

August 27, 2008

Mr. Adam C. Heflin
Senior Vice President and
Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT, UNIT 1 - ISSUANCE OF AMENDMENT RE: TECHNICAL SPECIFICATION 3.8.3, "DIESEL FUEL OIL, LUBE OIL AND STARTING AIR" (TAC NO MD6549)

Dear Mr. Heflin:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 185 to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated August 20, 2007, as supplemented by letter dated March 12, 2008.

The amendment revises TS 3.8.3, "Diesel Fuel Oil, Lube Oil, and Starting Air," and its associated Surveillance Requirement 3.8.3.1 to increase the current minimum emergency diesel generator (EDG) fuel oil inventory required to be maintained onsite. The increase in minimum EDG fuel oil would provide conservative margin against potential vortex effects that could occur during fuel oil transfer pump operation.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Mohan C. Thadani, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosures:

1. Amendment No. 185 to NPF-30
2. Safety Evaluation

cc w/encls: See next page

August 27, 2008

Mr. Adam C. Heflin
Senior Vice President and
Chief Nuclear Officer
Union Electric Company
P.O. Box 620
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT, UNIT 1 - ISSUANCE OF AMENDMENT RE: TECHNICAL SPECIFICATION 3.8.3, "DIESEL FUEL OIL, LUBE OIL AND STARTING AIR" (TAC NO MD6549)

Dear Mr. Heflin:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 185 to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated August 20, 2007, as supplemented by letter dated March 12, 2008.

The amendment revises TS 3.8.3, "Diesel Fuel Oil, Lube Oil, and Starting Air," and its associated Surveillance Requirement 3.8.3.1 to increase the current minimum emergency diesel generator (EDG) fuel oil inventory required to be maintained onsite. The increase in minimum EDG fuel oil would provide conservative margin against potential vortex effects that could occur during fuel oil transfer pump operation.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Mohan C. Thadani, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosures:

1. Amendment No. 185 to NPF-30
2. Safety Evaluation

cc w/encls: See next page

DISTRIBUTION:

PUBLIC
LPLIV Reading
RidsAcrsAcnw_MailCTR Resource
RidsNrrDirsltsb Resource
RidsNrrDorlDpr Resource
RidsNrrDorlLpl4 Resource
RidsNrrDssSbpb Resource

RidsNrrPMMThadani Resource
RidsNrrLAJBurkhardt Resource
RidsOgcRp Resource
RidsRgn4MailCenter Resource
OHopkins, NRR/DSS/SBPB
GHill, OIS (2)

ADAMS Accession Nos.: Pkg **ML082190587**, Amdt. ML082190681, License/TS Pgs ML082190727 (*) SE input memo

OFFICE	NRR/LPL4/PM	NRR/LPL4/LA	DSS/SBPB/BC	OGC, NLO	NRR/LPL4/BC (A)	NRR/LPL4/PM
NAME	MThadani	JBurkhardt	DHarrison (*)	SHasemian	BSingal	MThadani
DATE	8/26/08	8/7/08	5/23/08	8/22/08	8/26/08	8/26/08

OFFICIAL RECORD COPY

Callaway Plant, Unit 1

(7/2/2008)

cc:

John O'Neill, Esq.
Pillsbury Winthrop Shaw Pittman LLP
2300 N. Street, NW
Washington, DC 20037

Mr. Rick A. Muench, President and CEO
Wolf Creek Nuclear Operating Corporation
P.O. Box 411
Burlington, KA 66839

Mr. Tom Elwood, Supervising Engineer
Regulatory Affairs and Licensing
AmerenUE
P.O. Box 620
Fulton, MO 65251

Certrec Corporation
4200 S. Hulen, Suite 422
Fort Worth, TX 76109

Mr. Les H. Kanuckel, Manager
Quality Assurance
AmerenUE
P.O. Box 620
Fulton, MO 65251

Technical Services Branch Chief
FEMA Region VII
2323 Grand Blvd., Suite 900
Kansas City, MO 64108-2670

