June 17, 2014

ULNRC-06125

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

10 CFR 2.101
10 CFR 2.109(b)
10 CFR 50.4
10 CFR 50.30
10 CFR 51.53(c)
10 CFR 54

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
AMENDMENT 37 TO THE CALLAWAY LRA

References: 1) ULNRC-05830 dated December 15, 2011

By the Reference 1 letter, Union Electric Company (Ameren Missouri) submitted a license renewal application (LRA) for Callaway Plant Unit 1. As a result of a phone call with the staff on June 12, 2014 and after further investigation, the loss of containment tendon prestress associated with the containment tendon predicted lower limit (PLL) time-limited aging analysis (TLAA) is revised to be dispositioned under 10 CFR 54.21(c)(1)(iii) and managed by the Concrete Containment Tendon Prestress program for the period of extended operation.

Enclosure 1 of this letter provides LRA Amendment 37, which modifies the LRA to change the containment tendon PLL analysis from a TLAA disposition category under 10 CFR 54.21(c)(1)(ii) to a TLAA disposition category under 10 CFR 54.21(c)(1)(iii).

There are no changes to license renewal commitments contained in this transmittal.

If you have any questions with regard to this amendment, please contact me at (573) 489-9435 or Roger Wink at (314) 225-1561.

I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,

Executed on: June 17, 2014

Sarah Kovaleski

Sarah Kovaleski
Director, Engineering Design

DS/nls

Enclosure 1: Amendment 37, LRA Changes

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Amendment 37, LRA Changes

Enclosure 1 Summary Table

Affected LRA Section	LRA As-Submitted Page Number(s)
Table 4.1-1 TLAA Category 4	4.1-5
Section 4.5	4.5-1 through 4.5-3
Section A3.4	A-31

Callaway Plant
License Renewal Application
Amendment 37

Revised TLAA Category 4 of Table 4.1-1 to change the disposition category for the concrete containment tendon prestress TLAA associated with the predicted lower limit TLAA from Projection (10 CFR 54.21(c)(1)(ii)) to Aging Management (10 CFR 54.21(c)(1)(iii)).

TLAA Category 4 of Table 4.1-1 (Page 4.1-5) is revised as follows (new text shown underlined and deleted text shown in strikethrough):

Table 4.1-1 List of TLAAs

TLAA Category	Disposition	Disposition Category(1)	Section
4.	Concrete Containment Tendon Prestress	i, ~~ii,~~ iii	4.5

Callaway Plant
License Renewal Application
Amendment 37

Revised Section 4.5 to change the disposition category for the concrete containment tendon prestress TLAA associated with the predicted lower limit TLAA from Projection (10 CFR 54.21(c)(1)(ii)) to Aging Management (10 CFR 54.21(c)(1)(iii)).

Section 4.5 (Pages 4.5-1 through 4.5-3) is revised as follows (new text shown underlined and deleted text shown in strikethrough):

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

The Callaway containment structure is a prestressed, post-tensioned concrete structure with a cylindrical wall, a hemispherical dome, and a flat foundation slab. Post-tensioned tendons compress the concrete and permit the structure to withstand design basis accident internal pressures.

The Callaway post-tensioning system consists of the following tendon groups:

- 86 vertical, inverted U-shaped tendons, extending through the full height of the cylindrical walls and over the dome, and anchored at the bottom of the base slab.

- 165 horizontal hoop tendons. Together, 135 cylinder hoop tendons and 30 dome hoop tendons make up the horizontal tendon group. The 135 cylinder hoop tendons are anchored at buttresses located 240 degrees apart. Three adjacent cylinder tendons anchored at alternate buttresses result in two complete hoop tendons. The 30 hemispherical dome hoop tendons start at the springline and continue up to an approximate 45-degree vertical angle from the springline. The inverted U-shaped tendons discussed above are also utilized to prestress the hemispherical dome.

Each tendon consists of approximately 170, ¼ in. high strength steel wires. The ultimate strength of each tendon is approximately 1,000 tons. The prestressing load is transferred to the steel bearing plates embedded in the structure. The unbonded tendons are installed in tendon ducts (sheathing), which is filled with a petroleum-based corrosion inhibitor after tensioning.

The steel tendons, in tension, relax with time; and the concrete structure, which the tendons hold in compression, both creeps and shrinks with time. Therefore, to ensure the integrity of the containment pressure boundary under design basis accident loads, tendon surveillances are performed under the inservice inspection program per ASME Section XI Subsection IWL. The acceptance criteria compare the individual tendons against the predicted lower limit (PLL) force lines, and the surveillance includes a regression analysis for the vertical and horizontal tendon groups, to confirm whether average prestresses are expected to remain above their minimum required values (MRVs) for the remainder of the licensed operating period. (The dome tendons are included in the horizontal tendon group regression analysis.) The PLL and the regression analyses predict the future performance of the post-tensioning system to the end of design life and are TLAAs.

