

July 7, 1993

Docket No. 50-483

Mr. Donald F. Schnell  
Senior Vice President - Nuclear  
Union Electric Company  
Post Office Box 149  
St. Louis, Missouri 63166

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Dear Mr. Schnell:

SUBJECT: AMENDMENT NO. 82 TO FACILITY OPERATING LICENSE NO. NPF-30  
(TAC NO. M83955)

The Commission has issued the enclosed Amendment No. 82 to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1. This amendment revises the Technical Specifications in response to your application dated June 12, 1992, as clarified by letter dated August 31, 1992.

The amendment revises the Technical Specification Section 3/4.9.12, Figure 3.9-1 to reflect a maximum initial enrichment of 4.45 w/o U-235 for fuel storage in Region 2 of the Callaway spent fuel pool.

A copy of the Safety Evaluation and a notice of issuance is also enclosed. The original of the notice of issuance has been forwarded to the Office of the Federal Register for publication.

Sincerely,

Original signed by L. Raynard Wharton

L. Raynard Wharton, Project Manager  
Project Directorate III-3  
Division of Reactor Projects III/IV/V  
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 82 to License No. NPF-30
2. Safety Evaluation
3. Federal Register Notice

cc w/enclosures:  
See next page

\*See Previous Concurrences

LA:PDIII-3 MRushbrook 6/18/93	PM:PDIII-3 LRWharton/lrw/bj 7/8/93	*SRXB RJones 6/14/93	*D:PDIII-3 JHannon 6/11/93	*OGG-OWF 6/22/93
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DOCUMENT NAME: g:\callaway\CAL83955.AMD

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PDR ADDCK 05000483  
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

July 7, 1993

Docket No. 50-483

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Senior Vice President - Nuclear  
Union Electric Company  
Post Office Box 149  
St. Louis, Missouri 63166

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A copy of the Safety Evaluation and a notice of issuance is also enclosed. The original of the notice of issuance has been forwarded to the Office of the Federal Register for publication.

Sincerely,

A handwritten signature in cursive script that reads "L. Raynard Wharton".

L. Raynard Wharton, Project Manager  
Project Directorate III-3  
Division of Reactor Projects III/IV/V  
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 82 to  
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2. Safety Evaluation
3. Federal Register Notice

cc w/enclosures:

See next page

Mr. D. F. Schnell  
Union Electric Company

Callaway Plant  
Unit No. 1

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 82  
License No. NPF-30

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment filed by Union Electric Company (UE, the licensee) dated June 12, 1992, as clarified by letter dated August 31, 1992, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and 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:

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P PDR

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 82 , and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into the license. UE shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance, and is to be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



L. Raynard Wharton, Project Manager  
Project Directorate III-3  
Division of Reactor Projects III/IV/V  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of issuance: July 7, 1993

ATTACHMENT TO LICENSE AMENDMENT NO. 82

OPERATING LICENSE NO. NPF-30

DOCKET NO. 50-483

Revise Appendix A Technical Specifications by removing the page identified below and inserting the enclosed page. The revised page is identified by the captioned amendment number. Corresponding overleaf page is provided to maintain document completeness.

