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

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

SUPPORTING AMENDMENT NO. 68 TO FACILITY OPERATING LICENSE NO. DPR-77

AND AMENDMENT NO. 60 TO FACILITY OPERATING LICENSE NO. DPR-79

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 AND 50-328

1.0 INTRODUCTION

By letter dated January 11, 1988, Tennessee Valley Authority (TVA) requested a change to the Sequoyah Nuclear Plant, Units 1 and 2 Technical Specifications (TS). The change would revise the TS surveillance requirement 4.7.7.e.3 for both units. The licensee has stated by telephone that, although the testing has shown that the required control room pressure can be maintained by an intake airflow of less than 200 cfm, the required intake airflow is so close to the existing TS maximum allowed value as to allow for little degradation of the control room during plant operation. The licensee stated that an intake of up to 1000 cfm will still keep exposures to control room operators to a fraction of the General Design Criteria (GDC) 19 limits of Appendix A to 10 CFR Part 50.

The proposed change revises surveillance requirement 4.7.7.e.3 (Units 1 and 2) to allow up to 1000 cubic feet per minute (cfm) intake of fresh air to the control room during emergency ventilation system (CREVS). The TS requirement now allows only up to 200 cfm.

2.0 DISCUSSION

During an accident, the control room is pressurized to prevent unfiltered air from seeping into the control room. The current filtered makeup flow into the control room is 200 cfm with 3800 cfm recirculation flow. During the current outage at Sequoyah, TVA has performed a significant amount of testing on the CREVS. These tests revealed that the control room needs approximately 190 cfm to maintain the minimum of 1/8 inch water guage required by TS 4.7.7.e.3 for both units. The proposed change revises surveillance requirement 4.7.7.e.3 (Units 1 and 2) to allow up to 1000 cubic feet/minute intake of filtered fresh air during operation of the CREVS.

3.0 EVALUATION

Recent special testing performed on CREVS identified several deficiencies and previously unidentified system interactions. One system interaction that was identified directly impacts the control room pressurization surveillance. This interaction existed between the normal control building pressurization fans and CREVS. The flow diagram for these systems is SQN Final Safety Analysis Report (FSAR) Figure 9.4.1-2. The logic diagram is FSAR Figure 9.4.1-3.

The system design called for the normal control building pressurization fan flow to be decreased from 8200 cfm to approximately 3000 cfm if a control room isolation (CRI) was initiated. The CRI also isolates flow control valves (FCVs) 31A-105A and 31A-106A. This isolation directed the normal pressurization flow to the suction of the electrical board room air handling units. These units in turn supplied outside air to the two lower floors (elevations [E.1] 669.0 and 685.0) of the control building.

A deficiency in this system that was discovered during the special testing was that the normal pressurization flow was not adequately reduced during a CRI. The failure of a nonsafety related controller for the fan blade pitch caused the inadequate flow reduction. The controller logic is shown on FSAR Figure 9.4.1-3. Because it was nonsafety related, the controller was not routinely calibrated or tested. The resulting high flow from the normal pressurization fans, and thus from the electrical board room air handling units, resulted in an abnormal pressurization of the lower two elevations of the control building. Normal leakage around doors and wall peretrations allowed air to pass through the stairwells and into the cable spreading room (EL. 706.0). This provided the potential for a pressurization of the cable spreading room and the stairwells that lead to the control room elevation. The pressurization of the cable spreading room and the stairwells would have masked the potential for outleal ge from the habitability zone and, if severe enough, would have resulted in unfiltered inleakage into the habitability zone. The potential radiological consequences for unfiltered inleakage are currently being assessed by the licensee.

As an interim measure, power has been removed from the normal pressurization fans, elimirating the potential for pressurization of the cable spreading room. The licensee is developing a permanent design fix because the controller involved has a poor performance history in this and other applications.

A system interaction that directly impacts the ability to satisfy SR 4.7.7.e.3 was also identified. This interaction involves the discharge duct of the spreading room supply fan. On a CRI signal, the spreading supply fan stops and flow control operators (FCOs) 31A-17 and 31A-102 isolate. As can be seen on FSAR figure 9.4.1-2, the recirculation suction duct for the control building emergency air cleanup fans ties into the spreading room supply fan duct. In this configuration, operation of CREVS induced a substantial differential pressure across FCOs 31A-17 and 31A-102. This caused a backflow of air from the spreading room, through the blade-type isolation dampers, through the idle spreading room supply fan, and into CREVS. This backflow would serve as additional makeup flow to CREVS, and until the recent testing, was not identified or quantified. This additional makeup flow is passed through the CREVS filter banks before reaching the control room.