Mr. Luke Graessle, Manager
Regulatory Affairs
AmerenUE
P.O. Box 620
Fulton, MO 65251

Kathleen Logan Smith, Executive Director and
Kay Drey, Representative, Board of Directors
Missouri Coalition for the Environment
6267 Delmar Blvd., Suite 2E
St. Louis, City, MO 63130

Mr. Scott Maglio
Assistant Manager, Regulatory Affairs
AmerenUE
P.O. Box 620
Fulton, MO 65251

Mr. Lee Fritz, Presiding Commissioner
Callaway County Courthouse
10 E. Fifth Street
Fulton, MO 65251

U.S. Nuclear Regulatory Commission
Resident Inspector Office
8201 NRC Road
Steedman, MO 65077-1302

Mr. Keith G. Henke, Planner III
Division of Community and Public Health
Office of Emergency Coordination
Missouri Department of Health and
Senior Services
930 Wildwood Drive
P.O. Box 570
Jefferson City, MO 65102

Missouri Public Service Commission
Governor Office Building
200 Madison Street
P.O. Box 360
Jefferson City, MO 65102-0360

Mr. Scott Clardy, Director
Section for Environmental Public Health
Missouri Department of Health and
Senior Services
930 Wildwood Drive
P.O. Box 570
Jefferson City, MO 65102

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
612 E. Lamar Blvd., Suite 400
Arlington, TX 76011-4125

Director, Missouri State Emergency
Management Agency
P.O. Box 116
Jefferson City, MO 65102-0116

Mr. H. Floyd Gilzow
Deputy Director for Policy
Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 185
License No. NPF-30

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Union Electric Company (UE, the licensee), dated August 20, 2007, as supplemented by letter dated March 12, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C.(2) of Facility Operating License No. NPF-30 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan*

- The Technical Specifications contained in Appendix A, as revised through Amendment No. 185 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This amendment is effective as of its date of issuance, and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Balwant K. Singal, Acting Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Facility Operating
License No. NPF-30 and
Technical Specifications

Date of Issuance: August 27, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 185

FACILITY OPERATING LICENSE NO. NPF-30

DOCKET NO. 50-483

Replace the following pages of the Facility Operating License No. NPF-30 and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Facility Operating License

REMOVE

-3-

INSERT

-3-

Technical Specifications

REMOVE

3.8-19
3.8-21

INSERT

3.8-19
3.8-21

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 185 TO

FACILITY OPERATING LICENSE NO. NPF-30

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By letter dated August 20, 2007 (Reference 1), as supplemented by letter dated March 12, 2008 (Reference 2) (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML072400345 and ML080800458, respectively), the licensee (Union Electric Company) for Callaway Plant, Unit 1 requested an amendment to Facility Operating License NPF-30. The amendment would revise Technical Specification (TS) 3.8.3, "Diesel Fuel Oil, Lube Oil, and Starting Air," and its associated Surveillance Requirement (SR) 3.8.3.1, to increase the current minimum emergency diesel generator (EDG) fuel oil inventory required to be maintained onsite. The increase in minimum EDG fuel oil inventory would provide conservative margin against potential vortex effects that could occur during fuel oil transfer pump operation.

The changes are being made in response to a design control issue identified during a review of an operating experience (OE) report that summarized inspection findings at another facility. The OE report identified a design control issue wherein vortex prevention was not properly taken into account in the calculation that was performed to determine the usable volume in the diesel fuel oil storage tanks for the plant's EDGs. As a result, the minimum required fuel oil volume is increased by approximately 0.6 percent to provide additional margin for precluding adverse effects that could result from air entrapment caused by a vortex condition during fuel oil transfer pump operation.

The supplemental letter dated March 12, 2008, provided additional information that clarified the application, but the letter did not expand the scope of the application as originally noticed or change the U.S. Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration as published in the *Federal Register* on September 11, 2007 (72 FR 51866).

