ALNRC 00025
May 15, 2009

Enclosure F

Red-line strikeout changes to Sections 1.2, 2.2.2, 3.7 and 5.1 of the ER

1.0 INTRODUCTION

This report provides information to the Nuclear Regulatory Commission (NRC) to facilitate preparation of an environmental impact statement in accordance with the provisions of 10 CFR 51 Subpart A, National Environmental Policy Act (NEPA)– Regulations Implementing Section 102 (2) (CFR, 2007a) for the preferred location for a new nuclear power plant on the Callaway site in Callaway County, Missouri. This report was prepared in accordance with the guidance provided in NUREG-1555, "Environmental Standard Review Plan" (NRC, 1999) and Regulatory Guide 4.2, Revision 2 (NRC, 1976), "Preparation of Environmental Reports for Nuclear Power Stations."

1.1 PROPOSED ACTION

AmerenUE proposes to construct and operate a new nuclear power plant to be designated as Callaway Plant Unit 2 located on the Callaway site. Federal action resulting in the issuance of a combined license (COL) by the NRC under 10 CFR 52, Early Site Permits; Standard Design Certification; and Combined Licenses for Nuclear Power Plants (CFR, 2007b) is anticipated. The purpose of the new nuclear power plant is to generate electricity for sale.

1.2 PROJECT DESCRIPTION

1.2.1 OWNERSHIP AND APPLICANT

Union Electric Company, doing business as AmerenUE, is applying for a combined license to construct and operate the nuclear power plant to be known as Callaway Plant Unit 2. AmerenUe will be the owner, operator and licensee of Callaway Plant Unit 2. The combined license application for Callaway Plant Unit 2 references AREVA's U.S. Evoluntionary Power Reactor (U.S. EPR), now undergoing design certification before the Nuclear Regulatory Commission.

AmerenUE is the second applicant to reference the U.S. EPR in an application for the combined license. The application to construct and operate Calvert Cliffs Nuclear Power Plant Unit 3 is the first and is the reference plant for the U.S. EPR. AmerenUE's Callaway Plant Unit 2 will likely be the third U.S. EPR to be built and operated in the United States.

AmerenUE will participate in the process for standardized engineering, procurement and construction for Callaway Plant Unit 2 and will operate Unit 2 in accordance with policies and precedures established and maintained by UniStar Nuclear Operating Services, LLC (UNOS). In association with UNOS, AmerenUE will benefit from being part of the fleet of nuclear plants which maintain strict standardization with regard to the U.S. EPR design certification, as well as licensing, engineering, construction, operations, maintenance, modification, and procurement for the U.S. EPR. UNOS will provide licensing services to AmerenUE.

1.2.2 SITE LOCATION

Callaway Plant Unit 2 is located northwest of Callaway Plant Unit 1 on the Callaway site. The Callaway site consists of approximately 2,800 acres (1,133 hectares) dedicated to power generation, fully contained within the 7,354 acre (2,976 hectare) parcel owned by AmerenUE in Callaway County, Missouri, approximately 5 miles (8 km) north of the Missouri River at its closest point and 10 miles (16 km) southeast of the city of Fulton. The site is approximately 80 mi (129 km) west of the St. Louis Metropolitan area. Figure 1.2-1 and Figure 1.2-2 illustrate the location of the Callaway site.

1.2.3 REACTOR INFORMATION

Callaway Plant Unit 2 consists of one pressurized water reactor steam electric system of the AREVA U.S. EPR design. The rated core thermal power will be 4,590 MWt. The rated and design net electrical output is approximately 1,600 MWe. The Design Certification Application for the U.S. EPR was made in December 2007.

1.2.4 COOLING SYSTEM INFORMATION

The two major cooling systems interacting with the environment are the Circulating Water System (CWS) and the Essential Service Water System (ESWS). Figure 1.2-3 provides a simplified diagram of these two systems.

1.2.4.1 Circulating Water System

The U.S. EPR uses a CWS to dissipate waste heat rejected from the main condenser and turbine building closed cooling water heat exchangers (via heat exchange with the auxiliary cooling water system) during normal plant operation at full station load. A closed-cycle, wet cooling system is used for Callaway Plant Unit 2, similar to Callaway Plant Unit 1. The Callaway Plant Unit 2 system uses two natural draft cooling towers for heat dissipation. The CWS cooling towers will have the same basic structure and profile as the cooling tower at Callaway Plant Unit 1.

The exhausted steam from the low pressure steam turbine is directed to a surface condenser (i.e., main condenser), where the heat of vaporization is rejected to a closed loop of cooling water. Cooling water from the CWS is also provided to the auxiliary cooling water system. Two 100% capacity auxiliary cooling water system pumps receive cooling water from the CWS and deliver the water to the Closed Cooling Water System (CLCWS) heat exchangers. Heat from the CLCWS System is transferred to the auxiliary cooling water system in the CLCWS System heat exchangers and heated auxiliary cooling water is returned to the CWS. The heated cooling water from the main condenser and auxiliary cooling water system is sent to the spray headers of the cooling tower, where heat content of the cooling water is transferred to the ambient air via evaporative cooling and conduction. After passing through the cooling tower, the cooled water is recirculated back to the main condenser and auxiliary cooling water system to complete the closed cycle cooling water loop.

Makeup water from the Missouri River Alluvial Aquifer (aquifer) is required to replace evaporative water losses, drift losses, and blowdown discharge.

Makeup water for the CWS is taken from the aquifer by pumps installed in a Collector Well River Intake Structure located near Missouri River mile mark 115. The makeup water is pumped through a common line to the water treatment system where it receives treatment to reduce dissolved iron before being sent to the cooling tower basin. Cooling water is pumped through the main condenser, to and from the auxiliary cooling system (all in parallel), and then returns to the cooling towers to dissipate heat to the atmosphere. Figure 1.2-4 provides a conceptual view of the site, showing the relationship of the Callaway Plant Unit 2 cooling towers to Callaway Plant Unit 1. Blowdown from the cooling towers discharge to a common pipe where it combines with the discharge from Callaway Plant Unit 1 and then to the Missouri River.

1.2.4.2 Essential Service Water System

The U.S. EPR design has a safety-related Essential Service Water System (ESWS) to provide cooling water to the Component Cooling Water System (CCWS) heat exchangers located in the Safeguard Buildings as well as the Emergency Diesel Generator Heat Exchangers located in the Emergency Power Generating Buildings. The ESWS is used for normal operations, refueling,

shutdown/cooldown, anticipated operational events, design basis accidents and severe accidents. The ESWS is a closed-loop system with four safety-related trains and one non-safety-related dedicated (severe accident) train to dissipate design heat loads. Each safety-related train uses one of the four safety-related two-cell mechanical draft cooling towers to dissipate heat during normal conditions, shutdown/cooldown, or design basis accident conditions. The non-safety-related train uses its associated safety-related train ESWS cooling tower (Ultimate Heat Sink (UHS)) to dissipate heat under severe accident conditions. The ESWS water is pumped to the CCWS heat exchanger and to the EDG heat exchanger for the removal of heat. Each of the four ESWS cooling towers has a dedicated CCWS heat exchanger to maintain separation of the safety-related trains. Heated ESWS water returns through piping to the spray distribution header of the ESWS cooling tower. Water exits the spray distribution piping through spray nozzles and falls through the tower fill. Two fans provide upward air flow to remove latent and sensible heat from the water droplets as they fall through the tower fill, rejecting heat from the service water to the atmosphere. The heated air will exit the tower and mix with ambient air, completing the heat rejection process. The cooled water is collected in the tower basin for return to the pump suction for recirculation through the system. Each ESWS cooling tower has a dedicated ESWS pump. An additional pump connected to one ESWS train supplies the severe accident train. Makeup to the ESWS is normally supplied from the Collector Well River Intake System. Blowdown from the ESWS Cooling Tower discharges to a common discharge pipe to the Missouri River.

Under post-accident conditions lasting longer than 72 hours, water may be supplied from the safety-related ESW Emergency Makeup System (ESWEMS) that utilizes a dedicated Retention pond. The ESWEMS pumps are housed in a safety-related structure near the ESWEMS Retention pond.

