

March 24, 1992

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.68 TO FACILITY OPERATING LICENSE NO. NPF-30
(TAC NO. M82301)

The Commission has issued the enclosed Amendment No. 68 to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1. This amendment revises the Technical Specifications (TSs) in response to your application dated December 18, 1991.

The amendment revises TS 4.5.2.h. to reflect new surveillance requirements for maximum and minimum Emergency Core Cooling System (ECCS) subsystem flow rates. In addition, the surveillance requirements for performing flow balance tests on specific ECCS subsystems are clarified. These changes will ensure that the performance of these ECCS subsystems is demonstrated to be consistent with the current plant safety analyses.

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

Sincerely,

Original signed by

James R. Hall, Sr. Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 68 to License No. NPF-30
2. Safety Evaluation

cc w/enclosures:
See next page

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PKreutzer

JRHall/bj

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BC/SRXB

OGC-OWF

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

March 24, 1992

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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Sincerely,

A handwritten signature in cursive script that reads "James R. Hall".

James R. Hall, Sr. Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 68 to License No. NPF-30
2. Safety Evaluation

cc w/enclosures:
See next page

Mr. D. F. Schnell
Union Electric Company

Callaway Plant
Unit No. 1

cc:

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Jefferson City, Missouri 65102



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

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 68
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 December 18, 1991, 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:

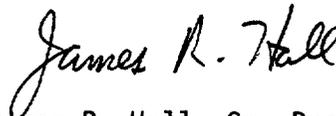
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(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 68 , 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.

FOR THE NUCLEAR REGULATORY COMMISSION



James R. Hall, Sr. 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: March 24, 1992

ATTACHMENT TO LICENSE AMENDMENT NO. 68

OPERATING LICENSE NO. NPF-30

DOCKET NO. 50-483

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change. Corresponding overleaf pages are provided to maintain document completeness.

REMOVE

3/4 5-6

B 3/4 5-2

B 3/4 5-3

-

INSERT

3/4 5-6

B 3/4 5-2

B 3/4 5-3

B 3/4 5-4

EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- 2) A visual inspection of the containment sump and verifying that the subsystem suction inlets are not restricted by debris and that the sump components (trash racks, screens, etc.) show no evidence of structural distress or abnormal corrosion.
- e. At least once per 18 months, during shutdown, by:
- 1) Verifying that each automatic valve in the flow path actuates to its correct position on a Safety Injection test signal and/or on Automatic Switchover to Containment Sump from RWST Level-Low-Low coincident with Safety Injection test signal; and
- 2)# Verifying that each of the following pumps start automatically upon receipt of a Safety Injection actuation test signal:
- a) Centrifugal charging pump,
- b) Safety Injection pump, and
- c) RHR pump.
- f. By verifying that each of the following pumps develops the required differential pressure on recirculation flow when tested pursuant to Specification 4.0.5:
- 1) Centrifugal charging pump \geq 2400 psid,
- 2) Safety Injection pump \geq 1445 psid, and
- 3) RHR pump \geq 165 psid.
- g. By verifying the correct position of each mechanical position stop for the following ECCS throttle valves:
- 1) Within 4 hours following completion of each valve stroking operation or maintenance on the valve when the ECCS subsystems are required to be OPERABLE, and
- 2) At least once per 18 months.

<u>HPSI System</u>		<u>CVCS System</u>
<u>Valve Numbers</u>		<u>Valve Numbers</u>
EMV095	EMV109	BGV-198
EMV096	EMV110	BGV-199
EMV097	EMV089	BGV-200
EMV098	EMV090	BGV-201
EMV107	EMV091	BGV-202
EMV108	EMV092	

#The specified 18 month frequency may be waived for Cycle I provided the surveillance is performed prior to restart following the first refueling outage or June 1, 1986, whichever occurs first. The provisions of Specification 4.0.2 are reset from performance of this surveillance.

