March 30, 1995

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Mr. Donald F. Schnell
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Union Electric Company
Post Office Box 149
St. Louis, MO 63166

SUBJECT: AMENDMENT NO. 96 TO FACILITY OPERATING LICENSE NO. NPF-30 - CALLAWAY, UNIT 1 (TAC NO. M90168)

Dear Mr. Schnell:

The Commission has issued the enclosed Amendment No. 96 to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1. This amendment revises the Technical Specifications (TS) in response to your application dated August 4, 1994, as supplemented on March 14, 1995, and March 28, 1995.

The amendment replaces Technical Specification (TS) 3/4.6.2.2, Spray Additive System, with a new TS 3/4.6.2.2 entitled Recirculation Fluid pH control (RFPC) System. The associated TS Surveillance Requirements and the Bases will also be revised. In addition, the Bases section for the Refueling Water Storage Tank (RWST) System will be revised.

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 L. Raynard Wharton

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

Docket No. 50-483

Enclosures: 1. Amendment No. 96 to License No. NPF-30
2. Safety Evaluation

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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. 96
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 August 4, 1994, as supplemented on March 14, 1995, and March 28, 1995, 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:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 96 , 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. The Technical Specifications are to be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

L. Raynard Wharton

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

Attachment: Changes to the Technical Specifications

Date of issuance: March 30, 1995

ATTACHMENT TO LICENSE AMENDMENT NO. 96

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 vertical lines indicating the area of change. The corresponding overleaf pages, indicated by an asterisk, are also provided to maintain document completeness.

REMOVE	INSERT
3/4 6-14	3/4 6-14
B 3/4 1-3	B 3/4 1-3
B 3/4 1-4*	B 3/4 1-4*
B 3/4 5-3*	B 3/4 5-3*
B 3/4 5-4	B 3/4 5-4
B 3/4 6-3	B 3/4 6-3
B 3/4 6-4	B 3/4 6-4

RECIRCULATION FLUID pH CONTROL (RFPC) SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.2 The RFPC System shall be OPERABLE with each of the two storage baskets (one within the confines of each of the two containment recirculation sumps) containing a minimum of 30", but not to exceed 36.8" (uniform depth), of granular trisodium phosphate dodecahydrate (TSP-C).

APPLICABILITY: MODES 1, 2, 3, and 4

ACTION:

With the RFPC System inoperable, restore the system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the RFPC System to OPERABLE status within the next 48 hours or be in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.2 The RFPC System shall be demonstrated OPERABLE at least once per 18 months by verifying that:

(a) One TSP-C storage basket is in place in the confines of each containment recirculation sump, and

(b) Both baskets show no evidence of structural distress or abnormal corrosion, and

(c) Each basket contains between 30" and 36.8" (uniform depth) of granular TSP-C.

BORATION SYSTEMS (Continued)

With the RCS temperature below 200°F, one Boration System is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity changes in the event the single Boron Injection System becomes inoperable.

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 pump to be inoperable in MODES 4, 5, and 6 provides assurance that a mass addition pressure transient can be relieved by the operation of a single PORV or an RHR suction relief valve.

The boron capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% $\Delta k/k$ after xenon decay and cooldown from 200°F to 140°F. This condition requires either 2968 gallons of 7000 ppm borated water from the boric acid storage tanks or 14,076 gallons of 2350 ppm borated water from the RWST.

The contained water volume limits include allowance for water not available because of discharge line location and other physical characteristics.

The limits on contained water volume and boron concentration of the RWST also ensure a minimum equilibrium sump pH of 7.1 for the solution recirculated within Containment after a LOCA. This pH level minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

The OPERABILITY of one Boration System during REFUELING ensures that this system is available for reactivity control while in MODE 6.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

This specifications of this section ensure that: (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of rod misalignment on associated accident analyses are limited. OPERABILITY of the control rod position indicators is required to determine control rod positions and thereby ensure compliance with the control rod alignment and insertion limits. Verification that the Digital Rod Position indicator agrees with the demanded position within ± 12 steps at 24, 48, 120 and 228 steps withdrawn for the Control Banks and 18, 210 and 228 steps withdrawn for the Shutdown Banks provides assurance that the Digital Rod Position Indicator is operating correctly over the full range of indication. Since the Digital Rod Position System does not indicate the actual shutdown rod position between 18 steps and 210 steps, only points in the indicated ranges are picked for verification of agreement with demanded position. Shutdown and control rods are positioned at 225 steps or higher for fully withdrawn.