1.2.5 TRANSMISSION SYSTEM INFORMATION

The transmission system for Callaway Plant Unit 1 utilized two 345 kV circuits from the Montgomery Substation about 21 miles (33.8 km) to the northeast near New Florence, ~~and~~ a 345 kV circuit from the Bland Substation~~.~~, approximately 29 miles (47km) to the south near Owensville, and a 345kV circuit from the Loose Creek Substation approximately 17 miles (27.4km) to the south near Linn. ~~The Bland Substation is located on the south side of the 345 kV Labadie-Franks-3 transmission line right-of-way, north of Owensville, Missouri, and west of State Highway 19 and is about 29 airline miles (46.7 km) to the south of the plant.~~ This arrangement provides two physically-separated offsite transmission lines comprised of ~~three~~ four 345 kV circuits. ~~The nearest distance between a Bland and a Montgomery line is the point where they attach to the switchyard arbors. The distance between the outside phases of these lines at this point is 406 ft (124 m) and~~ The arrangement of these transmission lines is presented in Figure 1.2-2. The Callaway-Bland line was broken apart in 2005 to allow routing of power to a new substation called Loose Creek. This change was made to reduce line congestion to the south and to provide additional power to Jefferson City.

- To accommodate the Callaway Plant Unit 2 transmission system requirements, a 345 kV transmission line is routed from the Loose Creek tie-in point approximately 6.7 miles south of the Callaway site to the Callaway Plant Unit 1 Switchyard and the Callaway-Bland line is restored to the original design. The Callaway-Loose Creek line parallels the Callaway-Bland lines and utilizes an additional 150 ft (46 m) easement where it is routed on non-AmerenUE property.

- Callaway-Montgomery Line 7 and 8 connections are re-located to Callaway Plant Unit 2 Switchyard from the Unit 1 Switchyard and two independent 345 kV transmission lines

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are routed from the Callaway Plant Unit 2 Switchyard to the Unit 1 Switchyard, tying them together.

Transmission system expansion planning conforms to the process established by the Midwest Independent System Operator (MISO).

1.2.6 PROPOSED ACTION AND CONSTRAINTS

The proposed action is to construct and operate a new nuclear power unit on the Callaway site. The NRC 10 CFR 52 (CFR, 2007b) licensing process will be followed to obtain a combined license. At the time of application submittal, there are no constraints on the review process. Numerous other permits and approvals are required from various Federal, State and local agencies as discussed in Section 1.3. These actions will require public meetings and hearings to obtain the necessary approvals to proceed with construction and operation of the new unit. Constraints may be placed on the action as the various agency reviews and approvals are processed and issued.

Environmental issues are evaluated using a three-tier standard of significance – SMALL, MODERATE, or LARGE. The definitions of the three significance levels are defined in Footnote 3 of Table B-1 of 10 CFR 51 (CFR, 2007c) as follows:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

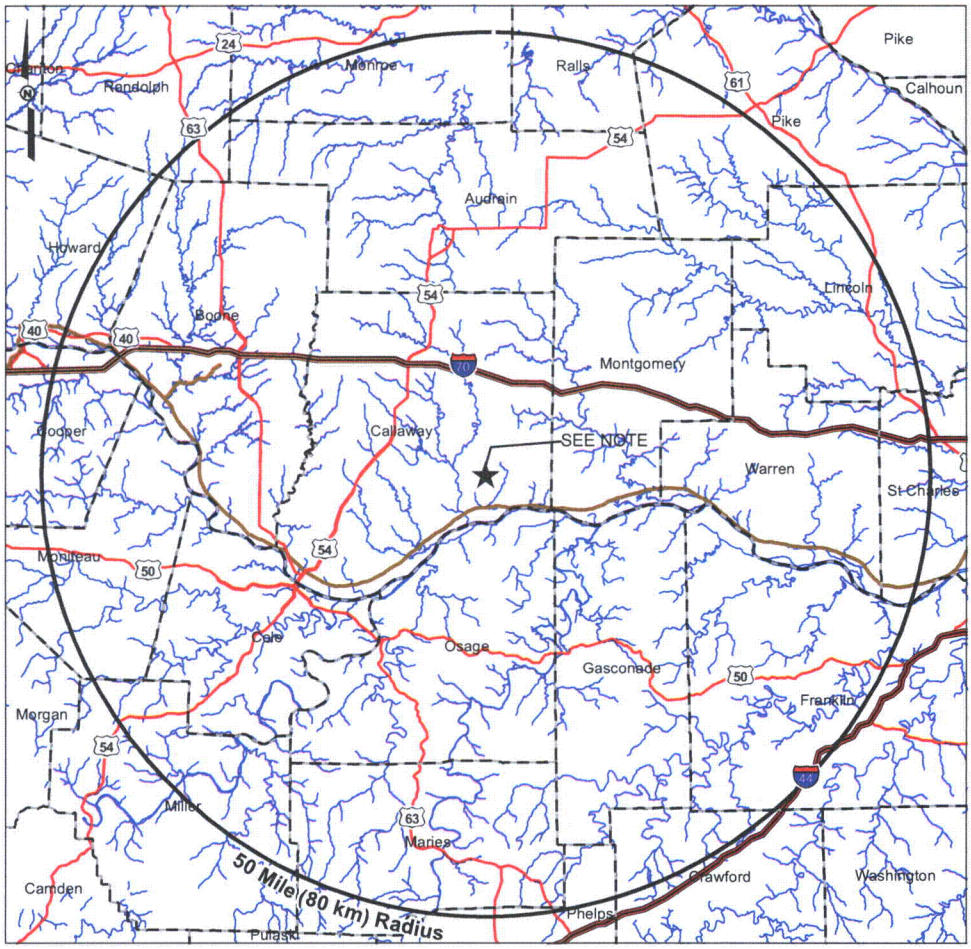
LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

1.2.7 MAJOR ACTIVITY START AND COMPLETION DATES

The following major activities are scheduled:

1.	Order Ultra Heavy Forgings for Reactor Vessel and NSSS Components	May 2007
2.	Submit Design Certification Application for the U.S. EPR	December 2007
3.	Submit COL Application for Callaway Plant Unit 2	August 2008
4.	NRC Issues Design Certification for U.S. EPR	October 2010
5.	NRC Issues COL	September 2011
6.	Plant Construction Starts	June 2013
7.	Construction Complete	June 2017
8.	Plant Startup Testing Begins	June 2017
9.	Commercial Operation	December 2017

Figure 1.2-1—Callaway Site 50 mi (80 km) Region



LEGEND:

- County Boundary
- Interstate Highway
- US Highway
- Katy Trail
- Primary Streams

0 5 10 20 Miles

NOTE:
REFERENCE CENTER POINT OF PLANT SITE IS DEFINED AS THE MIDPOINT BETWEEN EXISTING REACTOR FOR CALLAWAY PLANT UNIT 1 AND REACTOR FOR CALLAWAY PLANT UNIT 2.

REFERENCE:
Roads, Katy Trail, and Streams from Missouri Spatial Data Information Service (MSDIS) web site http://www.msdis.missouri.edu/. Accessed September 2007.

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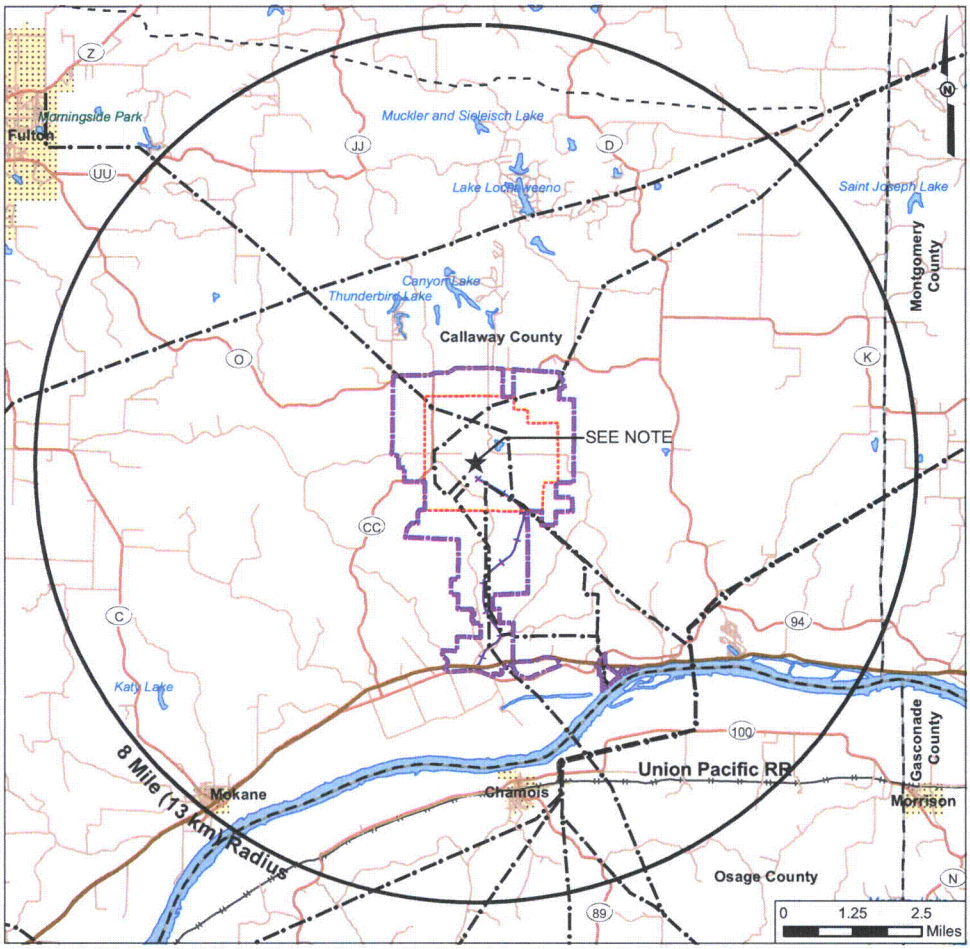
Figure 1.2-2—Callaway Site 8 mi (13 km) Region