The tendon surveillance results from 2010, the 25-year tendon surveillance (Reference 9), found (1) no significant abnormal degradation, and (2) no lift off values from this surveillance below the predicted force line (the first action limit).

The discussion below reviews the three parameters used in the implementation of the tendon surveillance program: MRV, PLL force lines, and the regression analysis.

Minimum Required Value

The MRV is the average tendon prestress force used in the prestressed concrete containment design analysis. The design prestress must account for the loss of prestressing force after the initial tensioning in accordance with Regulatory Guide 1.35.1. The MRV is the acceptance criterion for the average tendon prestressing force over the entire plant life and does not vary with the plant life. Therefore the MRV is not a TLAA, in accordance with 10 CFR 54.3(a) criterion 3.

Predicted Lower Limit

The Concrete Containment Tendon Prestress program (Section B3.3), which is part of the ASME Section XI, Subsection IWL Inservice Inspection program, manages loss of tendon prestress. Predicted force lines are incorporated in the ~~tendon surveillance~~ Concrete Containment Tendon Prestress program to identify any abnormal degradation in tendon prestressing force. The predicted loss lines determine the PLL force lines which are the acceptance criteria of individual tendons. The calculations of PLL lines are consistent with NRC Regulatory Guide 1.35.1, *Determining Prestressing Forces for Inspection of Prestressed Concrete Containments*. ~~As part of the Tendon Surveillance program, described in Appendix B, Section B3.3, the PLL force lines will be extended to 60 years.~~ Actual measured values for each tendon are compared to their respective PLL values, with acceptance criteria consistent with ASME Section XI, Subsection IWL requirements. ~~This~~ Therefore, loss of tendon prestress will be managed through the period of extended operation and the TLAA is dispositioned in accordance with ~~10 CFR 54.21(c)(1)(ii)~~ 10 CFR 54.21(c)(1)(iii).

Disposition: ~~Projection, 10 CFR 54.21(c)(1)(ii)~~ Aging Management , 10 CFR 54.21(c)(1)(iii)

Regression Analysis

The lift-off trend lines are necessary to demonstrate that the tendon prestressing force will remain above the MRV at least until the next scheduled surveillance. The tendon surveillances are scheduled every five years. The trend lines are calculated by regression of individual tendon lift off data and are therefore consistent with NRC Information Notice 99-10, Revision 1, Attachment 3.

The regression analysis trend lines indicate lift-offs in excess of the MRV for at least 60 years. The IWL Inspection Report includes the results through the 2010, 25-year surveillance. Table 4.5-1, *Vertical Tendon Regression Analysis* and Table 4.5-2, *Horizontal Tendon (Cylinder and Dome) Regression Analysis* summarize the input data of the 2010 regression analyses. Figure 4.5-1, *Regression Analysis of Vertical Tendons* and Figure

4.5-2, *Regression Analysis of Horizontal Tendons* show the results of the surveillance and the regression analyses.

The current analysis demonstrates that the average tendon prestresses in each of the vertical group and hoop tendon group will remain above their MRVs through 60 years of operation; therefore the analysis is valid for the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

A3.4 CONCRETE CONTAINMENT PRESTRESS

Predicted Lower Limit

Predicted lower limit force lines are incorporated in the ~~tendon surveillance~~ Concrete Containment Tendon Prestress program to identify any abnormal degradation in tendon prestressing force. The calculations of predicted lower limit lines are consistent with NRC Regulatory Guide 1.35.1. ~~As part of the Tendon Surveillance program, described in Section A2.3, the PLL force lines will be extended to 60 years.~~ Actual measured values for each tendon are compared to their respective PLL values, with acceptance criteria consistent with ASME Section XI, Subsection IWL requirements. ~~This~~ Therefore, loss of tendon prestress will be managed through the period of extended operation and the TLAA is dispositioned in accordance with ~~10 CFR 54.21(c)(1)(ii)~~ 10 CFR 54.21(c)(1)(iii).

Regression Analysis

The trend lines are calculated by regression of individual tendon lift off data and are consistent with NRC Information Notice 99-10, *Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments*, Revision 1, Attachment 3. The regression analysis trend lines indicate lift-offs in excess of the MRV for at least 60 years ; therefore the analysis is valid for the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).