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.

3/4.6.1.7 CONTAINMENT VENTILATION SYSTEM

The 36-inch containment purge supply and exhaust isolation valves are required to be closed and blank flanged during plant operations since these valves have not been demonstrated capable of closing during a LOCA or steam line break accident. Maintaining these valves closed and blank flanged during plant operation ensures that excessive quantities of radioactive material will not be released via the Containment Purge System. To provide assurance that the 36-inch containment purge valves cannot be inadvertently opened, the valves are blank flanged.

The use of the containment mini-purge lines is restricted to the 18-inch purge supply and exhaust isolation valves since, unlike the 36-inch valves, the 18-inch valves are capable of closing during a LOCA or steam line break accident. Therefore, the SITE BOUNDARY dose guideline values of 10 CFR Part 100 would not be exceeded in the event of an accident during containment purging operation. Operation will be limited to 2000 hours during a calendar year. The total time the Containment Purge (vent) System isolation valves may be open during MODES 1, 2, 3, and 4 in a calendar year is a function of anticipated need and operating experience. Only safety-related reasons; e.g., containment pressure control or the reduction of airborne radioactivity to facilitate personnel access for surveillance and maintenance activities, should be used to support additional time requests. Only safety-related reasons should be used to justify the opening of these isolation valves during MODES 1, 2, 3, and 4 in any calendar year regardless of the allowable hours.

Leakage integrity tests with a maximum allowable leakage rate for containment purge supply and exhaust isolation valves will provide early indication of resilient material seal degradation and will allow opportunity for repair before gross leakage failures could develop. The 0.60 L_a leakage limit of Specification 3.6.1.2b. shall not be exceeded when the leakage rates determined by the leakage integrity tests of these valves are added to the previously determined total for all valves and penetrations subject to Type B and C tests.

3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS
3/4.6.2.1 CONTAINMENT SPRAY SYSTEM

The OPERABILITY of the Containment Spray System ensures that containment depressurization and cooling capability will be available in the event of a LOCA or steam line break. The pressure reduction and resultant lower containment leakage rate are consistent with the assumptions used in the safety analyses.

The Containment Spray System and the Containment Cooling System are redundant to each other in providing post-accident cooling of the Containment atmosphere. However, the Containment Spray System also provides a mechanism for removing iodine from the containment atmosphere and therefore the time requirements for restoring an inoperable spray system to OPERABLE status have been maintained consistent with that assigned other inoperable ESF equipment.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 96 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 4, 1994, as supplemented on March 14, 1995, and March 28, 1995, Union Electric Company (the licensee) requested an amendment to Operating License NPF-30, which would replace Technical Specification (TS) 3/4.6.2.2, Spray Additive System, with a new TS 3/4.6.2.2 entitled Recirculation Fluid pH Control (RFPC) system. The associated TS Bases section and the Refueling Water Storage Tank (RWST) System Bases would also be revised. The request eliminates the need for the sodium hydroxide additive in the containment spray system and instead uses trisodium phosphate for controlling sump pH in the Callaway Plant.

The March 14, 1995, and March 28, 1995, submittals provided supplemental information which did not affect the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