EMERGENCY CORE COOLING SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- h. By performing a flow balance test of the affected centrifugal charging pump portions of the ECCS subsystem, during shutdown, following completion of modifications to that centrifugal charging pump subsystem that alters the subsystem flow characteristics. The test shall be performed with a single pump running and the throttle valves set within setting tolerance to provide balanced branch line flow. Under these conditions there is zero mini-flow and 79 plus 2 or minus 4 gpm simulated reactor coolant pump seal injection line flow. This test shall verify:
- 1) The total flow to the four branch lines is less than or equal to 469 gpm, and
 - 2) The total flow to the four branch lines is greater than or equal to 406.2 gpm (this corresponds to an analyzed flow rate of 301.8 gpm through the three lowest flow branch lines).
- i. By performing a flow balance test of the affected safety injection pump portions of the ECCS subsystem, during shutdown, following completion of modifications to that safety injection pump subsystem that alters the subsystem flow characteristics. The test shall be performed with a single pump running and the throttle valves set within setting tolerance to provide balanced branch line flow. This test shall verify:
- 1) The total pump flow rate is less than or equal to 675 gpm, and
 - 2) The total flow to the four branch lines is greater than or equal to 611.3 gpm (this corresponds to an analyzed flow rate of 455.6 gpm through the three lowest flow branch lines).
- j. By performing a flow test, during shutdown, following completion of modifications to the RHR subsystems that alter the subsystem flow characteristics and verifying that for RHR pump lines, with a single pump running:
- 1) The sum of the injection line flow rates is greater than or equal to 3800 gpm, and
 - 2) The total pump flow rate is less than or equal to 5500 gpm.

EMERGENCY CORE COOLING SYSTEMS

BASES

ECCS SUBSYSTEMS (Continued)

The limitation for a maximum of one centrifugal charging pump to be OPERABLE and the Surveillance Requirement to verify all charging pumps except the required OPERABLE charging pump to be inoperable in MODES 4 and 5 and in MODE 6 with the reactor vessel head on, provides assurance that a mass addition pressure transient can be relieved by the operation of a single PORV or RHR suction relief valve. In addition, the requirement to verify all Safety Injection pumps to be inoperable in MODE 4, in MODE 5 with the water level above the top of the reactor vessel flange, and in MODE 6 with the reactor vessel head on and with the water level above the top of the reactor vessel flange, provides assurance that the mass addition can be relieved by a single PORV or RHR suction relief valve.

With the water level not above the top of the reactor vessel flange and with the vessel head on, Safety Injection pumps may be available to mitigate the effects of a loss of decay heat removal during partially drained conditions.

The Surveillance Requirements, which are provided to ensure the OPERABILITY of each component, ensure that, at a minimum, the assumptions used in the safety analyses are met and that subsystem OPERABILITY is maintained. The safety analyses make assumptions with respect to: (1) both the maximum and minimum total system resistance, (2) both the maximum and minimum branch injection line resistance, and (3) the maximum and minimum ranges of potential pump performance. These resistances and ranges of pump performance are used to calculate the maximum and minimum ECCS flows assumed in the safety analyses.

The centrifugal charging pump minimum flow Surveillance Requirement provides the absolute minimum injected flow assumed in the safety analyses. The maximum total system resistance defines the range of minimum flows (including the minimum flow Surveillance Requirement), with respect to pump head, that is assumed in the safety analyses. Therefore, the centrifugal charging pump total system resistance ($(P_d - P_{RCS})/Q_d^2$) must not be greater than $1.004E-02$ ft/gpm², where P_d is pump discharge pressure in feet, P_{RCS} is RCS pressure in feet, and Q_d is the total pump flow rate in gpm.

The safety injection pump minimum flow Surveillance Requirement provides the absolute minimum injected flow assumed in the safety analyses. The maximum total system resistance defines the range of minimum flows (including the minimum flow Surveillance Requirement), with respect to pump head, that is assumed in the safety analyses. Therefore, the safety injection pump total system resistance ($(P_d - P_{RCS})/Q_d^2$) must not be greater than $0.423E-02$ ft/gpm², where P_d is pump discharge pressure in feet, P_{RCS} is RCS pressure in feet, and Q_d is the total pump flow rate in gpm.

