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LIC-12-0005  
February 6, 2012

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

- References:
1. Docket No. 50-285
  2. *Materials Reliability Program: Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines (MRP-326)*. EPRI, Palo Alto, CA: 2011. 1022871.
  3. NUREG-1782, "Safety Evaluation Report Related to the License Renewal of Fort Calhoun Station, Unit 1", dated October 2003

**SUBJECT: Request for Change in Reactor Vessel Surveillance Capsule Removal Schedule**

Pursuant to 10 CFR 50, Appendix H, Section II.B.3, the Omaha Public Power District (OPPD) requests NRC authorization to change the schedule for removal of reactor vessel surveillance capsules associated with the Fort Calhoun Station (FCS) Reactor Vessel Integrity (RVI) Program. This request is consistent with industry initiatives for a coordinated U.S. pressurized water reactor (PWR) reactor vessel surveillance program (RVSP) capsule management plan that will fill the high fluence irradiated Charpy data gaps in the PWR RVSP capsule database. This database is currently being used by the NRC in the development of embrittlement correlations.

The current FCS surveillance capsule removal schedule and the proposed schedule modifications are attached. The proposed schedule reflects the planned coordinated U.S. PWR reactor vessel surveillance program. The technical basis for the schedule modifications is described in Reference 2, which is enclosed.

The optimized capsule removal schedule is presented to yield data assuring that the vessel meets the requirements of Regulatory Guide 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 02, Position 2.1 analysis. Consistent with Reference 3, OPPD will continue to evaluate applicable surveillance data from other reactor vessels to ensure that the conclusions of Reference 2 remain valid.

The current schedule is consistent with the Generic Aging Lessons Learned (GALL) Report and Reference 3. The proposed changes remain consistent with these documents as well.

A008  
NRR

If you should have any questions regarding this submittal, please contact Mr. Bill R. Hansher at (402) 533-6894.

Sincerely,

A handwritten signature in black ink, appearing to read "J. B. Herman". The signature is fluid and cursive, with a large initial "J" and "B".

J. B. Herman  
Division Manager-Nuclear Engineering

JBH/MLE/mle

Attachment: Proposed Changes to the Fort Calhoun Station, 10 CFR 50, Appendix G, Surveillance Program

Enclosure: *Materials Reliability Program: Coordinated PWR Reactor Vessel Surveillance Program (CRVSP) Guidelines (MRP-326)*. EPRI, Palo Alto, CA: 2011. 1022871.

E. E. Collins, Jr., NRC Regional Administrator, Region IV (w/o Enclosure)

L. E. Wilkins, NRC Project Manager (w/o Enclosure)

J. C. Kirkland, NRC Senior Resident Inspector (w/o Enclosure)

## **Proposed Changes to the Fort Calhoun Station, 10 CFR 50, Appendix G, Surveillance Program**

### **Material Description**

Six surveillance capsules containing beltline materials fabricated from American Society of Mechanical Engineers (ASME) SA-533 Grade B Class 1 (low Cu group) were inserted in the reactor prior to initial start-up. The capsules contain specimens made from shell plate D4802-2, heat number A1768-1, and weld flux Linde 1092 heat 305414, which is representative of the beltline region welds.

Three supplemental capsules (W-225S, W-265S and W-275S) containing materials fabricated from weld flux Linde 1092 were inserted at later dates. Capsules W-225S and W-265S contain Linde 1092 weld heat 305414 while W-275S (installed in 1993) contains weld heats 27204/27204 and 12008/13253. Fort Calhoun Station takes credit for data irradiated in Mihama Unit 1, Diablo Canyon Unit 1, and Palisades for the limiting 3-410 welds.

Each of the original capsules contains the following Charpy V-notch specimens: 24 base (12 longitudinal and 12 transverse), 12 weld metal and 12 HAZ.