LEGEND:

- County Boundary
- Callaway Plant Site Area
- Ameren Property Boundary
- Pipeline (Natural Gas)
- Power Transmission ROW
- Secondary State and County Highways
- Local, Neighborhood, Rural or City Street
- Railroad
- Railroad - NOT IN USE
- Katy Trail
- Water
- Census Designated Place

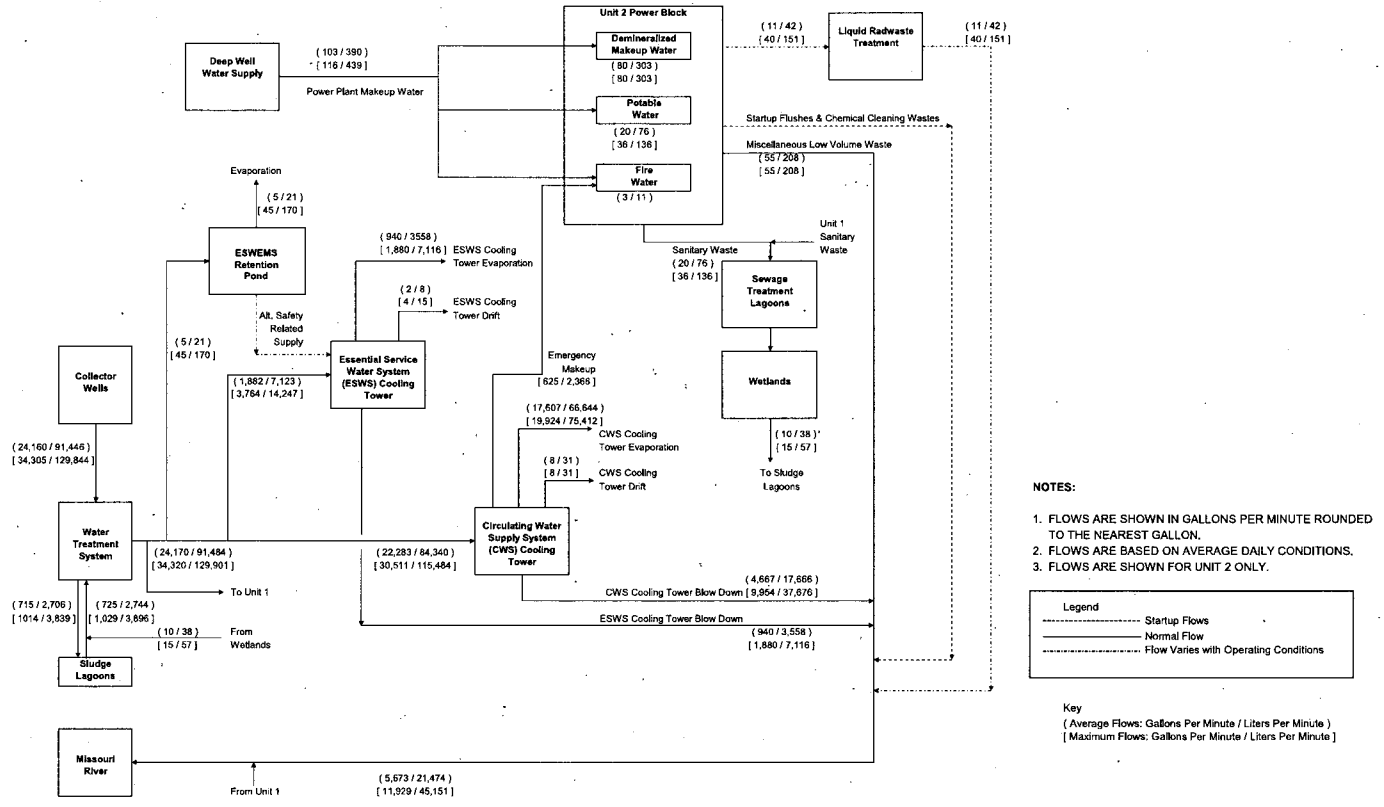
NOTE:

REFERENCE CENTER POINT OF PLANT SITE IS DEFINED AS THE MIDPOINT BETWEEN EXISTING REACTOR FOR CALLAWAY PLANT UNIT 1 AND REACTOR FOR CALLAWAY PLANT UNIT 2.

REFERENCE:

ESRI StreetMap Pro [CD-ROM], 2007, Parks,Streets,Waterbody, and Census Designated Places.
Katy Trail from Missouri Spatial Data Information Service (MSDIS) web site http://www.msdis.missouri.edu/. Accessed September 2007.
Utility lines and the railroad not in use digitized from USGS 1:24K Topographic Maps. Pipeline digitzed from 2006 Missouri USDA NAIP Data and National Pipeline Mapping System.
Ameren UE Dwg UE 8600-x-89930 (rev 14).
Ameren UE Dwg UE 8600-x-89931 (rev 12).

Figure 1.2-3—General Cooling System Flow Diagram for Callaway Plant Unit 2



NOTES:

1. FLOWS ARE SHOWN IN GALLONS PER MINUTE ROUNDED TO THE NEAREST GALLON.
2. FLOWS ARE BASED ON AVERAGE DAILY CONDITIONS.
3. FLOWS ARE SHOWN FOR UNIT 2 ONLY.

Legend
- Startup Flows
- Normal Flow
- Flow Varies with Operating Conditions

Key
(Average Flows: Gallons Per Minute / Liters Per Minute)
[Maximum Flows: Gallons Per Minute / Liters Per Minute]

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Figure 1.2-4—Aerial View of Callaway Site with Callaway Plant Unit 2 Superimposed

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Egress from the site to the north or south is afforded by State Route CC, and County Routes 459 and 448. Egress- to the east and west is afforded by State Route O along the northern site boundary and by State Route 94 on the south boundary. Area evacuation routes in the event of a radiological emergency are shown on Figure 2.2-8 (AmerenUE, 2007b).

The mineral resources on the Callaway Plant site and land in the vicinity are owned by the respective surface landowners. The Mertens Construction Company, Incorporated Reform Quarry, located 4.5 miles (7.2 km) northwest of the Callaway Plant site, extracts approximately 150,000 tons (136,000 metric tons) per year of crushed and broken limestone. The quarry employs 15 persons and has a potential reserve of about 16.5 million tons (15.0 million metric tons) of rock. An inactive limestone mine owned by AmerenUE is located approximately one mile (1.6 km) east of the site.

No comprehensive land use or zoning plans exist covering the rural portions of Callaway County including the Callaway Plant site or vicinity. Legislation authorizing the establishment of Regional Planning Commissions was enacted in 1969 and appears in Chapter 251 of the Revised Statutes of Missouri (RSMo) Part 160 (RSMo, 2007). The functions of a Regional Planning Commission are "solely advisory to the local governments comprising the region" (RSMo 251.300). A total of 19 Regional Planning Commissions have been established in accordance with this legislation (MACOG, 2007). Callaway County is represented by the Mid-Missouri Regional Planning Commission. Comprehensive plans covering unincorporated areas of the State, including the area comprising the site and vicinity, have not been prepared. Enabling legislation establishing County Planning Commissions with the authority to create, adopt, amend and carry out a county plan (Senate Bill [SB] 193, 2007) became effective on August 28, 2007.