3/4.5 EMERGENCY CORE COOLING SYSTEMS

BASES

3/4.5.1 ACCUMULATORS

The OPERABILITY of each Reactor Coolant System (RCS) accumulator ensures that a sufficient volume of borated water will be immediately forced into the core through each of the cold legs in the event the RCS pressure falls below the pressure of the accumulators. This initial surge of water into the core provides the initial cooling mechanism during large RCS pipe ruptures.

The limits on accumulator volume, boron concentration and pressure ensure that the assumptions used for accumulator injection in the safety analysis are met.

The accumulator power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std. 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these accumulator isolation valves fail to meet single failure criteria, removal of power to the valves is required.

The limits for operation with an accumulator inoperable for any reason except an isolation valve closed minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional accumulator which may result in unacceptable peak cladding temperatures. If a closed isolation valve cannot be immediately opened, the full capability of one accumulator is not available and prompt action is required to place the reactor in a MODE where this capability is not required. In order to perform check valve surveillance testing per 4.0.5 or 4.4.6.2.2 above 1000 psig RCS pressure, one accumulator isolation valve may be closed for up to 2 hours in mode 3 only.

The requirement to verify accumulator isolation valves shut with power removed from the valve operator when the pressurizer is solid ensures the accumulators will not inject water and cause a pressure transient when the Reactor Coolant System is on solid plant pressure control.

3/4.5.2, 3/4.5.3, and 3/4.5.4 ECCS SUBSYSTEMS

The OPERABILITY of two independent ECCS subsystems ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the accumulators is capable of supplying sufficient core cooling to limit the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double ended break of the largest RCS cold leg pipe downward. In addition, each ECCS subsystem provides long-term core cooling capability in the recirculation mode during the accident recovery period.

With the RCS temperature below 350°F, one OPERABLE ECCS subsystem is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the limited core cooling requirements.

EMERGENCY CORE COOLING SYSTEMS

BASES

ECCS SUBSYSTEMS (Continued)

The centrifugal charging pump maximum total pump flow Surveillance Requirement ensures the maximum injection flow limit of 550 gpm is not exceeded. This value of flow is comprised of the total flow to the four branch lines of 469 gpm and a seal injection flow of 79 gpm plus 2 gpm for instrument uncertainties.

The safety injection pump maximum total pump flow Surveillance Requirement ensures the maximum injection flow limit of 675 gpm is not exceeded. This value of flow includes a nominal 30 gpm of mini-flow.

The test procedure places requirements on instrument accuracy (20 inches of water column for the charging branch lines and 10 inches of water column for the safety injection branch lines) and setting tolerance (30 inches of water column for both the charging and safety injection branch lines) such that branch line flow imbalance remains within the assumptions of the safety analyses.

The maximum and minimum potential pump performance curves, in conjunction with the maximum and minimum flow Surveillance Requirements, the maximum total system resistance, and the test procedure requirements, ensure that the assumptions of the safety analyses remain valid.

The surveillance flow and differential pressure requirements are the Safety Analysis Limits and do not include instrument uncertainties. These instrument uncertainties will be accounted for in the surveillance test procedure to assure that the Safety Analysis Limits are met.

The Surveillance Requirements for leakage testing of ECCS check valves ensure that a failure of one valve will not cause an inter-system LOCA. The Surveillance Requirement to vent the ECCS pump casings and accessible, i.e., can be reached without personnel hazard or high radiation dose, discharge piping ensures against inoperable pumps caused by gas binding or water hammer in ECCS piping.