In the original design, sodium hydroxide additive was used to control pH of the containment spray solution in order to enhance removal of elemental iodine from the post-accident containment atmosphere and prevent stress corrosion cracking of austenitic steel components. The pH was maintained at 8.5 to 11. At the time the plant was designed it was thought that these high pH values were required to remove elemental iodine. As more information was gained on iodine removal, it was found that in an iodine free solution pH could be maintained at much lower values and still be effective in removing elemental iodine. In addition, it was found that some of the iodine is in a cesium iodide form and could dissolve in water regardless of its pH. There was no need, therefore, to control pH of the spray water as long as it was free of dissolved iodine. However, when iodine containing water is used, as for example, during the recirculation phase spraying, pH has to be maintained above 7, otherwise reevolution of dissolved iodine will occur. A pH higher than 7 has to also be maintained to prevent chloride induced stress corrosion cracking of austenitic steel components exposed to spray water and minimize evolution of hydrogen from the corrosion of zinc on galvanized surfaces and in zinc based paints. These requirements are reflected in Sections 6.1.1 and 6.5.2 of the Standard Review Plan (SRP). In the submittal, the licensee proposes to use borated water with the lowest pH of 4 and control sump water pH between 7.1 and 9 with trisodium phosphate from the baskets placed in the containment sump. The licensee will incorporate the proposed changes in amended Technical Specification 3/4.6.2.2 and in appropriate sections of the plant's Final Safety Analysis Report (FSAR).

3.0 EVALUATION

3.1 Iodine Removal from Containment Atmosphere

During the injection phase, the licensee proposes to operate the containment sprays with borated water without sodium hydroxide additive. The pH of this water could be as low as 4. Using the information currently available on iodine removal and the guidance provided in Section 6.5.2 of the SRP, the licensee has demonstrated that this low value of pH would not affect removal rates of elemental and particulate iodine from the post-accident containment atmosphere. These rates are determined by the first-order removal coefficients which are independent of pH and are not affected, therefore, by elimination of the pH controlling additive. The same applies to the removal coefficient for particulate iodine which is controlled by the hydrodynamic characteristics of the sprays.

During the spray recirculation phase, water will come from the sump and will contain dissolved iodine removed from the containment atmosphere during the injection phase. In a radiation environment, this iodine could be revolatilized and released to the containment atmosphere if the Ph of the solution is acidic. In order to prevent this from happening, the pH of the sump solution should be kept above 7. The licensee proposes to control Ph by having between 9000 and 13440 pounds of hydrated trisodium phosphate (TSP) in the two baskets located in the sump. This TSP will dissolve as it comes in contact with the spray water and will buffer pH between 7.1 and 9. Based on Reference 1, the licensee assumed a dissolution rate of 0.7 lbm/ft^2-min. Since the new sump pH differs from the pH currently specified, there will be some difference in the amount of iodine removed from the containment atmosphere and in the resulting radiation doses. These doses were, therefore, revised by the licensee.

The iodine removal coefficients (λ) remained unchanged because removal rates for both elemental and particulate iodine are independent of pH and are not affected by the change of the pH control agent. The coefficients used by the licensee were found to be conservative, relative to the values determined by the methodology described in Section 6.5.2 of the SRP.

The change in the total amount of iodine removed from the containment atmosphere is due to a significant effect of pH on the amount of iodine dissolved in spray solution, before it becomes saturated. Saturation concentration of iodine is determined by equilibrium between its concentrations in the containment atmosphere and the sump water. This equilibrium is determined by a partition coefficient (H) for iodine between air and water which decreases with pH. It is expected, therefore, that the decontamination factor (DF), which is a measure of the amount of iodine removed from the containment atmosphere, will be decreased for lower values of pH.

Currently, sodium hydroxide will maintain sump pH at a value between 8.5 and 11. Using trisodium phosphate this value will change to between 7.1 to 9. This represents a marked difference and should be reflected in the decontamination factors used in dose calculations. The current value of DF used by the licensee for calculating offsite and control room radiation doses is DF=100 for both elemental and particulate iodine. For equipment qualification, the licensee used decontamination factors of DF=200 and DF=10000 for elemental and particulate iodine, respectively. In the submittal, a new value of DF=28.7 for elemental iodine was provided. This value is based on the partition coefficient of H=1100 which was calculated for lower pH using information from Reference 2. For particulate iodine, the licensee used a very conservative value of DF=50.