2.2.2 TRANSMISSION CORRIDORS AND OFFSITE AREAS

2.2.2.1 Existing Corridors

The Callaway Plant power transmission system consists of three routes; a 23 mile (37 km) long northeast route connecting Callaway Plant Unit 1 with the Montgomery substation (Callaway-Montgomery line), a 32 mile (51 km) long southern route connecting Callaway Plant Unit 1 with the Bland substation (Callaway-Bland Line) and a 17 mile (27.4 km) long southern route connecting Callaway Plant Unit 1 with the Loose Creek Substation (Callaway-Loose Creek line). The Callaway-Montgomery line consists of two 345 kV circuits routed commonly on galvanized steel towers contained within a 200 foot (61 m) wide corridor. The Callaway-Bland and Callaway-Loose Creek circuits each consist of one 345 kV circuit routed commonly on galvanized steel towers contained within a 200 foot (61 m) wide corridor. 6.7 miles (11 km) south of Callaway Plant Unit 1 the Callaway-Loose Creek circuit diverges southwest on wooden H-frame towers contained within a 150 foot (45 m) right of way, while the Callaway-Bland circuit continues south.

2.2.2.2 Proposed Transmission System Modifications

An assessment was made to identify additions and modifications to the transmission system needed to connect Callaway Plant Unit 2 to the power grid. The results of the assessment indicated that no additional transmission corridors would be required. However, ~~an extension of an~~widening an existing corridor will be required.

In 2005 one of the two original Callaway-Bland circuits was broken apart to allow routing power to a new Loose Creek substation and establishing a Callaway-Loose Creek transmission system. This change was made to reduce transmission line congestion to the south and provide

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additional power to Jefferson City. The new transmission line will route power at 345 kV from the Unit 1 switchyard to a tie-in point on the Callaway-Loose Creek line 6.7 miles (10.8 km) south of the Unit 1 switchyard. This action will allow the existing Callaway-Bland line to be restored to its original two circuit design. The existing Callaway-Bland corridor will be widened by 150 ft (46 m) to accommodate the new section of the Callaway-Loose Creek transmission line. This will necessitate obtaining additional easements permitting the widening of the transmission corridor for that portion that is off AmerenUE property. New transmission towers supporting the 345 kV transmission lines will be installed in the widened corridor parallel to and west of the existing Callaway-Bland transmission line, crossing the Missouri River at river mile 116.6 (187.6 km). The following additional facilities and system additions would also be constructed:

- One new 345 kV switchyard to transmit power from Callaway Plant Unit 2;
- Relocate Callaway-Montgomery lines 7 and 8 from the Unit 1 switchyard to the new Callaway Plant Unit 2 switchyard and install two lines between the Unit 1 and Unit 2 switchyards tying them together.

Transmission system expansion planning will conform to the planning process established by the Midwest Independent Transmission System Operator (Midwest ISO).

2.2.2.3 Land Use

The southern Bland/Loose Creek route of the Callaway power transmission system is located in a corridor totaling approximately 32 miles (51 km) of 150 ft to 200 ft (46 m to 61 m) width. The transmission lines extend south from the Unit 1switchyard on AmerenUE property to State Route 94, then within easements through the Missouri River flood plain both north and south of the river, crossing the river at river mile 116.6 (187.6 km). The lines cross mostly secondary-growth oak forests, grassland, and farmland.

The transmission line work being considered to support this project would complete the Callaway-Loose Creek transmission system by installing new facilities within a widened corridor, separating this final section of the Callaway-Loose Creek transmission system from the existing Callaway-Bland transmission system. The work will require new towers and a 345 kV transmission line connecting the Callaway Plant Unit 1 switchyard to a tie-in point on the Callaway-Loose Creek transmission line south of the Missouri River as described above. Land use in the portion of the corridor affected by this change is primarily Deciduous Woody Herbaceous or Deciduous Forest on AmerenUE property and Cropland in the Missouri River floodplain.

Design and construction of transmission lines would be based on the guidance provided by the National Electric Safety Code (NESC) (ANSI/IEEE, applicable version), state and local regulations.

2.2.3 THE REGION

The region within 50 miles (80 km) of the Callaway Plant site includes all or part of 22 Missouri counties. The 50 mile (80 km) region including major waterways and highways is shown in Figure 2.2-9. Interstate 70 (I-70) passes approximately 10.8 miles (17 km) north of the proposed project Site.

Land acreage devoted to major uses within the 50 mile (80 km) region are presented in Table 2.2-3 and shown on Figure 2.2-4. The land use/cover categories used in the table are consistent with USGS land use categories. Principal agricultural commodities, dollar values of

3.7 POWER TRANSMISSION SYSTEM

The transmission corridor siting is currently undergoing evaluation ~~by the Midwest Independent Transmission System Operator (MISO)~~ and has not been established. ~~Therefore, construction of the transmission line required for the Callaway Plant Unit 2, as well as all impacts, are considered independent from the Callaway Plant Unit 2 project.~~ In accordance with NRC Staff guidance (NRC, 2009), transmission impacts are considered "pre-construction activities" and ~~These~~ are discussed elsewhere in this document as appropriate under Cumulative Impacts.

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The NRC criteria for review of power transmission systems are presented in Section 3.7 of NUREG-1555 (NRC, 1999). To address these criteria, this section of the Environmental Report describes the transmission system from the Callaway Plant Unit 2 switchyard to its connections with the existing Callaway Plant Unit 1 transmission systems, including lines, corridors, towers, substations, and communication stations. Callaway Plant Unit 2, with an approximate additional 1,600 MWe net rating, would require the following new facilities and upgrades to connect to the existing transmission system:

- One new 345 kV, 16 breaker, breaker-and-a-half switchyard to transmit power from Callaway Plant Unit 2.
- Two new 345 kV, 2,090 MVA (normal rating) circuits connecting the new Callaway Plant Unit 2 switchyard to the existing Callaway Plant Unit 1 switchyard,
- A new transmission line from a tie point on an existing 345 kV transmission line approximately 6.7 miles (11 km) south of the Callaway Plant Unit 1,
- Re-routing of the Callaway-Montgomery Lines 7 and 8 into the Callaway Plant Unit 2 switchyard from the Callaway Plant Unit 1 switchyard, and
- Completion of the breaker and a half scheme at Bland substation.

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The existing transmission system, constructed and operated for Callaway Plant Unit 1, was addressed in the Environmental Statement submitted with the original plant license application (UEC, 1975). The existing transmission system consists of two 345 kV circuits from the Montgomery Substation about 21 miles (34 km) to the northeast near New Florence, ~~and~~ a 345 kV circuit from the Bland Substation~~.~~, approximately 29 miles (47km) to the south near Owensville, and a 345kV circuit from the Loose Creek Substation approximately 17 miles (27.4km) to the south near Linn. ~~The Bland Substation is located on the south side of the 345 kV Labadie-Franks-3 transmission line right-of-way, north of Owensville, Missouri and west of State Highway 19, and is about 29 airline miles (47 km) to the south of the plant.~~ This arrangement provides two physically-separated offsite transmission lines comprised of ~~three~~four 345 kV circuits. ~~The nearest distance between a Bland and a Montgomery line is the point where they attach to the switchyard arbors. The distance between the outside phases of these lines at this point will be approximately 1,300 ft (396 m).~~ The existing transmission system will not be addressed in this section, except where it impacts or is impacted by the transmission facilities of Callaway Plant Unit 2. The routes for the existing two 345 kV circuits from the Callaway Plant site to the Montgomery Substation, ~~and~~the single 345 kV circuit from the Callaway Plant site to the Bland Substation, and the single 345kV circuit from the Callaway Plant Site to the Loose Creek Substation ~~Generating Station~~ are presented in Figure 3.7-1.

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Transmission System Expansion Planning will conform to the planning process established by the Midwest Independent Transmission System Operator (MISO).

3.7.1 SWITCHYARD AND CONNECTING CIRCUITS

3.7.1.1 Callaway Plant Unit 2 Switchyard

The Callaway Plant Unit 2 switchyard occupies a 900 ft (274 m) by 650 ft (198 m) tract of land approximately 1,050 ft (320 m) southwest of the Callaway Plant Unit 2 reactor centerline and 700 ft (213 m) northwest of the existing switchyard as detailed in Figure 3.7-2. The Callaway Plant Unit 2 switchyard is electrically integrated with the existing Callaway Plant Unit 1, 345 kV, switchyard by constructing two approximately 1 mile (1.6 km), 345 kV, 2,090 MVA lines on common towers. The Callaway Plant Unit 2 is connected to the transmission system via the two Callaway-Montgomery County lines to be re-routed to its switchyard.