3/4.5.5 REFUELING WATER STORAGE TANK

The OPERABILITY of the refueling water storage tank (RWST) as part of the ECCS ensures that a sufficient supply of borated water is available for injection by the ECCS in the event of a LOCA. The limits on RWST minimum volume and boron concentration ensure that: (1) sufficient water is available within containment to permit recirculation cooling flow to the core, and (2) the reactor will remain subcritical in the cold condition following mixing of the RWST and the RCS water volumes assuming all the control rods are out of the core. These assumptions are consistent with the LOCA analyses.

EMERGENCY CORE COOLING SYSTEMS

BASES

REFUELING WATER STORAGE TANK (Continued)

The contained water volume limit includes an allowance for water not usable because of tank discharge line location or other physical characteristics.

The limits on contained water volume and boron concentration of the RWST also ensure a pH value of between 8.5 and 11.0 for the solution recirculated within containment after a LOCA. This pH band minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 68 TO FACILITY OPERATING LICENSE NO. NPF-30

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By letter dated December 18, 1991, the Union Electric Company (the licensee) requested changes to the Technical Specifications (TSs) for Callaway Plant, Unit 1. Additional information was provided in telephone conversations with the NRC staff on December 20, 1991, and February 20, 1992. The proposed changes would separate current TS surveillance requirement (SR) 4.5.2.h. into two new surveillance requirements; one to specify the requirements for performing a flow balance test of the centrifugal charging pump (CCP) portions of the Emergency Core Cooling System (ECCS) subsystem, and the second to specify similar test requirements for the safety injection pump (SIP) portions of the ECCS subsystem. The revised SRs would also specify new acceptable flow limits, which would allow additional margin and reduce uncertainties in the measurement of ECCS subsystem flow characteristics. The revised surveillance requirements would ensure that the actual system flow characteristics remain consistent with assumptions used in the Callaway accident analysis. The corresponding Bases would also be revised accordingly.

Westinghouse has identified several "Potential Issues" (PIs) concerning ECCS flow measurement and pump performance, which have been evaluated by the licensee for applicability to the Callaway plant. These evaluations have indicated that the CCPs and the SIPs may develop greater flow at pump runout conditions than was previously considered in the Callaway accident analysis. The licensee also investigated expanding the window between maximum and minimum ECCS subsystem flows in order to facilitate the performance of the surveillance. As a result, the licensee and Westinghouse have analyzed the possible impact of the revised ECCS pump flows and have further evaluated the uncertainties in measuring flow and calculating branch line imbalances. The results of these analyses support the proposed TS changes.

Specifically, the proposed TS changes would:

- (1) Separate existing SR 4.5.2.h. into new SRs 4.5.2.h. and 4.5.2.i., to require a flow balance test (during shutdown) only of the affected CCP or SIP portions of the ECCS subsystem following completion of modifications that alter that subsystem's flow characteristics. Current SR 4.5.2.i. will be redesignated as SR 4.5.2.j.

- (2) Retain in revised SR 4.5.2.h. the current CCP maximum flow rate limit of 550 gallons per minute (gpm) for the flow balance test; but would specify that this limit is comprised of a total maximum flow of 469 gpm to the four branch lines, plus a value of 79 +2/-4 gpm for simulated reactor coolant pump seal injection line flow.
- (3) Decrease the minimum limits on total flow for the flow balance tests of the CCP and SIP portions of the ECCS subsystem in new SRs 4.5.2.h. and 4.5.2.i., respectively, and express each limit in terms of total flow to the four branch lines, instead of the sum of the three lowest injection line flow rates.
- (4) Revise the SIP maximum pump flow rate limit from 655 gpm to 675 gpm in new SR 4.5.2.i.

2.0 EVALUATION

The current Callaway TSs require the performance of flow balance tests to ensure that the ECCS subsystems and their components are operable and function in conformance with the assumptions made in the plant safety analyses. These assumptions include the maximum and minimum system and branch line resistances and the maximum and minimum ranges of potential pump performance. The licensee and Westinghouse have evaluated concerns that could potentially impact the safety analyses, and the licensee has concluded that the proposed TS changes will improve the capability to confirm that the actual ECCS subsystem performance is consistent with the safety analyses assumptions.