2.0 REGULATORY EVALUATION

2.1 System Description

2.1.1 Standby Emergency Diesel Generators

The onsite standby power source for each 4.16 kiloVolt (kV) Engineered Safeguards Features (ESF) bus is a dedicated EDG. EDGs NE01 and NE02 are dedicated to ESF buses NB01 and NB02, respectively. An EDG starts automatically on a safety injection (SI) signal (i.e., low pressurizer pressure, steam line pressure, or high containment pressure signals) or on an ESF bus undervoltage signal. After the EDG has started, it will automatically tie to its respective bus after offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with an SI signal. The EDGs will start and operate in the standby mode without tying to the ESF bus on an SI signal alone. Following a trip of offsite power, a Load Shedder and Emergency Load Sequencer (LSELS) strips nonpermanent loads from the ESF bus. When the EDG is tied to the ESF bus, loads are then sequentially connected to its respective ESF bus by the LSELS. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the EDG by automatic load application. In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the EDGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a design-basis accident (DBA) such as a loss-of-coolant accident (LOCA).

As noted above, each EDG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage. This is required to be accomplished within 12 seconds. Each EDG must also be capable of accepting required loads within the assumed loading sequence intervals, and continuing to operate until offsite power can be restored to the ESF buses.

2.1.2 Diesel Fuel Oil Storage System

Each EDG is provided with a fuel oil storage tank that has a fuel oil capacity sufficient to operate the diesel for a period of 7 days, with the EDG operating at its continuous rating, as discussed in Final Safety Analysis Report (FSAR) Section 9.5.4. Each tank has a maximum capacity of approximately 100,000 gallons. The tank capacity ensures the EDG is capable of meeting its maximum post-LOCA load demand for 7 days, and is sufficient to operate the EDG for longer than the time required to replenish the onsite supply from outside sources (such as by truck).

The fuel oil is transferred from the storage tank to the EDG's day tank by a can-type transfer pump. Level transmitters installed on the day tanks initiate a signal to start the transfer pumps on low level and to stop the pump on high level. If the EDGs are running, the transfer pumps will run continuously. Redundancy of pumps and piping precludes the failure of one pump, or the rupture of any pipe, valve, or tank resulting in the loss of more than one EDG.

2.2 Regulatory Framework

Applicable regulatory requirements and associated guidance documents are as follows:

- Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix A, General Design Criterion (GDC) 17, "Electric Power Systems," in part, sets forth the following requirement:

"The safety function for each [electric power] system [including components] (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

- Regulatory Guide 1.9, Revision 3, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," Regulatory Position C.2, provides recommended surveillance tests for demonstrating operability of the DGs.
- Regulatory Guide 1.137, Revision 1, "Fuel-Oil Systems for Standby Diesel Generators," provides guidance concerning the design and other requirements for EDG fuel oil systems, including calculation of fuel oil storage requirements.

3.0 TECHNICAL EVALUATION

In 2005, the licensee completed their review of an OE report that summarized inspection findings at another facility. The OE report identified a design control issue wherein vortex prevention was not properly taken into account in the calculation to determine the usable volume in the diesel fuel oil storage tanks for the plant's EDGs. It was noted that vortexing could cause the transfer pump to ingest air. A vortex represents a flow in which the streamlines are in concentric circles. The formation of surface and subsurface vortices can cause numerous hydraulic problems. Surface vortices are produced by localized eddies on the surface of the liquid. If the disturbance continues, the fluid flow will carry the submerged part of the vortex down toward the suction inlet and ultimately into the pump. The ingestion of a surface vortex into a pump's suction will introduce air resulting in efficiency loss, performance degradation, increased vibration, and potentially pump damage. Subsurface vortices can cause similar problems.

After thorough review of the OE, the licensee confirmed that this condition was applicable to Callaway. As part of confirming the applicability of the noted condition to Callaway, the calculation that was originally performed for establishing the fuel oil tank volume requirements and corresponding level setpoints at Callaway was reviewed. It was confirmed that while net positive suction head requirements were considered in the calculation (with respect to proper transfer pump operation) to ensure the operability of the EDG as discussed in FSAR Section 9.5.4, vortex prevention was not considered.