The Callaway Plant Unit 2 switchyard and transmission lines ~~is~~are constructed in areas that, at present, are disturbed and utilized for other present Callaway Plant purposes, or are contiguous with the current transmission lines. Any vegetation which might be present will be removed. Areas under the transmission lines would be cleared of any vegetation that could pose a safety risk to the transmission system, either through arcing or reducing the structural integrity of towers.

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3.7.1.2 Connecting Circuits

The Callaway Plant Unit 2 switchyard is electrically integrated with the existing Callaway Plant Unit 1, 345 kV, switchyard by constructing two approximately 1 mile (1.6 km), 345 kV, 2,090 MVA lines on common towers. A topographic map showing the location of the connecting circuits between the two switchyards is presented in Figure 3.7-2.

A new transmission line is constructed from a tie point on an existing 345 kV transmission line approximately 6.7 miles (10.8 km) south of the Callaway Plant Unit 1 switchyard. This results in new 345 kV transmission line from a tie point on the existing Callaway-Loose Creek Line to the Callaway Plant Unit 1 switchyard. The new line is routed adjacent to the existing Callaway-Bland lines that are also routed to the Callaway Plant Unit 1 switchyard. An additional easement of 150 ft (46 m) is required over the existing 200 ft (61 m) easement for that section of the line not on AmerenUE property. This new Callaway-Loose Creek line allows the existing Callaway-Bland line to be restored as originally designed. The original Callaway-Bland line was broken apart in 2005 to allow routing of power to a new substation called Loose Creek This change was made to reduce line congestion to the south and to provide additional power to Jefferson City.

The routing of the new lines is contained within the Ameren UE property lines or widened offsite easements.

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3.7.2 ELECTRICAL DESIGN PARAMETERS

3.7.2.1 Circuit Design

The detailed design of the transmission lines has not begun but would include selection of the conductor and conductor configuration and the other design parameters specified by NUREG-1555 (NRC, 1999). Design and construction of transmission lines would be based on the guidance provided by the National Electric Safety Code (NESC) (ANSI/IEEE, applicable version), state and local regulations, the Midwest Independent System Operator (MISO), and any requirements of the Missouri Public Service Commission (PSC).

The conductors would be selected to meet the power delivery requirements of Callaway Plant Unit 2. The two 345 kV lines connecting the existing Callaway Plant Unit 1 switchyard and the Callaway Plant Unit 2 switchyard would be rated at 2,091 MVA. Each phase would use the same

dual sub-conductor bundles comprised of 954 circular mills, 54/7 ACSS conductors per phase with 18 inches (0.5 m) separation. There would also typically be two overhead ground wires of 3/8 inch (0.01 m), 7 strand, extra high strength steel wire.

The new portion of line from the tie point back to Callaway Plant Unit 1 would be comprised of two 954 circular mills, 54/7 ACSS conductors per phase with 18 inches (0.5 m) separation. There would also be typically two overhead ground wires of 3/8 inch (0.01 m), 7 strand, extra high strength steel wire.

The new lines would be designed to preclude crossing of lines wherever possible.

3.7.2.2 Induced Current Analysis

The design of the new transmission circuits would consider the potential for induced current as a design criterion. The NESC has a provision that describes how to establish minimum vertical clearances to the ground for electric lines having voltages exceeding 98 kV alternating current to ground. The clearance must limit the induced current due to electrostatic effects to 5 mA if the largest anticipated truck, vehicle, or equipment were short-circuited to ground. For this determination, the NESC specifies that the lines be evaluated assuming a final unloaded sag at 120°F (49°C). The calculation is a two step process in which the analyst first calculates the average field strength at 1.0 m (3.3 ft) above the ground beneath the minimum line clearance, and second, calculates the steady-state current value. The design and construction of the Callaway Plant Unit 2 switchyard and transmission circuits would comply with this NESC provision. At a minimum, conductor clearances over the ground would equal or exceed the NESC requirements.

3.7.3 NOISE LEVELS

The noise impacts associated with the transmission system would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the switchyard transformers; and (3) maintenance work and vehicles.

3.7.3.1 Corona

Corona discharge is the electrical breakdown of air into charged particles caused by the electrical field at the surface of the conductors, and is increased by ambient weather conditions such as humidity, air density, wind, and precipitation and by irregularities on the energized surfaces.

Audible noise from the corona effect for the existing 345 kV Callaway-Loose Creek line was calculated to be approximately 56 dB at the line surface during adverse weather conditions using the HVTRC calculation method. The noise level had attenuated to 52.1 dB at a distance of 80 ft (24.4 m) from the line. For reference, normal speech has a sound level of approximately 60 dB and a bulldozer idles at approximately 85 dB.

As shown in Figure 3.7-2, the proposed Callaway Plant Unit 2 switchyard and transmission lines connecting the Callaway Plant Unit 2 switchyard to the existing Callaway Plant Unit 1 switchyard would be constructed entirely on the Callaway Plant site. The new portion of the Callaway-Loose Creek line would be constructed on the existing Callaway-Bland right-of-way. Therefore all newly constructed transmission systems will be contained in AmerenUE owned property or on existing easements.

3.7.3.2 Switchyard Noise

Switchyards include transformer banks and circuit breakers that create "hum," normally around 60 dBA, and occasional instantaneous sounds in the range of 70 to 90 dBA during activation of circuit breakers (SCE, 2006). The proposed Callaway Plant Unit 2 switchyard would introduce these new noise sources (transformers and circuit breakers) to its location. The noise levels surrounding the switchyard would likely be close to 60 dBA near the switchyard fence, but would be significantly reduced near the site boundary, approximately 2,700 ft (820 m) to the south.

3.7.3.3 Maintenance Noise

Regular inspections and maintenance of the transmission system and rights-of-way are performed. A patrol is performed twice annually of all transmission corridors, while more comprehensive inspections are performed on a rotating 5 year schedule. Maintenance is performed on an as-needed basis as dictated by the results of the line inspections and are generally performed on a 5 to 6 year rotating schedule for tree trimming, with herbicide use on a 3 year as-needed schedule. The noise levels for maintenance activities would typically be those associated with tree trimming, spraying, mowing and vehicle driving. Noise levels for maintenance in the new onsite corridor are expected to be similar to those currently generated by maintenance activities.

3.7.4 STRUCTURE DESIGN

The existing 345 kV transmission towers are designed and constructed to National Electric Safety Code and current AmerenUE standards. New towers added to support Callaway Plant Unit 2 will also conform to these criteria. The new towers will be wood H-frame design for the Loose Creek line, and will provide minimum clearances in accordance with the aforementioned standards. The two circuits connecting the existing Callaway Plant Unit 1 switchyard and the Callaway Plant Unit 2 switchyard would be carried on common steel towers. Near the plant switchyard the Loose Creek line may be changed to steel structures to minimize the footprint required for the towers. All structures would be grounded with a combination of ground rods or a ring counterpoise system. The towers for the new Callaway-Loose Creek line Missouri River crossing may exceed the 200 ft (61 m) height above the ground, thus navigation lights may be needed. The existing towers for the Callaway-Bland line have navigation beacons. Federal Aviation Administration permits may be required.

3.7.5 INSPECTION AND MAINTENANCE

Regular inspections and maintenance of the transmission system and rights-of-way will be performed. These inspections and maintenance include patrols and maintenance of transmission line hardware on a periodic and as-needed basis. Vegetation maintenance may include tree trimming and application of herbicide. Maintenance of the proposed onsite corridors including vegetation management will be implemented under AmerenUE existing programs in accordance with ANSI A300 (ANSI, 2001a; ANSI, 2006b) standards to promote safety, reliability, and environmental benefit.

3.7.6 REFERENCES

ANSI/IEEE, applicable version. National Electric Safety Code, ANSI/IEEE C2, version in effect at time of design, American National Standards Institute/Institute of Electrical and Electronics Engineers.

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UEC,1975. Final Environmental Statement Related to the Proposed Callaway Plan Units 1 and 2, Union Electric Company, docket nos. STN 50-483 and STN 50-486, U.S. Nuclear Regulatory Commission, March 1975.