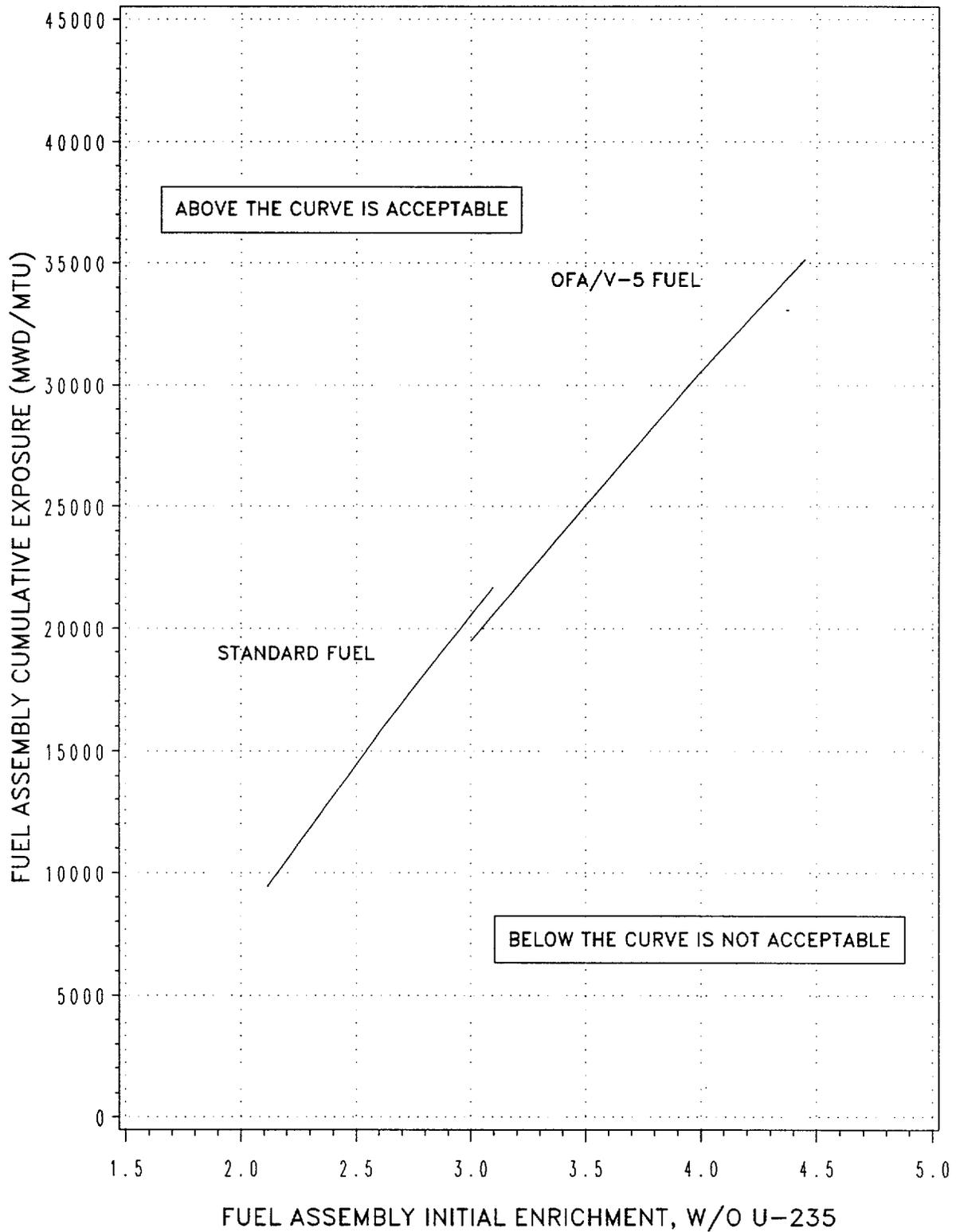
REMOVE

3/4 9-16

INSERT

3/4 9-16

FIGURE 3.9-1  
MINIMUM REQUIRED FUEL ASSEMBLY BURNUP AS A FUNCTION  
OF INITIAL ENRICHMENT TO PERMIT STORAGE IN REGION2





UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 82 TO FACILITY OPERATING LICENSE NO. NPF-30

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By application for license amendment dated June 12, 1992, and clarifying information dated August 31, 1992, Union Electric Company (the licensee) requested changes to the Technical Specification (TS) Section 3/4.9.12, "Spent Fuel Assembly Storage," for the Callaway Plant, Unit 1. The amendment would replace Figure 3.9.1, a graph of fuel assembly cumulative exposure (MWD/MTU) versus fuel assembly initial enrichment. The change would reflect an increase in the maximum initial U-235 enrichment for storage in Region 2 of the spent fuel pool. The current maximum allowable enrichment of 4.25 w/o U-235 would be increased to 4.45 w/o U-235.

During the next refueling outage, Refuel 6, fuel with a maximum initial enrichment of 4.40 w/o U-235 will need to be discharged to the spent fuel pool Region 2. The spent fuel pool consists of two regions, 1 and 2. Region 1 is designed to store unirradiated fuel assemblies and a full core-off-loading. Region 2 is designed to store irradiated fuel assemblies. The current and future fuel which Region 2 needs to be able to store consists of three types: 1) Westinghouse Standard Fuel Assemblies, 2) Optimized Fuel Assemblies, and 3) Westinghouse Vantage 5 Fuel Assemblies (V-5).

The staff review addresses the criticality aspects of Region 2. Since the licensee changed methodologies to perform the criticality calculations, the new methodology was also reviewed.