Based on the revised calculation, the licensee determined that an additional 0.6 percent (500 gallons) volume increase of the fuel oil is appropriate to continue to maintain the required 7-day fuel oil volume of the EDG fuel oil storage tank considering potentially adverse vortex effects.

The change to the minimum fuel oil volume required to be contained in each fuel oil storage tank when the associated EDG is required to be operable requires the following changes to be made to TS 3.8.3. TS 3.8.3 specifies requirements for the diesel fuel oil, lube oil, and starting air systems for the EDGs. With regard to diesel fuel oil requirements, SR 3.8.3.1 requires verifying, at least once per 31 days, that each fuel oil storage tank has at least a 7-day supply of fuel (currently specified as greater than (>) 80,400 gallons). Condition A under the Limiting Condition for Operation (LCO) of TS 3.8.3 addresses the condition of having less than the required 7-day supply. More precisely, it addresses the condition of having less than a 7-day supply but greater than a 6-day supply (currently specified as > 69,300 gallons). With a fuel oil volume in this range, some time is allowed per Required Action A.1 (i.e., 48 hours) to restore fuel oil to within the required limit (i.e., to greater than the 7-day volume).

Condition A (in the ACTIONS section of TS 3.8.3)

Condition A currently reads as follows:

"A. One or more DGs with fuel level < 80,400 gal and > 69,300 gal in storage tank."

This Condition would be revised to read as follows:

"A. One or more DGs with fuel level < 80,900 gal and > 69,800 gal in storage tank."

The fuel levels in Condition A are being increased by 500 gallons.

SR 3.8.3.1

This SR currently reads, in part, as follows:

"Verify each fuel oil storage tank contains > 80,400 gal of fuel."

This SR would be revised to read as follows:

"Verify each fuel oil storage tank contains > 80,900 gal of fuel."

The minimum fuel oil volume in the storage tank is being increased by 500 gallons.

The licensee states in the license amendment request that with regard to fire load considerations and the potential impact of the proposed increase in the minimum required fuel oil volume for the storage tanks, it should be noted that fire loading calculations and assumptions for a fire in the plant are based on an EDG's fuel oil day tank volume and an assumed time for continued operation of the fuel oil transfer pump, and not on the fuel oil volume in the associated main storage tank. Therefore, no changes to the plant's fire analyses

are required for the proposed changes. The NRC staff finds this to be acceptable because the fire analysis does not rely on the fuel oil volume in the main tank.

In response to a question on the hydraulic calculation by the NRC staff, the licensee provided additional information on how the hydraulic calculation was performed and how 0.6 percent (approximately 500 gallons) of additional fuel was determined. The licensee stated in the letter dated March 12, 2008, that equations in American Society of Mechanical Engineers (ASME) JPCG2001/PWR-19010 were used to determine the additional margin for vortex prevention. The licensee identified slight differences in the ASME model and justified the configuration at Callaway Plant. One of the differences is the fluid used in the ASME test. The ASME test uses water as the pumped fluid. The licensee stated that the primary differences are in the densities, viscosities, and surface tension. Citing the conclusion in the ASME equations that the viscous and surface tension forces were negligible (i.e., the Reynolds and Weber numbers are not the governing dimensionless parameters), the licensee stated that it is reasonable to assume that the results of the study may be utilized for applications using diesel fuel oil as the pumped fluid.