To minimize the likelihood of drawing makeup air from the cable spreading room, the CREVS recirculation duct has been disconnected from spreading room supply fan duct, and now draws air from an independent point in the E1.732 mechanical equipment room.

The main control room has sufficient out leakage such that when CREVS is operated with 200 cfm intake of fresh air, it may not maintain control room pressure at a positive 1/8 inch water gauge, or the rest of EL.732 slightly positive, as described in FSAR section 9.4.1. If the control room habitability zone is not maintained at a sufficiently positive pressure, the potential exists for unfiltered contaminated air to leak into the control room habitability zone during an accident.

The licensee performed a calculation, numbered Division of Nuclear Engineering (DNE) Calculation SQNAPS3-082, to determine the effect on operator dose of increasing the ratio of fresh air to recirculated air processed by CREVS. The total calculated operator dose in the control room is composed of three parts. The first part is the dose from activity surrounding the control room habitability zone. This dose is independent of the fresh air flow in CREVS. Additionally, it contributes only to the whole body dose. The dose from the surrounding activity is 0.07 rem

The second contributing factor to control room operator dose is the result of traveling to and from the control room during the accident period (30 days). This dose is also independent of the fresh air makeup in CREVS. This dose contributes 0.06 rem whole body dose, 0.1 rem beta dose, and 1.0 rem inhalation (thyroid) dose.

The third contributing factor to the control room operator dose is from the activity inside the control room habitability zone. The activity inside the control room is due to the contaminated fresh air that is processed by CREVS for pressurization of the control room and a defined amount of unfiltered inleakage.

The licensee's calculation shows that the whole body dose to the operator increases from 1.1 rem to 1.5 rem as the fresh air flow rate increases from 200 cfm to 1000 cfm. This is to be expected, since more contaminated air is being processed by CREVS, and ultimately delivered into the control room. The whole body dose is principally due to the noble gas activity, which is not affected by filtration or absorption. The beta dose, whis is also principally due to the noble gas activity, increases from 10.3 rem to 15.2 rem. The beta dose is essentially the skin dose, and would affect only uncovered parts of the operator's body. Finally, the inhalation dose decreases from 13.5 rem to 10.4 rem as the makeup flow increases. TVA explained that this is because of the relative dose contributions of the filtered and unfiltered air entering the control room. From measurements it has been determined that a pressurized duct carrying unfiltered air to CREVS equipment will leak at a rate of 51 cfm. This is unfiltered leakage into the control room habitability zone. The fresh air makeup flow used to pressurize the control room balances the outleakage from the control room; therefore, the greater the makeup flow rate, the shorter the residence time of the activity in the control room, and the smaller the buildup of activity. Because the ratio of filtered air to unfiltered inleakage increases as the makeup flow increases, there will be less total activity in the habitability zone, resulting in lower inhalation doses.

The NRC staff reviewed TVA's calculations and does not completely agree with the method as described in FSAR Section 15.5.3. Equation 2 should have contained an additional term to account for loss of one or more filtered radionuclide concentration by recirculation through the filter ($-RcK_2N/V$). Although inclusion of this term reduces the overall dose calculated, it shows an opposite trend than that calculated by the licensee. That is, the staff determined that increasing the intake flow increases the dose inside the control room including that from inhalation. The staff was able to verify TVA's calculations for inhalation doses from I-131 using the concentration model as described in FSAR Section 15.5.3 and agrees that operator doses will be below the GDC Criterion 19 exposure limits for makeup flows up to an including 1000 cfm.

The proposed change to the TS is also requested because the measured intake flowrate to the control room to meet the required positive 1/8 inch water guage pressure (about 190 cfm) is very close to the maximum allowed flow rate in the TS (i.e., 200 cfm). The licensee has stated that this does not allow for degradation of the control room during the lifetime of the plant. The tightness of the control room is determined by the amount of air needed to be drawn into the control room to maintain the required positive 1/8 inch pressure. The staff agrees that this tightness could degrade with time and the TS should allow for this degradation. Based on the proposed 1000 cfm intake resulting in only a fraction of the GDC exposure limits to the control room operators, the proposed 1000 cfm is acceptable to the staff.

Based on the above, the staff concludes that the proposed change to the TS is acceptable.

4.0 ENVIRONMENTAL CONSIDERATION

These amendments involve a change to 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 staff has determined that these amendments involve no significant increase in the amounts, and no signficant 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 these amendments involve no significant hazards consideration and there has been no public comment on such finding. Accordingly, these amendments meet 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 nor environmental assessment need be prepared in connection with the issuance of these amendments.

5.0 CONCLUSION

We have 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, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to the common defense and security nor to the health and safety of the public.

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Dated: February 17, 1988