2.0 EVALUATION

2.1 CRITICALITY ANALYSIS

The spent fuel pool incorporates the maximum density rack concept. For Region 2, spent fuel assemblies are stored in a three out of four configuration.

The current bounding exposure curves have been calculated up to a maximum initial enrichment of 4.25 w/o U-235. The methodology used to support these curves is described in Section 9.1A of the Callaway Final Safety Analysis Report (FSAR). A different methodology is used to support the exposure curves for proposed extension of the maximum initial enrichment to 4.45 w/o U-235.

However, the method used in both cases is the well known reactivity equivalence method. This involves selecting a conservative spent fuel pool effective multiplication constant (k-effective) which is used to generate the exposure versus fuel assembly initial enrichment curves. Since the calculations are performed for an infinite array in all directions, the calculated k-effective is actually the infinite multiplication factor (k-infinity) of the storage racks.

The licensee has performed criticality calculations for Region 2 using the CASMO/GRPDQ codes and NITAWL/KENO-V.a in the SCALE-4 code package. The CASMO-3 code is capable of performing burnup calculations using a 40 energy group library based on data from ENDF/B-4, and is used to generate the exposure versus initial enrichment curve. The NITAWL code and the Monte Carlo theory code, KENO-V.a, are used to verify the CASMO/GRPDQ criticality calculations using the 27 energy group master SCALE library, and to generate a conservative reference k-effective used for determining the exposure versus initial enrichment curve.

A conservative k-effective is found after determining the sum total of uncertainties and biases in the reactivity due to the method bias, the calculational uncertainty, the uncertainties in the storage rack geometry, and a 5 percent uncertainty due to burnup. Since the V-5 fuel and the Optimized fuel have identical design parameters for criticality considerations, the criticality calculations were only performed for V-5 fuel assemblies and the Standard Fuel Assemblies. A conservative k-effective of 0.9250, not including the sum total of uncertainties and biases, was chosen for each fuel type. An equivalent zero burnup enrichment which yields the same spent fuel pool k-effective as the CASMO burnup calculations was done with the KENO-V.a program. From this verification calculation, a conservative reference k-effective of 0.921, not including the total reactivity deviation, was chosen for determining the exposure versus enrichment curves.

The design basis for preventing criticality in the spent fuel pool is that there is a 95 percent probability at a 95 percent confidence level (95/95 probability/confidence) that the effective multiplication factor (k-effective), including uncertainties, will be no greater than 0.95 under unborated moderator conditions. The licensee has shown that the maximum k-effective for Region 2 was calculated to be 0.9480, including all appropriate uncertainties. This meets the staff acceptance criterion, and is, therefore, acceptable.

## 2.2 METHODOLOGY

Since methodologies have been changed to perform the spent fuel pool criticality calculations, the licensee has performed a benchmark analysis for CASMO-3 and NITAWL/KENO-V.a. The benchmark analysis includes benchmarking for criticality, depletion, and isotopic inventory calculations. CASMO-3 and NITAWL/KENO-V.a criticality benchmarking consisted of the set of the Babcock & Wilcox Critical Experiments, which used 2.46 w/o enriched fuel pins, and the Battelle Northwest Laboratory Critical Experiments, which used an enrichment

of 4.306 w/o, to simulate light water reactor fuel storage conditions. CASMO-3 depletion and isotopic inventory calculations were validated against the Yankee Rowe Core I isotopic benchmarks.

The criticality calculations had been performed for Region 2 using the spent fuel pool coolant temperature of 90 degrees F which yielded the largest reactivity for conservatism. The reactivity versus spent fuel pool temperature curve shows a reactivity peak at 90 degrees F. The Region 2 k-effective versus temperature curve in the FSAR, however, shows an increasing k-effective with temperature over the same range. In response to a staff question concerning this, the licensee evaluated the dissimilarity between the curves of the reactivity with temperature, and attributed the discrepancies to the use of different codes and methodologies which have slight differences in 1) PDQ model geometries, 2) cross section data (trends with temperature), and 3) cross section generation models.

The CASMO code has been used extensively for spent fuel pool criticality calculations in the nuclear industry, and the staff finds the provided CASMO/GRPDQ benchmark results to be reasonable. The NITAWL and KENO-V.a codes have also been extensively applied to spent fuel pool criticality calculations in the nuclear industry, and the staff finds the provided NITAWL/KENO-V.a benchmark results to be reasonable. Thus, the staff finds the methodology used in the criticality analysis acceptable.