The licensee evaluated the following accidents, identified in Chapter 15 of the Callaway Final Safety Analysis Report (FSAR), for potential impact as a result of the proposed changes: loss of coolant accidents (LOCAs), main steamline and main feedwater line breaks, Low Temperature Overpressure Protection System (LTOPS) analysis, and steam generator tube rupture (SGTR) margin to overfill. In addition, the licensee evaluated CCP and SIP performance at the higher calculated flow rates under pump runout conditions.

With respect to the large and small break LOCA events for Callaway, the licensee reanalyzed these events for the revised SIP and CCP flow rates using the original Callaway ECCS model. The results indicated that the maximum change in overall delivered ECCS flow for the large break LOCA was less than 1%; consequently, there was no effect on the existing calculated peak cladding temperature (PCT) of 2154.6°F. For the spectrum of small break LOCAs analyzed, the integrated ECCS flows were generally higher than previously analyzed, and the limiting break size and calculated PCT were also unchanged.

For the main steamline break accidents, sensitivity studies were performed which indicated that the impact of the reduced CCP flows on the calculated mass and energy releases inside and outside containment would be negligible. For those scenarios where Reactor Coolant System (RCS) pressure remains high, CCP flow is relatively small and is not a significant factor. For those cases where RCS pressure falls below the shutoff head of the SIPs, additional injection flow

would be provided. Similarly, the peak calculated core heat flux would not change as a result of the revised CCP flows. The previous calculated peak containment pressure of 48.1 psig (which results from the main steamline break) was determined to increase by less than 1%, still well below the design pressure of 60 psig.

For the main feedwater line break, the actuation of one CCP provides additional flow for heat removal from the RCS. Within minutes of the initiating event, RCS pressure increases above the shutoff head of the CCPs. Therefore, ECCS flow is not a significant source of heat removal for this scenario, and the revised CCP flow rates would not impact the existing analysis.

The licensee determined that the revised maximum CCP flow would not require a change to the current LTOPS setpoints, and that adequate capacity exists to relieve the mass input from a single CCP.

The licensee previously analyzed a forced overfill condition for the SGTR event, in which a 15% conservatism was applied to the maximum CCP flow rate. This forced overfill condition, which bounds the case for the proposed revised ECCS flows, resulted in lower offsite doses than for the worst-case SGTR event analyzed in the Callaway FSAR. Therefore, the revised ECCS flows will not impact the current FSAR analysis of this event.

With respect to pump performance, the Westinghouse model predicted potential maximum flow rates of 567 gpm for the CCPs and 691 gpm for the SIPs, when aligned in the recirculation phase of ECCS operation. A replacement CCP was tested at 574 gpm to demonstrate pump capability at the higher flow rate. Similar SIPs to those at Callaway have been operated in the field at flows up to 706 gpm with no observed degradation. The net positive suction head requirements for these pumps at the higher flow rates (less than 50 feet) would be met through the operation of the Residual Heat Removal pumps, which provide a minimum head of 275 feet of water to the CCPs and SIPs when the ECCS is operating in the recirculation phase.

The NRC staff has evaluated the licensee's analyses in support of the proposed changes to the Callaway Technical Specifications. The changes in ECCS flow rates have been evaluated with respect to the relevant accidents and events analyzed in the Callaway FSAR, and the FSAR analyses remain valid. The proposed changes will enable the licensee to more effectively perform ECCS subsystem flow balance testing, while minimizing personnel exposure and unnecessary wear on equipment. Therefore, the staff finds the proposed changes 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

This amendment involves changes to surveillance requirements. The 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 this amendment involves no significant hazards consideration and there has been no public comment on such finding (57 FR 2602). Accordingly, this 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 this amendment.

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 Contributor: James R. Hall

Date: March 24, 1992