Another reason for maintaining an alkaline solution in the containment sump is to minimize corrosion of metallic surfaces. Chloride induced stress corrosion cracking of austenitic stainless steel components is considerably reduced if pH of the solution to which the components are exposed is maintained above 7. Short exposure to low pH water during the injection phase will not cause significant stress corrosion cracking, but more extended exposure during the recirculation phase or in the sump may result in significant damage. Section 6.1.1 of the SRP (Branch Technical Position MTEB 6-1) recommends maintaining pH in a 7 to 9.5 range.

Control of the sump pH is also required to minimize hydrogen generation by corrosion of aluminum and zinc on galvanized surfaces and in the organic coatings on containment surfaces. The licensee has demonstrated that less corrosion of aluminum will occur and less hydrogen will be generated at an equilibrium sump pH of 7.1 than predicted by the current analysis which assumed a constant recirculation sump pH of 9.5. The generation of hydrogen due to the corrosion of zinc below 170 °F will increase with the lower pH values. However, this effect would be offset by a considerably smaller generation of hydrogen from the corroding aluminum surfaces.

Based on the above evaluation, the staff concludes that the modifications to the Callaway containment spray system, proposed by the licensee, meet the requirements of General Design Criterion (GDC) 41 for providing a satisfactory means of post-accident containment atmosphere cleanup. The staff further concludes that the proposed revised TSs for surveillance of trisodium phosphate in the containment sump meet the requirements of GDC-42 for inspection of containment atmosphere cleanup systems. Therefore, the staff review concludes that, relative to iodine removal, the licensee's proposed deletion of the sodium hydroxide containment spray additive system and addition of trisodium phosphate containment sump control system is acceptable.

3.2 Equipment Qualification

The staff also reviewed the replacement of the Containment Spray Additive System with the RFPC system with respect to environmental qualification of electric equipment. The licensee stated that post-accident airborne gamma doses increase slightly with the new system, but the margins available between the affected equipment's qualified test doses and the currently required doses are sufficient to accommodate these increases.

The proposed change was evaluated for the effects of radiation dose on environmental qualification of electric equipment. Radiation and chemical spray are part of environmental qualification. The changes in the containment spray system could affect post-accident radiation levels and pH of the spray fluid.

The licensee calculated accident radiation doses with the RFPC system in place. Airborne gamma doses inside containment were estimated to increase by 3%. Doses in penetration rooms were estimated to increase up to 8%. The licensee evaluated affected equipment and found that the margins available between the qualified test doses and the currently required doses are sufficient to accommodate these increases. The components that had the least margin for radiation dose were motor control centers located in electrical penetration rooms. There is margin available for the motor control centers, even with the new doses. The staff reviewed the radiation doses and agrees that there is adequate margin for environmental qualification.

The current design of the Containment Spray Additive System raises pH of containment spray to high levels (9.3 to 11.0) during the injection phase. With the new RFPC system, the initial pH of the spray fluid is between 4.0 and 7.0 during the injection phase of containment spray operation. The passive RFPC system will maintain the containment recirculation sump water equilibrium pH above 7.0. The equilibrium spray pH during the recirculation phase will be a minimum of 7.1 and a maximum of 9.0 with the new pH control system. Since the resulting pH level will be closer to neutral, post-LOCA corrosion of containment components will not be increased. The staff reviewed the change in containment spray pH and agrees that environmental qualification will not be affected.

The proposed change of the Containment Spray System affects radiation doses and chemical spray composition for environmental qualification of electric equipment. The new radiation doses do not exceed the qualified doses for electric equipment. The change in pH of the spray will not affect environmental qualification of equipment. The staff has determined that deletion of the Containment Spray Additive System and replacement with the passive RFPC system will not affect the qualification of electric equipment. Therefore, the staff concludes that the licensee's proposal is acceptable relative to equipment qualification.

3.3 Offsite and Control Room Dose Calculations

The licensee assessed the impact of the elimination of the spray additive system on iodine removal during a LOCA. The licensee determined that iodine removal during the injection phase can still be effectively performed by boric acid sprays without using NaOH as an additive and that long-term iodine retention in the sumps is assured as long as the equilibrium sump pH level is maintained above 7.0. In the licensee's prior offsite and control room operator dose calculations, spray removal rate constants of 10/hr and 0.45/hr were utilized for the elemental and particulate forms of iodine, respectively. The licensee assumed in their prior calculations that the spray removal constants were effective until a DF of 100 was obtained for both chemical forms of iodine.