### 2.3 ACCIDENT ANALYSIS

Certain postulated events which could lead to a storage rack reactivity increase were evaluated. Asymmetric positioning of a fuel element in the cells has been shown to yield results equal to or more conservative than symmetrically positioned fuel assemblies. A dropped fuel assembly will be sufficiently separated from the active fuel height of the assemblies in the rack such that there will be no storage rack reactivity increase. Conditions which would result in an increase in reactivity, such as placing a fuel element outside or adjacent to the rack or placing a fuel element in the wrong position, were also evaluated. Application of the double contingency principle of ANSI N16.1-1975 allows credit to be taken for the 2000 ppm of soluble boron in the spent fuel pool. The double contingency principle states that an evaluation is not required to assume two unlikely, independent concurrent events to provide for protection against a criticality accident. In both cases considered above, the evaluation showed that the spent fuel pool would stay subcritical by at least 5%. This satisfies the NRC acceptance criterion of k-effective no greater than 0.95. Additionally, the water box, in which no fuel is stored in the three out of four configuration, has been provided with a lead-in guide which prevents insertion of fuel assemblies into the box.

The staff has reviewed the submittal for the spent fuel assembly storage technical specification change and determined that the methodology used was acceptable. Figure 3.9-1 will be used to determine if a fuel assembly with an initial U-235 w/o enrichment up to 4.45 enrichment that has undergone a

determined exposure can be stored in Region 2 of the storage racks. The review has concluded that the spent fuel pool criticality analysis is in accordance with staff positions, and that storage of Callaway Plant fuel assemblies in Region 2 using the proposed limiting exposure curves is acceptable.

### 3.0 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.

### 4.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact has been prepared and published in the Federal Register on July 7, 1993 (58 FR 36482). Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of this amendment will not have a significant effect on the quality of the human environment.

### 5.0 CONCLUSION

The staff 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 this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: D. O'Neal  
L. R. Wharton

Date: July 7, 1993

U. S. NUCLEAR REGULATORY COMMISSION

UNION ELECTRIC COMPANY

DOCKET NO. 50-483

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 82 to Facility Operating License No. NPF-30 issued to Union Electric Company (the licensee), for operation of the Callaway Plant located in Callaway County, Missouri. The amendment is effective as of the date of issuance.

The amendment revised Technical Specification Section 3/4.9.12, Figure 3.9-1 to reflect a maximum initial enrichment of 4.45 w/o U-235 for fuel storage in Region 2 of the Callaway spent fuel pool.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment.

Notice of Consideration of Issuance of Amendment and Opportunity for Hearing in connection with this action was published in the Federal Register on September 22, 1992 (57 FR 43756). No request for a hearing or petition for leave to intervene was filed following this notice.

The Commission has prepared an Environmental Assessment related to the action and has determined not to prepare an environmental impact statement. Based upon the environmental assessment, the Commission has concluded that the

issuance of this amendment will not have a significant effect on the quality of the human environment (58 FR 36482).

For further details with respect to this action, see (1) the application for amendment dated June 12, 1992, as clarified by letter dated August 31, 1992, (2) Amendment No. 82 to License No. NPF-30, (3) the Commission's related Safety Evaluation, and (4) the Commission's Environmental Assessment dated June 29, 1993. All of these items are available for public inspection at the Commission's Public Document Room located in the Gelman Building, 2120 L Street, NW., Washington, DC 20555 and at the local public document room located in the Callaway Public Library, 710 Court Street, Fulton, Missouri 65251.

Dated at Rockville, Maryland, this 8th day of July 1993.

FOR THE NUCLEAR REGULATORY COMMISSION



L. Raynard Wharton, Project Manager  
Project Directorate III-3  
Division of Reactor Projects III/IV/V  
Office of Nuclear Reactor Regulation

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Dated at Rockville, Maryland, this 8th day of July 1993.

FOR THE NUCLEAR REGULATORY COMMISSION

ORIGINAL SIGNED BY:

L. Raynard Wharton, Project Manager  
Project Directorate III-3  
Division of Reactor Projects III/IV/V  
Office of Nuclear Reactor Regulation

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MRushbrook           LRWharton           OGC

\*See previous concurrences

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DATE	7/7/93	7/8/93	6/22/93	6/1/93

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