Ameren MISSOURI

Callaway Plant

September 18, 2012

ULNRC-05912

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
SUPPLEMENTAL RESPONSES TO ENVIRONMENTAL RAI SET #1
TO THE CALLAWAY LRA

References: 1) ULNRC-05830 dated December 15, 2011
2) ULNRC-05893 dated August 13, 2012

By the Reference 1 letter, Union Electric Company (Ameren Missouri) submitted a license renewal application (LRA) for Callaway Plant Unit 1. Reference 2 transmitted responses to the first Request for Additional Information (RAI) received in regard to the environmental portion of our application.

Enclosure 1 contains supplemental responses to the following RAI responses contained in Reference 2:

- Hydrology and Water Quality-Groundwater #2
- Hydrology and Water Quality-Groundwater #4

If you have any questions concerning these RAI responses please contact me at (573) 823-9286 or Ms. Sarah Kovaleski at (314) 225-1134.

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

Sincerely,

Executed on: September 18, 2012

Les H. Kanuckel

Les H. Kanuckel
Manager, Engineering Design

DS/SGK/nls

Enclosures: 1) Supplemental Responses to Request for Additional Information (RAI) Environmental Set #1

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CALLAWAY PLANT UNIT 1
LICENSE RENEWAL APPLICATION

SUPPLEMENTAL RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION (RAI)
ENVIRONMENTAL Set #1

Hydrology and Water Quality-Groundwater #2
Hydrology and Water Quality-Groundwater #4

Hydrology and Water Quality-Groundwater

2. Confirm and provide documentation that the groundwater sample reported in the ER (Table 2.3-2) was analyzed for strontium, rather than only for the isotope of strontium (strontium-90).

Ameren Response

The table data were taken from Table 2.3-34 of the Unit 2 COL Application (AmerenUE 2009). Table 2.3-34 shows that the units for Sr-90 should be pCi/L. Therefore, radioactive strontium (Sr-90) is what was intended, not elemental strontium. A revised Table 2.3-2 from the Callaway license renewal ER is included as Enclosure 10.

The ^{90}Sr reported in the Environmental Report Table 2.3-2 is the radionuclide ^{90}Sr and the correct units are pCi/L and not µg/L. The information presented in Table 2.3-2 was taken from the Callaway Unit 2 COLA[1].

The ^{90}Sr reported in Table 2.3-2 was for a single sample obtained from groundwater well U2MW-2S in the 4th Quarter, 2007. The uncertainty in the measurement was about 40%. There was no duplicate measurement on this sample. ^{90}Sr was not detected in samples taken from U2MW-2S in the 1st, 2nd, and 3rd Quarters of 2007. All samples were discarded by the laboratory.

Samples were taken from U2MW-2S in October, 2011 and January, 2012 and sent to a different laboratory for ^{90}Sr analysis. ^{90}Sr was not detected in either of these samples. The Minimum Detectable Concentration for these samples was <0.5 pCi/L which is substantially lower than the ^{90}Sr value reported for the 4th Quarter, 2007 sample. If ^{90}Sr had been present at the concentration reported for the 4th Quarter, 2007 sample, it would have been easily detected and quantified.

U2MW-2S is located on the periphery of the plateau, approximately 1.8 miles (9500 ft.) due north of the Callaway Energy Center. Most of the plateau area is blanketed by modified loess, a fairly continuous layer of mottled reddish brown and gray silty clay on top of a deposit of moderately plastic, gray, silty clay, known as Accretion-gley. The k_D of the undisturbed modified loess/ Accretion- gley[2] is < 3E-3 ft. d^{-1}, therefore a leak of radioactive material on the plant site would require approximately 8700 years to reach well U2MW-2S, neglecting dispersion, holdup of strontium by the cation exchange capacity of the clay material, and radioactive decay ($t_{½}$ = 28.8 years). It is very unlikely that ^{90}Sr in well U2MW-2S is the result of Callaway Energy Center operation.

The Callaway Energy Center has 9 groundwater monitoring wells on the north side of the plant within the Protected Area. These wells were installed during implementation of the Nuclear Energy Institute's Groundwater Protection Initiative[3]; sampling in four of these wells began nearly two years prior to the 4th Quarter sample from U2MW-2S. These wells are routinely sampled and analyzed to ensure there are no leaks from plant structures or piping; they are positioned to intercept a ground water plume of radioactive material before the plume could leave the Protected Area and long before the plume could reach well U2MW-2S. These wells have never detected licensed radioactive

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[1] Callaway Unit 2 COLA (Environmental Report), Rev. 1, ML090710387, Table 2.3-34, page 2-154
[2] Callaway Unit 1 Final Safety Analysis Report- Site Addendum, Table 2.5-15
[3] NEI 07-07, "Industry Ground Water Protection Initiative- final Guidance Document". August, 2007

material. It is very unlikely that ^{90}Sr in well U2MW-2S is the result of Callaway Energy Center operation.