Again in response to the same question by the NRC staff, the licensee stated that geometry is an important consideration when utilizing scale models to analyze fluid flow characteristics, which was another difference between the ASME JPCG2001/PWR-19010 model and Callaway's fuel oil transfer pump installation that needed to be reconciled. The ASME model consisted of a suction line connected to the side of a tank. Callaway's fuel oil transfer pumps' suction is horizontal; however, it is located in an open portion of its tank. The licensee provided additional information on the differences between the ASME test equations and configurations. The ASME test model included several water levels including above and below the top of the suction pipe. The licensee stated that the inclusion of these test conditions show that the suction nozzle surroundings are not a dominant factor in vortex behavior. This configuration is very similar to Callaway's transfer pump installation. Callaway's fuel oil transfer pumps take suction through a weld neck flange connected directly to the pump inlet (i.e., there are no connections to the flange). The hub surrounding the inlet of the flange will act as a vortex breaker.

In response to a question on the unusable volume of the storage tank by the NRC staff, the licensee provided additional information on how fuel oil contamination caused by vortex disturbance is prevented. The licensee states in its letter dated March 12, 2008, that the required minimum fuel oil storage volumes contain an unusable volume that provides sufficient submergence of the transfer pump suction nozzle to preclude the formation of surface and subsurface vortices. Therefore, the licensee stated that the fuel oil contamination due to vortex disturbance is not credible. Additional conservatisms are also built into the prevention of sludge into the transfer pumps. Examples given by the licensee of the additional conservatisms include:

- The oil fill connection to the underground storage tank is located above grade and includes a strainer.
- Duplex basket strainers and duplex oil filters are installed in series on the fuel oil lines from the day tank to the engine.

- The storage tanks have integral sumps. Each tank is sloped to the sump. Sample lines extend from the sumps to the vaults for periodic bottom sampling and water draw-off.

The NRC staff reviewed comparisons between the ASME test and the fuel oil pump-storage tank configuration at Callaway given above.

The ASME equations are used to calculate the required submergence height of the suction pipe to preclude vortex formation. Using the calculated submergence and the pipe inner diameter, the required fluid depth was determined, which yielded the liquid height required to maintain the new unusable fuel oil volume. This value was then rounded up to 2 inches to incorporate additional conservatism.

The licensee states that because the Callaway EDG fuel oil storage tanks are installed at a slight angle, a model was developed wherein incremental cross-sectional volume slices were added to get the total fluid volume of the tanks. In the model, the fluid level was increased in 1/10-inch increments until the computed transfer pump submergence was at least 2 inches. The volume at this fluid level represents the new unusable volume of approximately 500 gallons. The increase of the required 7-day fuel oil volume from 80,400 gallons to 80,900 gallons corresponds to an increase of approximately 0.6 percent.

Based on its review of the licensee's analysis, the NRC staff finds that the proposed change to increase the amount of fuel oil in each fuel oil storage tank provides an additional amount of margin that prevents the potential of air ingestion by the diesel fuel oil transfer pumps. This helps ensure the continued ability of the EDG to perform its intended function. In addition, based on the staff's review and engineering judgment, the staff finds that the licensee's hydraulic calculation is reasonable and appropriate for this application. Therefore, the staff finds that the licensee's proposed change to increase the minimum amount of diesel fuel oil in the EDG fuel oil storage tank and its associated SR is acceptable. Based on this, the staff further concludes that the proposed change meets GDC 17. Based on this conclusion, the staff concludes that the proposed amendment to TS 3.8.3 is acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Missouri State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding published in the *Federal Register* on September 11, 2007 (72 FR 51866). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9).

Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. Letter from Luke H. Graessle, AmerenUE, to U.S. Nuclear Regulatory Commission, "Proposed Revision To Technical Specification 3.8.3, "Diesel Fuel Oil, Lube Oil, And Starting Air" (License Amendment Request OI-1271), dated August 20, 2007 (ADAMS Accession No. ML072400345).
2. Letter from Mark A. McLachlan, AmerenUE, to U.S. Nuclear Regulatory Commission, "Responses to Request for Additional Information Regarding Proposed Revision to Technical Specification 3.8.3, 'Diesel Fuel Oil, Lube Oil and Starting Air'", dated March 12, 2008 (ADAMS Accession No. ML080800458).

Principal Contributor: O. Hopkins

Date: August 27, 2008