For this amendment request, the licensee assessed the impact of the removal of the spray additive system on the elemental and particulate spray removal constants and on the DFs for the two forms of iodine. In the licensee's analysis to support the removal of the spray additive system, they determined that a larger elemental spray removal constant could be assigned, but chose to continue with the value of 10/hr in their calculations. In their revised analysis, the licensee determined that effectiveness of the elemental iodine spray removal constant would only continue until a DF of 28.7 was obtained. For the particulate form of iodine, the licensee assumed no change in the spray removal constant, but removal was only considered to continue until a DF of 50 was obtained.

In the licensee's prior assessment of the control room operator's thyroid dose evaluation, they assumed a charcoal adsorber efficiency of 90% for the elemental and organic forms of iodine. In the licensee's current assessment to support this amendment request, an adsorber efficiency of 95% was assumed.

The licensee calculated the thyroid dose resulting from a postulated LOCA. Doses were evaluated for the control room operators and individuals located at the exclusion area boundary (EAB) and low population zone (LPZ). At Callaway, the potential sources of releases in the event of a LOCA are containment leakage, emergency core cooling system (ECCS) recirculation loop leakage, and leakage from the recirculation of containment sump liquid past ECCS isolation valves to the RWST.

Containment sources were assumed to be reduced by the sprays. Leakage was assumed to occur to the environment unfiltered during the duration of the accident, and was assumed to be ground level.

ECCS recirculation loop leakage was assumed to be released to the auxiliary building with no credit for holdup, but with credit for filtration by the emergency exhaust system high efficiency particulate air (HEPA) filter and charcoal adsorber system. The release would be exhausted through the unit vent, which is located atop containment. The licensee assumed that the χ/Q value for the unit vent was different from the χ/Q values utilized for the containment releases. The licensee considered these two release locations to be different, because they considered the unit vent to be an elevated release point.

In the licensee's analysis of the leakage back to the RWST, they assumed the volume of the release from the RWST was at the same rate at which the liquid volume was discharged into the tank. Thus, the licensee did not assume a changing air volume in the tank based upon 3 gallons of liquid entering the tank each minute, and a certain portion of the activity in the liquid becoming airborne in the RWST air volume. Instead, the licensee assumed that for the leakage to the RWST, 10% of the iodine activity became airborne, was mixed in the RWST air volume and then vented directly to the environment. The release from the RWST vent was assumed to occur at ground-level. Therefore, the containment χ/Q values were assumed to be applicable for the RWST release.

The staff has assessed the radiological impact resulting from the elimination of the spray additive system for iodine. The staff performed an independent assessment of the control room operator thyroid dose and the EAB and LPZ thyroid doses resulting from a LOCA. The assumptions utilized by the staff are presented in Table 1. The thyroid doses calculated by the staff are presented in Table 2. As shown in Table 2, the thyroid doses at the EAB and LPZ were found acceptable, but the control room operator dose exceeded the limits of GDC-19.

As noted in Table 1, the staff assumed adsorber efficiencies of 90% for the charcoal in both the control room pressurization and filtration systems. This was consistent with the value assumed by the licensee in previous analyses. The staff assessed crediting the adsorber with an efficiency of 95%, but could not justify such an efficiency. The basis for not providing such credit is discussed below. Had the staff credited the control room systems' adsorbers with an efficiency of 95%, the control room operator thyroid doses would have met GDC-19.

The staff's review resulted in the determination that there were certain positions and assumptions made by the licensee which the staff found unacceptable. One such example was the licensee's assumption that the unit vent is an elevated release. As noted in Regulatory Guide 1.145, a stack release is one in which the release point is at a level that is at least 2.5 times higher than the height of adjacent solid structures. That is not the case with the unit vent. Its discharge point is only a few feet above the dome of the containment. Therefore, since ECCS leakage is discharged from the unit vent, a ground-level χ/Q should be assumed. Therefore, the staff can not concur with the licensee's assumption on the χ/Q for the unit vent.