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Figure 3.7-1—Callaway Plant Unit 2 345 kV Circuit Corridors

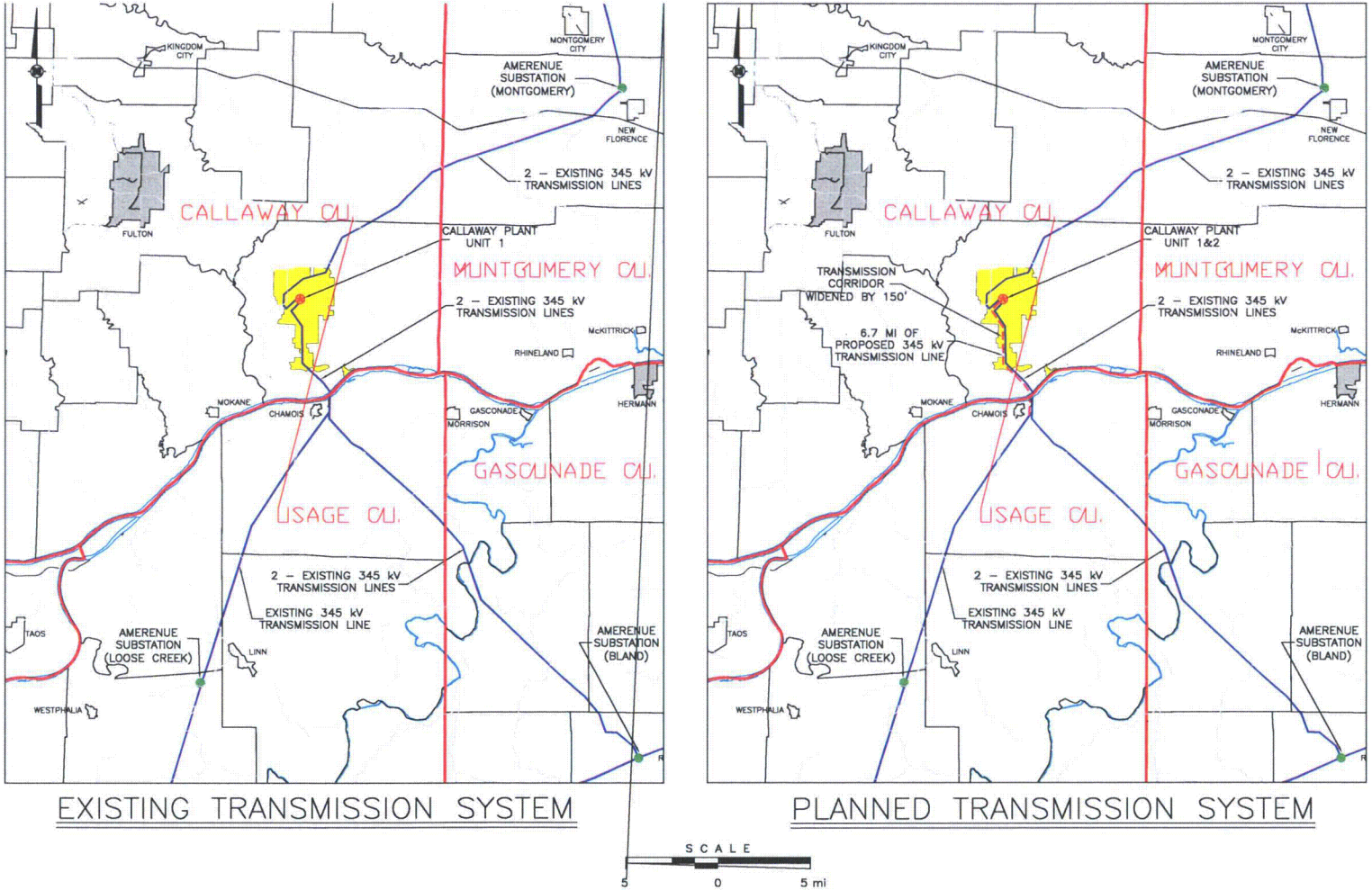

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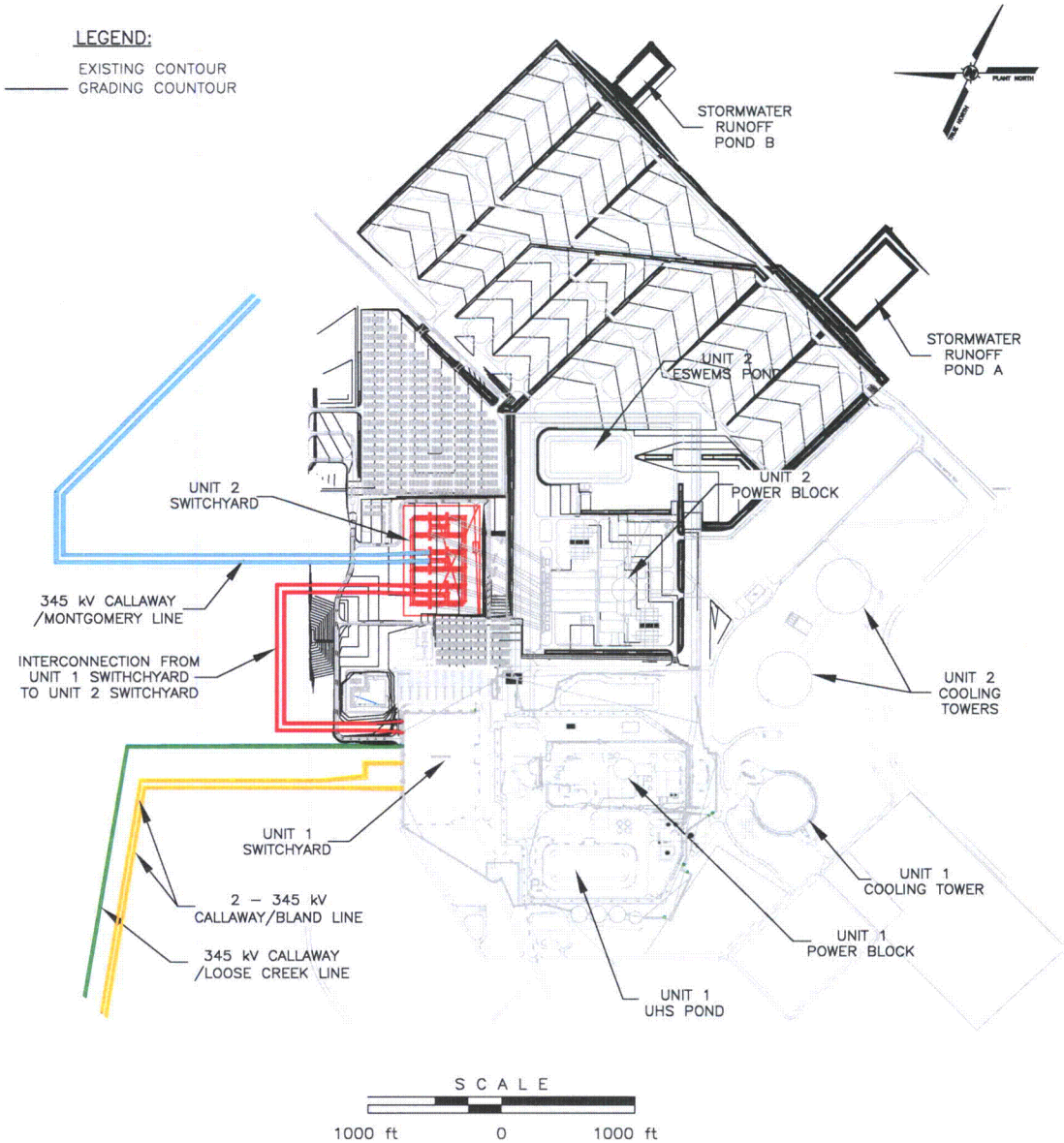
Figure 3.7-2—Callaway Plant Unit 2 Topography and Switchyard Interconnection



5.0 ENVIRONMENTAL IMPACTS OF STATION OPERATION

5.1 LAND USE IMPACTS

The following sections describe the impacts of Callaway Plant Unit 2 operations on land use at the Callaway Site, the 8 mile (13 km) vicinity, and associated transmission line corridors, including impacts to historic and cultural resources. The operation of Callaway Plant Unit 2 is not anticipated to affect any current or planned land uses.