The preoperational radioecology study performed in 1973-1974 showed ^{90}Sr in several surface water and well water samples. Of those samples with detectable ^{90}Sr, the ^{90}Sr concentration ranged from 0.5 pCi/L- 3.3 pCi/L[4], which brackets the value of 1.3 pCi/L shown in Table 2.3-2 of the Environmental Report. The ^{90}Sr in the preoperational samples was residual contamination from atmospheric testing of nuclear weapons in the Cold War era.

The most likely source of ^{90}Sr in the sample from well U2MW-2S is residual contamination from atmospheric testing of nuclear weapons in the Cold War era. It is very unlikely that ^{90}Sr in well U2MW-2S is the result of Callaway Energy Center operation in that:

- There was no detectable ^{90}Sr in samples taken from well U2MW-2S in October, 2011 and January, 2012;
- There was no detectable ^{90}Sr in samples taken from well U2MW-2S in the 1st, 2nd, and 3rd Quarters of 2007;
- ^{90}Sr concentrations in preoperational water samples taken in 1973- 1974 bound the ^{90}Sr concentration in the 4th Quarter, 2007 sample from well U2MW-2S;
- A leak of water containing ^{90}Sr from plant structures or piping would take approximately 8700 years to reach well U2MW-2S;

Routine sampling and analysis of groundwater monitoring wells on the north side of the plant since 2006 has not detected licensed radioactive material.

[4] Callaway Plant Units 1 and 2 Preoperational Radioecology Summary, Table 5.3-1

Hydrology and Water Quality-Groundwater

4. To adequately describe groundwater quantity impacts, NRC needs to know the source or sources of the water that flows into the groundwater sump (i.e., What aquifers are being impacted or are there other sources for the water?). In responding to this request, explain why you believe the groundwater is being supplied from that source or sources that are identified in the response. If there are other sumps in the basements of the buildings of the power block collecting groundwater, estimate the rate of groundwater collected from those sources. Provide cross section drawings referred to in an October 8, 2008, letter from Ameren to the Missouri Department of Natural Resources (MDNR) (ML083150703) as Attachment F.

Ameren Response

The undisturbed areas surrounding the power block still have the original glacial till and loess creating a fairly impermeable "bathtub" comprised of Graydon Chert (extremely low permeability rates) (Callaway Standard Plant FSAR Section 1.2.1.5). After excavation, the powerblock area was backfilled with Category I Structural Backfill and capped with a clay blanket. The source of the water in the bathtub area under the Callaway power block is rainwater. Based on the design of the power block bathtub, there would be very limited to no interaction between the ground water inside the bathtub and existing aquifers. Therefore, there would be no significant aquifer impacts.

Ameren has also observed minor amounts of condensed tritium in washout (by rain or snow) from airborne effluent releases in several monitoring wells and in the groundwater sump samples. Potential leaks of plant piping or components within the power block area would be identified quickly in these monitoring wells. Water is continuously pumped from the groundwater sump. This pump was installed in the groundwater sump to help remediate a diesel fuel oil leak within this area. Water within the bathtub is drawn down or pulled towards the groundwater sump and is pumped to an oily waste separator. No other sumps are currently installed to collect this groundwater. The groundwater sump and additional monitoring wells located within the power block bathtub are monitored monthly for tritium and gamma emitters. This provides the earliest indication of any potential leak of radioactive fluid from power block piping or equipment.

Sumps in the power block buildings do not normally collect groundwater, but may collect groundwater if the groundwater within the bathtub area is high enough for intrusion into the buildings. Sumps are piped to the Radwaste Building for discharge in radioactive liquid effluents.

