAI is identified as draft at this time to confirm your understanding of the information that the NRC staff needs to complete the evaluation. If the request for information is understood, please respond to this request for additional information within 30 days of the date of this request.

Please contact me if you would like to set up a conference call to clarify this request for information.

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OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ADDITIONAL INFORMATION REGARDING CHANGES TO THE REACTOR VESSEL MATERIALS SURVEILLANCE PROGRAM WITHDRAWAL SCHEDULE

ENTERGY NUCLEAR OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

By letter dated September 14, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17257A121), as supplemented by letter dated November 1, 2017 (ADAMS Accession No. ML17035B616), Entergy Operations, Inc. (Entergy, the licensee) submitted a proposed revision to the reactor vessel surveillance withdrawal schedule for Arkansas Nuclear One, Unit 2 (ANO-2) for U.S. Nuclear Regulatory Commission (NRC) approval. The NRC staff has reviewed the submittals and determined that additional information is required to complete its review.

Background

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H, contains the requirements for reactor vessel material surveillance programs. Specifically, Appendix H requires that the design of the surveillance program and the withdrawal schedule meet the requirements of the edition of American Society of Testing and Materials (ASTM) E185 that was current on the issue date of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code to which the reactor vessel was purchased; however, later editions, up to and including the 1982 Edition of ASTM E185 (ASTM E185-82), may be used instead.

Table 1 of ASTM E185-82 contains the surveillance capsules withdrawal schedule. However, the withdrawal schedule in Table 1 of ASTM E 185-82 is based on plant operation during the original license term of 40 years. Additional surveillance capsules may be needed for the period of extended operation. This ASTM standard describes the methods used to monitor irradiation embrittlement, selection of materials, and the withdrawal schedule for capsules. These requirements ensure that the aging effects of the reactor vessel due to neutron radiation will be monitored throughout the operating lifetime of the plant.

The renewed operating license for ANO-2 was issued on June 30, 2005, and expires on July 17, 2038. For the license renewal period, Section XI.M31, “Reactor Vessel Surveillance,” of NUREG-1801 (*Generic Aging Lessons Learned* [GALL] Report), Revision 2 (ADAMS Accession No. ML103490041), states in part, “The plant-specific or integrated surveillance program shall have at least one capsule with a projected neutron fluence equal to or exceeding the 60-year peak reactor vessel wall neutron fluence prior to the end of the period of extended operation. The program withdraws one capsule at an outage in which the capsule receives a neutron fluence of between one and two times the peak reactor vessel wall neutron fluence at the end of the period of extended operation and tests the capsule in accordance with the requirements of ASTM E 185-82.”

The licensee’s submittal proposes the withdrawal of Capsule W-277 be at a “minimum of 40 EFPY” [effective full power years]. At that point, the surveillance capsule will have accumulated

a neutron fluence of 4.98 E19 neutrons per square centimeter (n/cm^2), which is the projected 60-year (54 EFPY) peak vessel fluence.

RAI-1

Aging Management Program (AMP) XI.M31 of the GALL Report specifies that the Appendix H surveillance program withdraws one capsule at an outage in which the capsule receives a neutron fluence of between one and two times the peak reactor vessel wall neutron fluence at the end of the period of extended operation. The withdrawal schedule should indicate a specific target in terms of Year/EPFY and projected neutron fluence so that staff can confirm consistency with the GALL Report. Table 7.1, "Surveillance Capsule Withdrawal Schedule," from Westinghouse Topical Report WCAP-18166-NP, Revision 0, "Analysis of Capsule 284 from the Entergy Operations, Inc. Arkansas Nuclear One, Unit 2 Reactor Vessel Radiation Surveillance Program" (ADAMS Package Accession No. ML16293A577) indicates a specific target withdrawal for Capsule 277°, as follows:

Table 7-1 Surveillance Capsule Withdrawal Schedule

Capsule ID and Location	Status	Capsule Lead Factor[(a)]	Withdrawal EFPY[(b, c)]	Capsule Fluence (n/cm^2, E > 1.0 MeV)[(c)]
97°	Withdrawn (EOC 2)	1.34	1.69	0.303 x 10^{19}
104°	Withdrawn (EOC 14)	1.31	15.69	2.15 x 10^{19}
284°	Withdrawn (EOC 24)	1.32	29.24	3.67 x 10^{19}
277°	In Reactor	1.35	40.00[(d)]	4.98 x 10^{19}[(d)]
83°	In Reactor	1.35	Note (e)	Note (e)
263°	In Reactor	1.35	Note (f)	Note (f)

Notes:

(a) Updated in Capsule 284° dosimetry analysis; see Table 6-8.
(b) EFPY from plant startup.
(c) Updated in Capsule 284° dosimetry analysis; see Table 6-7.
(d) Capsule 277° should be withdrawn at the vessel refueling outage nearest to but following 40 EFPY of plant operation, which is when the fluence on the capsule will have reached the projected 60-year (54 EFPY) peak vessel fluence (4.98 x 10^{19} n/cm^2).
(e) Capsule 83° should remain in the reactor. If additional metallurgical data is needed for ANO-2, such as in support of a second license renewal to 80 total years of operation, withdrawal and testing of Capsule 83° should be considered.
(f) Capsule 263° should remain in the reactor and continue to accrue irradiation for potential future testing, if needed.

Provide the specific withdrawal target year/EFPY and corresponding neutron fluence for the ANO-2 Capsule 277°.