5.1.1 THE SITE AND VICINITY

Land use impacts from construction are described in Section 4.1.1. The only additional impacts to land use from operations will be the impacts of solids deposition from cooling tower drift. The cooling system for Callaway Plant Unit 2 is a closed-cycle, wet cooling system, consisting of two natural draft hyperbolic cooling towers for heat dissipation. Each tower is approximately 550 ft (168 m) high with a base and top diameter of 414 ft (126 m) and 242 ft (74 m), respectively. The distance between these two identical cooling towers is approximately 500 ft (152 m). Makeup water for the units is taken from the collector wells at an average rate of 24,160 gpm (91,446 lpm), assuming 4.8 cycles of concentration.

The cooling tower system occupies an area of approximately 15 acres (6.1 hectares). Details of cooling tower design are discussed in Section 3.4.2 and impacts of the heat dissipation system, including salt deposition, are discussed further in Section 5.3.3.1 and Section 5.3.3.2. The cooling tower to the south (the first unit) and the cooling tower to the north (the second unit) for Callaway Plant Unit 2 are located east and northeast of the Callaway Plant Unit 2 power block, respectively. The first and second cooling towers are approximately 5,826 ft (1,776 m) and 5,108 ft (1,557 m), respectively, from the center of the tower to the nearest property line. The wind driven cooling tower plume could occur in all compass directions.

The maximum salt deposition rate from the cooling towers is provided in Table 5.3-7. The predicted deposition rate is below the NUREG-1555 (NRC, 1999) significance level for possible vegetation damage of 8.9 lbs per acre per month (10 kg per hectare per month) in all directions from the cooling towers, during each season and annually. Therefore, impacts to vegetation from the salt deposition are not expected for both onsite and offsite locations.

Previous studies (Union Electric, 1985 and Applied Biology, Inc., 1986, 1987, 1991, 1993) reported that the Callaway Plant Unit 1 cooling tower drift revealed no evidence of adverse impacts to vegetation. The drift from the Callaway Plant Unit 2 cooling towers is much less than the drift from the Callaway Plant Unit 1 cooling tower. Based on these facts, no impacts affecting land-use pattern are expected from the operations of the new cooling towers.

The average plume length and height was calculated from the frequency of occurrence for each plume by distance from the tower. The average plume length ranges from 0.36 miles (0.6 km) to the south in the summer season, to 2.6 miles (4.2 km) to the southeast in the winter season. The annual average plume length is 1.2 miles (2.0 km) to the southeast. The average plume height above the tower ranges from 490 ft (150 m) in the summer season to 1,900 ft (570 m) in the winter season. The annual average plume height is 1,000 ft (320 m). Due to the varying directions that the plume travels and short average plume height and length, impacts from elevated plumes would be SMALL and would not warrant mitigation.

The electrical switchyard for Callaway Plant Unit 2 is located approximately 1,960 ft (600 m) to the southwest of the location for the circulating water supply system (CWS) cooling towers. A

maximum predicted solids deposition rate of 0.0013 lbs per acre per month (0.0015 kg per hectare per month) is expected at the Callaway Plant Unit 2 switchyard. Additionally, the electrical switchyard for Callaway Plant Unit 1 is located approximately 2,800 ft (853 m) to the south-southwest, from the location of the Callaway Plant Unit 2 CWS cooling towers. The maximum predicted solids deposition expected at the Callaway Plant Unit 1 electrical switchyard due to operation of the Callaway Plant Unit 2 CWS cooling tower is 0.0025 lbs per acre per month (0.0027 kg per hectare per month).

Based on industry experience, adjustments to maintenance frequencies (e.g., insulator washing) may be necessary due to solids deposition; however, the expected deposition rates will not affect switchyard component reliability or increase the probability of a transmission line outage at Callaway Plant Unit 1 or Callaway Plant Unit 2. Table 5.3-7 shows the extent of solids deposition during the summer months.

Impacts from salt deposition from the Callaway Plant Unit 2 cooling tower will be SMALL. Section 5.3.3.2, Terrestrial Ecosystems, presents information on the sensitivity of specific species to salts.

Section 2.2.1presents land use on the Callaway Site and its vicinity extending 8 miles (13 km) from the site midpoint and includes maps showing land use and transportation routes. Land use across the entire Callaway Site is shown in Table 5.1-1 and discussed in more detail in Section 2.2. Grassland is the most common land use at the Callaway Site and represents 43% of the Callaway Site acreage. The next highest land use category is forest. The forested area, including deciduous forest and evergreen forest, represents 27% of the Callaway Site acreage. High intensity urban/built-up is the least land use area classification at the Callaway Site and represents less than 0.1% of the Callaway Site acreage.

Land use data for the 8 mile (13 km) site vicinity is presented in Table 5.1-2 and discussed in more detail in Section 2.2. Forest, including deciduous forest and evergreen forest, is the largest land use category and represents approximately 53% of the area in the 8 mile (13 km) site vicinity radius. Grassland is the next largest land use and represents approximately 21% of the land area, with the Urban/Built-up category representing 0.33% of the land area.

As described in Section 2.5, the impact evaluation assumes that the residences of Callaway Plant Unit 2 employees will be distributed across the region in the same proportion as those of the Callaway Plant Unit 1 employees. It is estimated that an additional operational work force of 363 onsite employees will be needed for Callaway Plant Unit 2. Section 5.8.2 describes the impact of 363 new employees on the region's housing market and the increases in tax revenues. Up to 1,500 additional workers are required during refueling outages. These additional workers typically fill the local hotels or occupy available RV spaces. This occupancy is consistent with the designated uses for the land and, therefore, does not result in any adverse impacts to land use.

Approximately 90% (330) of the new employees are expected to be drawn from or settle in Callaway County, Cole County, or Boone County. Forty-nine percent (423) of current Callaway Plant Unit 1 employees live in Callaway County. The county is mostly rural, with public utilities and amenities generally available in the larger municipalities. It is likely that the new employees who choose to settle near the Callaway Site will purchase homes or acreage in the Callaway County, Boone County, or Cole County area. Based on the 22 years of experience with the existing unit, increased tax revenues will not spur development in the vicinity of the Callaway Site.

It is therefore concluded that impacts to land use in the vicinity will be SMALL and will not warrant mitigation.

5.1.2 TRANSMISSION CORRIDORS AND OUTSIDE AREAS

As discussed in Section 2.2.2, the additional power generated by Callaway Plant Unit 2 will be transmitted along the existing unit/system and a new offsite transmission corridor developed adjacent to the existing transmission corridor. It requires widening existing 200 ft (61 m) wide right-of-way by 150 ft (46 m). New transmission towers supporting a 345 kV transmission line are installed in the widened corridor to the west of and parallel to the existing transmission lines. These lines carry power south from the switchyard through the Corridor Area of the Callaway Site property, and cross State Route 94 on the north side of the River, cultivated land within the Missouri River floodplain, the Missouri River at river mile 116.6, and State Route 100 on the south side of the River. The new portion of transmission line ends at a tie in point 6.7 miles (10.8 km) south of the Callaway Plant Unit 1 switchyard. Callaway Plant Unit 2 construction activities are discussed in Section 2.2.2.2.

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Line routing avoids or minimizes impact on forests, grasslands, wetlands, and threatened and endangered species identified in the local area. No operational land use impacts will occur as the result of the operation of the new transmission lines or the Callaway Plant Unit 2 substation.

In general, the transmission line owner (AmerenUE) ensures that land use in the corridors and underneath the high voltage lines is compatible with the reliable transmission of electricity. Vegetation communities in these corridors are kept at an early successional stage by mowing and application of herbicides and growth-regulating chemicals. In some instances, AmerenUE could allow agricultural activities in these rights-of-way. AmerenUE will also allow public recreational use with limitations on company-owned and Missouri Department of Conservation (MDC)-managed property, and individuals to exercise their rights of ownership in right-of-way outside of Ameren owned land, subject to negotiated agreements. However, AmerenUE's control and management of these rights-of-way precludes virtually all residential and industrial uses of the transmission corridors. As described in Section 3.7, AmerenUE has established corridor vegetation management and line maintenance procedures that will continue to be used to maintain the corridor and transmission lines.

There is no need for additional access roads along the existing offsite transmission corridors. Offsite corridor maintenance activities will be in accordance with existing right-of-way agreements between AmerenUE and current landowners, where applicable. Should additional access be warranted, AmerenUE will negotiate/renegotiate access agreements with the appropriate landowner. Therefore, it is concluded that land use impacts to offsite transmission corridors from operation of Callaway Plant Unit 2 will be identical to impacts from the existing Callaway Plant Unit 1.