Another area where the staff could not accept one of the licensee's assumptions involved the increase in control room pressurization and filtration systems' efficiency for the charcoal adsorber. The staff concluded that increasing the adsorber efficiency from 90% to 95% was unwarranted based upon the following:

1. The existing testing protocol and test conditions for the laboratory test of the charcoal are inappropriate and overestimate the actual capability of the charcoal.

2. The residence time associated with the control room filtration system is less than 0.25 seconds at certain allowed TS flow rates.

The existing TSs have the laboratory test for the control room charcoal utilizing the RDT 16-1T-1973 military standard as the test protocol with the test conducted at a temperature of 80 °C and a relative humidity of 70%. The staff has concluded that the performance of the laboratory tests at those test conditions and with that test protocol would not ensure that the charcoal would perform at an efficiency of 95%. In NRC Information Notice (IN) 86-76, the staff identified problems with licensees performing laboratory tests of charcoal at test conditions which are not representative of the most limiting condition that might be expected in the event of an accident. IN 87-32 specifically identified problems associated with the testing protocol. IN 87-32 concluded that utilization of the protocol scheduled to be published in the next revision of American Society for Testing and Materials (ASTM) D3803 (this became the 1989 revision), was the most appropriate test protocol. Therefore, since the licensee does not have laboratory test conditions appropriate for the control room and does not have an appropriate test protocol, the staff concluded that it was inappropriate to credit the control room charcoal adsorbers with an adsorber efficiency of 95% with the existing TS in place. In addition, when the staff performed a review of the existing TSs as to the appropriateness of increasing the credit for the efficiency of the control room charcoal adsorbers from 90% to 95%, the staff determined that there existed a question as to the adequacy of the charcoal's residence time, i.e., 0.25 seconds. In the current TSs, the allowable flow for the control room filtration unit is 2000 cfm +700/-200 and is 500 cfm +500/-50 for the control room pressurization system. The licensee indicated that the design flow rate for the control room filtration unit was 3000 cfm, while that for the pressurization system was 1000 cfm. The staff evaluated this information and information presented in the Callaway FSAR. Based upon the control room filtration system, fan capacity and the quantity of charcoal in the filtration systems relative to that of the pressurization system, the staff concluded that the design basis flow for the control room filtration unit is 2000 cfm. With that as a design flow rate, the staff concluded that the licensee would be unable to meet the 0.25 residence time commitment in the FSAR at a TS flow rate greater than 2200 cfm. This was a second reason for not increasing the adsorber efficiency from 90% to 95%.

The staff discussed interim compensatory measures with the licensee. In a letter dated March 14, 1995, the licensee committed to change the laboratory tests of the control room charcoal performed at a temperature of 30 °C and at a relative humidity of 70% for the control room filtration charcoal and for the control room pressurization charcoal. The ASTM D3803-1989 test protocol would be utilized for such tests. In a subsequent letter dated March 28, 1995, the licensee modified the allowable flow rate to ensure that the control room filtration system has a residence time of at least 0.25 seconds. Since these changes cannot be incorporated into TS prior to the issuance of this amendment, the licensee has committed to interim compensatory measures pending the staff's processing the amendment request on the laboratory testing conditions and protocol and the control room filtration system flow rate. With these actions, the staff credits a removal efficiency of 95% for the control room systems' charcoal, and the control room operator's thyroid dose will meet the limit of GDC-19. Therefore, the staff concludes that the licensee's proposal is acceptable relative to the offsite and control room dose calculations, based upon the licensee's interim compensatory measures to administratively implement the following until the additional test protocol and control room filtration flow rate TS change is processed:

1. Perform the laboratory tests of the control room charcoal at a temperature of 30 °C and at a relative humidity of 70%.

2. Perform the laboratory test of the control room charcoal in accordance with the protocol of ASTM D3803-1989.

3. Modify the allowable flow rate for the control room filtration system so that the maximum flowrate allowed will maintain a residence time of 0.25 seconds.