Drawings provided in the April 18, 2008 letter (Attachment F provided plant drawings showing cross-sections of the power block buildings and structures) are as follows and provided as Enclosures 12, 13, 14, 15, and 16 respectively:

8600-X-88130 – Power Block – Building Fill & Backfill Plan Sheet
8600-X-88133 – Power Block – Building Fill & Backfill Cross Sections
8600-X-88134 – Power Block – Building Fill & Backfill Cross Sections
8600-X-88139 – Power Block – Building Fill & Backfill Cross Sections
8600-X-88140 – Power Block – Building Fill & Backfill Cross Sections

The Callaway site was originally excavated as a two unit site (Callaway Unit 1 and the cancelled Callaway Unit 2). The plant site is situated on a plateau, most of which is blanketed by Modified Loess, a fairly continuous layer of mottled reddish brown and gray silty clay on top of a deposit of moderately plastic, gray, silty clay, known as Accretion-gley. The bottom of the sediment column is the Graydon Formation, a chert conglomerate unit that applies to deposits for cherty clay, sandstone, and sandy chert conglomerate that occur unconformably in the site area between the underlying Burlington Limestone and the overlying glacial deposits. All glacial and postglacial soils beneath Unit 1 and associated Category I structures were excavated to the top of the Graydon chert conglomerate. The excavated area around the Unit 1 power block buildings was backfilled with Category 1 granular structural fill.

Water movement within the Unit 1 backfill is rapid; the k_D of the backfill[5] is approximately 1ft d^{-1}. In contrast, the k_D of the undisturbed modified loess[6] is 3E-3 ft. d^{-1} or less. Given the low permeability of the undisturbed modified loess, it is unlikely that ground water from the Graydon Chert aquifer is a significant contributor to the ground water within the Unit 1 backfill.

The Ground Water Sump (GWS) was installed as a draw down well to remediate a diesel fuel oil leak that occurred in the mid- 1990's. The relationship of the GWS to rainwater and to the rapid water movement within the backfilled area is demonstrated when the GWS pump is out of service. If the GWS pump is out of service during periods of high rainfall, the ground water level in the backfill rises to the point where some of the plant buildings experience ground water intrusion. Once the pump is restored to service, the ground water level decreases and the intrusion ceases in 2- 3 days. During periods of exceptionally high rainfall over an extended period, some buildings may experience intrusion even with the GWS pump in service. This also demonstrates that rainwater is the source of the water in the backfilled area and there are no other significant sources.

The portion of the excavated area that was originally intended for Unit 2 - now called the 'prior excavation' – comprises approximately half of the total excavated area and forms a small pond adjacent to Unit 1. The water in the prior excavation is hydrologically connected to the shallow groundwater in the backfilled area around the Unit 1 power block. This has been demonstrated by lowering the water in the prior excavation and observing a concurrent decrease in the water level in the Unit 1 power block groundwater monitoring wells. The prior excavation has been recently drained, which in combination with the extreme drought in mid-Missouri has resulted in a 3'- 6' decrease of the water levels in the monitoring wells in the Unit 1 backfilled area. This also demonstrates that rainwater is the source of the water in the backfilled area and there are no other significant sources.

In addition, the shallow groundwater of the Graydon Chert aquifer is not suitable as a domestic water source due to low yield (1 gpm)[7], aesthetically unacceptable total dissolved solids (TDS)[8], and levels of beryllium, iron, lead, manganese, and nickel that exceed the State of Missouri regulatory limits for ground water[9,10]. Any draw down of this aquifer would have no effect on domestic water use since it cannot be used as a domestic water source.

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[5] Final Groundwater Model Report, Callaway Nuclear Power Plant, rev. 1, October 31, 2008, Table 4
[6] Callaway Unit 1 Final Safety Analysis Report- Site Addendum, Table 2.5-15
[7] Callaway Unit 2 COLA (Environmental Report),rev. 1, ML090710387, section 2.3.2.2.9, page 2-79
[8] Callaway Unit 2 COLA (Environmental Report),rev. 1, ML090710387, section 2.3.1.2.3.2.2, page 2-49
[9] Callaway Unit 2 COLA (Environmental Report),rev. 1, ML090710387, Table 2.3-34, page 2-154
[10] Missouri Code of State Regulations, 10 CSR 20.7-7, Table A

Operation of the Ground Water Sump will have no effect on the area domestic water supplies in that:

- The undisturbed modified loess surrounding the excavated area has very low permeability and water movement in the glacial till is very slow;
- There is a demonstrated strong relationship between ground water levels in the backfilled area and rain fall;
- The Unit 1 backfilled area and the prior excavation pond are hydrologically connected which effectively doubles the surface area for rainfall collection; and
- The ground water of the Graydon Chert aquifer is unsuitable for domestic use due to low yield, high TDS, and metals content in excess of the State of Missouri regulatory limits.