Onsite transmission corridor construction activities are discussed in Section 4.1. The basic transmission system electrical and structural design parameters for this new onsite transmission corridor are addressed in Section 3.7. Land use impacts from construction of the new onsite transmission corridor and new Callaway Plant Unit 2 switchyard are described in Section 4.1. Following construction, permanent impacts include the maintenance of the 150 ft (45.7 m) wide corridor as a grassed or farmed use rather than wooded. Since the new towers are placed within 150 ft (45.7 m) of the current towers, visual impacts are SMALL, particularly when viewed from a distance. As there are no residences in the immediate vicinity of the transmission towers, no other impacts (i.e., from electromagnetic forces or noise) are expected.

It is therefore concluded that impacts to land use in the existing transmission corridors or offsite areas would be SMALL and would not require mitigation.

5.1.3 HISTORIC PROPERTIES AND CULTURAL RESOURCES

Table 2.5-43 and Table 2.5-44 list historic properties within the project Areas of Potential Effect that are potentially eligible or eligible for listing on the National Register of Historic Places (NRHP). A total of approximately 97% of the Callaway Site has been surveyed for the presence of cultural resources. As described in Section 2.5.3, the cultural resource survey of the Callaway Site identified 79 prehistoric sites and 29 historic sites, of which a total of 20 were evaluated as eligible for inclusion on the National Register of Historical Places. The survey also identified 19 architectural resources, none of which are considered eligible for the National Register of Historical Places.

Steamboat wrecks circa late 19th century may exist on the Callaway Site property in the vicinity of the Mollie Dozier Chute, near the location of the collector well system. Historical maps indicate at least five steamboat wrecks in this area, most likely buried deeply underneath floodplain alluvium. In accordance with a monitoring plan approved by the Missouri State Historic Preservation Office (SHPO), a qualified archaeologist monitored all drilling activities in this area. The nearest drilling location was placed approximately 0.5 miles (0.8 km) from the locations of known steamboat wrecks. No evidence of steamboat wrecks was identified during the monitoring program.

The eligible sites are located at least one mile (1.6 km) from the Callaway Plant Unit 1 cooling tower and are not near the identified construction limits for Callaway Plant Unit 2. These sites are preserved in place by AmerenUE. Monitoring for and handling of historic properties and cultural resources will be addressed during construction as described in Section 4.1.3. Currently, construction and operation of Callaway Plant Unit 2 is expected to have no effect on these resources. However, should historic properties or cultural resources be identified during additional investigation and monitoring prior to and during construction, they will be handled in accordance with a standard operating procedure which has been reviewed and approved by SHPO.

Maintenance activities will occur in areas previously disturbed during Callaway Plant Unit 2 construction, none of which contain eligible archaeological resources. Thus, effects on such properties from maintenance activities are expected to be SMALL and not warrant mitigation. As discussed in Section 5.3.3.1, operation of cooling towers might produce a visible plume, occasional fog and ice, and salt deposition which could affect the settings or materials of historic properties. However, operational impacts of rime icing and ground fogging can occur but are not associated with natural draft cooling towers. Therefore, the operational impacts related to icing and fogging are expected to be SMALL and not warrant mitigation. Due to the sparsely populated nature of the project vicinity, and the fact that a natural draft cooling tower currently exists on the project site, visual impacts are expected to be SMALL and not warrant mitigation. Effects on the property from salt deposition could occur but are expected to be SMALL and not warrant mitigation due to the small amount that would be deposited in the area (0.00014 lbs per acre per month (0.00016 kg per hectare per month)).

Previously recorded historic or archaeological resources located within 10 miles (16 km) of the Callaway Site were also identified through research of existing records. Archaeological sites are abundant within the 10 mile (16 km) radius, although the majority have been reported by local residents and not surveyed by archaeologists. Two regionally important prehistoric sites are listed on the NRHP, as discussed in Section 2.5.3. These resources are provided in Appendix A of Section 2.5. Potential sources of effects on these resources would be operation of the cooling

towers and the resulting fog, ice, and the visible plume. There is a high probability that undiscovered prehistoric sites are present within the 10 mile (16 km) radius of the Callaway Site, primarily Native American mounds associated with prehistoric villages. There are no historic archaeological sites listed on the NRHP within the 10 mile (16 km) radius of the Callaway Site.

Because significant fogging and icing are not likely to occur with natural draft cooling towers, any adverse effect on offsite historic properties and their settings or materials would be SMALL and not warrant mitigation. The plume above the cooling tower would be visible from archaeological and historic resources in the region surrounding the Callaway Site and would introduce a modern feature into their viewsheds. However, due to the presence of numerous modern features in the region already, the effect on these properties would be anticipated to be SMALL and not warrant mitigation.

With maintenance and operations activities, there is always the possibility for inadvertent discovery of previously unknown cultural resources or human remains. Prior to initiating land disturbing activities, procedures will be developed which include actions to protect cultural, historic, or paleontological resources or human remains in the event of discovery. These procedures would comply with applicable Federal and State laws including the National Historic Preservation Act (USC, 2007) and the applicable sections of the Revised Statutes of Missouri (RSMo) Chapters 194 (RSMo, 2006a) and 253 (RSMo, 2006b).

The use of the transmission corridors by the project would not result in new impacts to cultural and historical resources. Should there be a need for ground disturbing activities during maintenance in the transmission corridor, Phase I surveys will be conducted in accordance with SHPO guidelines. Should new and significant cultural and historic resources be encountered along the transmission corridors, AmerenUE would contact the Missouri SHPO to consult on the discovery.

It is therefore concluded that Callaway Plant Unit 2 operations would have a SMALL impact on historic or cultural resources and would not require mitigation.

5.1.4 REFERENCES

Applied Biology, Inc., 1986, Aerial Photographic Monitoring and Interpretation of Vegetation at Callaway prepared for Union Electric Company, St. Louis, Missouri, October 1986.

Applied Biology, Inc., 1987, Aerial Photographic Monitoring and Interpretation of Vegetation at Callaway prepared for Union Electric Company, St. Louis, Missouri, October 1987.

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NRC, 1999. Environmental Standard Review Plan, NUREG-1555, Nuclear Regulatory Commission, October 1999.

RSMo, 2006a, Title XII Missouri Revised Statutes, Public Health and Welfare, Chapter 194, Death - - Disposition of Dead Bodies, August 2006.

RSMo, 2006b, Title XVI Missouri Revised Statutes, Conservation, Resources and Development, Chapter 253, State Parks and Historic Preservation, August 2006.

Union Electric, 1985, Aerial Photographic Monitoring and Interpretation of Vegetation at Callaway, Environmental Services Department, Union Electric Company, St. Louis, Missouri, August 1985.

USC, 2007. Title 16, United States Code, Part 470, National Historic Preservation Act of 1966, as amended, 2007.

Table 5.1-1—Land Use at the Callaway Site

Land Use Land Cover Class	Acres	Hectares	Percent of Total Area
Impervious	198	80	7.0%
High Intensity Urban	0.4	0.2	0.0%
Low Intensity Urban	60	24	2.1%
Cropland	471	191	16.8%
Grassland	1,213	491	43.1%
Deciduous Forest	738	299	26.2%
Evergreen Forest	11	5	0.4%
Deciduous Woody/Herbaceous	39	16	1.4%
Herbaceous-Dominated Wetland	1	0.4	0.0%
Open Water	81	33	2.9%

REFERENCES:

Missouri Spatial Data Information Service (MSDIS) web site, http://www.msdis.missouri.edu, Accessed September 27, 2007.

Table 5.1-2—Land Use Within the 8 mile (13 km) Radius of the Callaway Site

Land Use Land Cover Class	Acres	Hectares	Percent of Total Area
Impervious	1,509	611	1.17%
High Intensity Urban	0.4	0.2	0.00%
Low Intensity Urban	420	170	0.33%
Cropland	22,027	8,914	17.14%
Grassland	26,672	10,794	20.75%
Deciduous Forest	65,008	26,308	50.58%
Evergreen Forest	3,092	1,251	2.41%
Deciduous Woody/Herbaceous	1,863	754	1.45%
Woody-Dominated Wetland	3,764	1,523	2.93%
Herbaceous-Dominated Wetland	256	104	0.20%
Open Water	3,916	1,585	3.05%

REFERENCES:

Missouri Spatial Data Information Service (MSDIS) web site, http://www.msdis.missouri.edu,Accessed September 27, 2007.