### **Current Program**

Three of the original six surveillance capsules (W-225, W-265 and W-275) have been removed and tested (Table 1). Capsule W-275S was inserted at the end of Cycle 14. Fort Calhoun Station received approval for a 60-year (i.e., 48 effective full-power year (EFPY)) license renewal in November 2003. The projected 60-year (48 EFPY) peak reactor pressure vessel (RPV) fluence is  $3.5 \times 10^{19}$  n/cm<sup>2</sup>.

Capsule W-275S is currently scheduled to be removed and tested after reaching a fluence of at least  $1.719 \times 10^{19}$  n/cm<sup>2</sup> at 33.6 EFPY.

Capsule W-95 is currently scheduled to be removed and tested after 48 EFPY. Using the capsule lead factor and the linear relationship between the peak RPV fluence and the corresponding EFPY values, the capsule fluence at 48 EFPY was calculated to be  $3.92 \times 10^{19}$  n/cm<sup>2</sup>, which assumes a capacity factor of 0.95 starting in 1993.

**Table 1: Fort Calhoun Station Current Withdrawal Schedule**

Capsule	Location	Lead Factor	Removed EOC	Removal (EFPY)	Fluence (n/cm <sup>2</sup> )
W-225	225°	1.53	3(1977)	2.5	$5.1 \times 10^{18}$
W-265	265°	1.07	7(1983)	5.9	$9.0 \times 10^{18}$
W-275	275°	1.05	14 (1993)	13.6	$1.38 \times 10^{19}$
W-45	45°	1.51	Standby	---	---
W-85	85°	1.17	Standby	---	---
W-95	95°	1.17	Planned	48.0	$3.92 \times 10^{19}$ (a)
W-225S	225°	1.12	Standby	---	---
W-265S	265°	0.97	Standby	---	---
W-275S	275°	---	Planned	33.6	$1.719 \times 10^{19}$ (b)

(a) Greater than projected 60-year (48 EFPY) peak RPV fluence.

(b) Contains corresponding RPV weld material.

### Requested Program

As shown in Table 2 below, Capsule W-45 should be removed and tested after reaching the projected 80-year (67 EFPY) peak RPV fluence of  $4.72 \times 10^{19}$  n/cm<sup>2</sup>. This fluence was extrapolated from the linear relationship between the peak RPV fluence and the corresponding EFPY values. The 67 EFPY value was determined by assuming a 0.95 capacity factor starting after 60 years of operation. Using the capsule lead factor and the linear relationship between the reported peak RPV fluences and their corresponding EFPY values, capsule W-45 should reach the specified fluence at 42.0 EFPY, which will occur in approximately 2022.

Given the intent to obtain a higher fluence than the current withdrawal schedule for capsule W-275S which was inserted at an EFPY of 13.6, the reactor EFPY of the capsule at the requested time of removal is 47.2. Assuming a capacity factor of 0.95 starting in 1993, capsule W-275S should reach  $3.0 \times 10^{19}$  n/cm<sup>2</sup> in approximately 2028. This supports the goal of the Electric Power Research Institute (EPRI), Materials Reliability Program (MRP) to coordinate the withdrawal schedules of remaining surveillance capsules so that pressurized water reactor (PWR) high fluence surveillance data (i.e., above  $3.0 \times 10^{19}$  n/cm<sup>2</sup>) is available to develop future RPV embrittlement trend curves.

Capsule W-95 should remain in the reactor on standby.

**Table 2: Fort Calhoun Station Requested Withdrawal Schedule  
for Remaining Capsules**

Capsule	Location	Lead Factor	Removal Year	Removal (EFPY)	Fluence (n/cm <sup>2</sup> )
W-45	45°	1.51	2022	42.0	4.72 x 10 <sup>19</sup> (a)
W-275S	275°	---	2028	47.2	3.0 x 10 <sup>19</sup> (b,c)
W-85	85°	1.17	Standby	---	---
W-95	95°	1.17	Standby	---	---
W-225S	225°	1.12	Standby	---	---
W-265S	265°	0.97	Standby	---	---

(a) Projected 80-year (67 EFPY) peak RPV fluence.

(b) Contains corresponding RPV weld material.

(c) Not a change required for the CRVSP but added to list at request of OPPD.