Other differences between the staff and the licensee's assumptions can be determined by comparing the information contained in Callaway FSAR Chapter 15, and their submittals in support of this amendment request with the information contained in Table 1. The most significant differences were noted above.

The staff has assessed the capability of the Callaway Plant to meet the thyroid dose limits of 10 CFR 100 and GDC-19 with the elimination of the spray additive system for iodine. As a result of this assessment and the licensee's commitment to the above-mentioned interim compensatory measures and subsequent TS changes, the staff has concluded that the thyroid doses would not exceed the dose guidelines presently contained in 10 CFR Part 100 or GDC-19 of 10 CFR Part 50, Appendix A for either offsite locations or control room operators. Therefore, the staff finds the proposed TS amendment request 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 and changes 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 (59 FR 49440). 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.

6.0 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.

7.0 REFERENCES

(1) WCAP-12477, "Spray Additive Elimination Analysis for the South Texas Project," December 1989.

(2) NUREG/CR-4697, "Chemistry and Transport of Iodine in Containment," October 1986.

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Table 1

Assumptions for LOCA Analysis

Core Thermal Power (MWt)	3636
<u>Activity Released to the Reactor Building</u>	
Airborne (fraction of core)	
Iodine	0.5
Iodine Plateout Factor	0.5
Iodine Species (fraction)	
Elemental	0.91
Particulate	0.05
Organic	0.04
Activity Released to Sump (fraction)	
Iodine	0.5
<u>Containment</u>	
Free Volume (ft^3)	2.5E6
Leakage Rate (%/day)	
0-24 hours	0.2
> 24 hours	0.1
Sump Liquid Volume (ft^3)	4.6E5
<u>Containment Cooling Unit</u>	
Flow Rate (cfm)	6.7E4
<u>Containment Spray System</u>	
Actuation Time (sec)	60
Spray Duration	
Elemental (hrs)	0.5
Particulate (hrs)	Duration of accident

Table 1 continued

Spray Removal Constants (/hr)	
Elemental	10
Particulate	0.45 until DF = 50 0.045 after DF = 50
Spray Removal DF	
Elemental	28.7
Particulate	no limit
Fraction of Containment Unsprayed	0.15
Recirculation Loop	
Leakage Rate (gpm)	2
Minimum Time till Recirculation (hr)	0.42
Fraction Iodine Airborne	0.1
Passive Component Failure Leak Rate (gpm) for 30 minutes @24 hours post-LOCA	0
ESF Filter Efficiency (%)	90
Sump Volume (gal)	460,000
RWST Leakage	
Leakage Rate (gpm)	3
Time Leak Begins (hr)	0.42
Fraction Iodine Airborne	0.1
ESF Filter Efficiency (%)	0
RWST Volume (gal)	400,000

Table 1 continued

Control Room	
Free Volume (ft^3)	1.50E5
Pressurization Air Filtration Rate (cfm)	450-1000
Unfiltered Air Infiltration Rate (cfm)	300
Control Room Filtration Rate (cfm)	450-675
Filtered Recirculation Flow (cfm)	1350-2025
Recirculation Efficiency (%) for all forms of Iodine	90
Occupancy Factors	
0-1 day	1.0
1-4 days	0.6
4-30 days	0.4
Atmospheric Dispersion Factors (sec/m^3)	
EAB	1.5E-4
LPZ	
0-8 hours	2.1E-5
8-24 hours	1.4E-5
1-4 days	5.9E-6
4-30 days	1.7E-6
Control Room	
0-8 hours	7.6E-4
8-24 hours	5.6E-4
1-4 days	2.5E-4
4- 30 days	1.2E-4

Table 1 continued

<u>Breathing Rates (m^3/sec)</u>

Offsite	
0-8 hours	3.47E-4
8-24 hours	1.75E-4
1-30 days	2.32E-4
Control Room	3.47E-4

Table 2

Thyroid Doses from Postulated LOCA (Rem)

Source	EAB	LPZ	Control Room
Containment Leakage	69	73	48
ECCS Leakage	15	37	5
Flow to RWST	.1	20	24
Total	84	130	77
Regulatory Limit	300	300	30