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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 209 TO FACILITY OPERATING LICENSE NO. DPR-77

AND AMENDMENT NO. 199 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 application dated June 29, 1995, the Tennessee Valley Authority (the licensee) proposed an amendment to the Technical Specifications (TS) for Sequoyah Nuclear Plant (SQN) Units 1 and 2. The requested changes would revise TS 3.9.4, Containment Building Penetrations, to allow the containment personnel airlock (PAL) doors to be open during core alterations and irradiated fuel movement within the containment provided one door in each airlock is capable of closure and one train of auxiliary building gas treatment (ABGTS) remains operable.

In addition, the licensee proposed changing Surveillance Requirement (SR) 4.9.4 to (1) replace the requirement that the containment building penetrations be in their "closed/isolated" condition with the requirement that they be in their "required" condition to reflect the new status of the airlock doors, and (2) remove the requirement to perform the containment building penetration surveillance within 100 hours prior to the start of core alterations and irradiated fuel movement in the containment building. Also, a proposed change to the Bases would add related information.

2.0 SYSTEM DESCRIPTIONS

2.1 Containment

The Containment for each unit consists of a freestanding, welded steel containment vessel and a separate reinforced concrete Reactor Building (also known as the Shield Building). The reactor building is similar in shape to, and surrounds, the containment vessel. An annulus, approximately 4 feet wide, is formed between the two structures. The shield building is designed to be leak tight and is maintained at a negative pressure.

The secondary containment is formed by the Shield Building and the Auxiliary Building. The Auxiliary Building is common to both units and is attached to the reactor buildings and the common control room building. It encloses all equipment in the building that may handle, collect or store radioactive materials during normal operation or accidents. It is virtually leak tight and serves as the containment barrier for irradiated fuel accidents, radioactive spills or leaks, and any leakage that may bypass the shield building annulus into the auxiliary building.

The containment serves to contain fission product radioactivity that may be released from the reactor coolant system following an accident, such that offsite radiation exposures are maintained well within the requirements of 10 CFR 100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following an accident.

All normally used entrances and exits between the auxiliary building and the containment for both equipment and personnel are through two airlocks that are part of the containment boundary. The two airlocks provide a means of passage into the containment from the auxiliary building, one at the upper level and one at the lower level of the containment. Each airlock has a PAL door at each end that are interlocked with each other to prevent simultaneous opening when containment closure is required. During periods of unit shutdown when containment closure is not required, such as refueling outages, the door interlock mechanism may be disabled, allowing both PAL doors to remain open for extended periods for frequent containment entry and for routing of cables and hoses through the passageway.

2.2 Ventilation Systems

The primary and secondary containments are provided with ventilation and fission product cleanup systems. The proper operation (or isolation) of these systems is important for fission product control during a design basis accident. If airlock doors are permitted to be open during the initial stages of a FHA, proper operation of these systems is necessary to assure that offsite release of unfiltered ventilation effluent is mimimized. Because of the fission product control role of these systems, and their effect on radiological consequences, descriptions of them are provided below.

The Reactor Building Purge Ventilation System (RBPVS) is designed to maintain the environment in the primary and secondary containment within acceptable limits for equipment operation and for personnel access during inspection, testing, maintenance, and refueling operations, and to limit the release of radioactivity to the environment. The system is used as necessary during power operation or when shutdown or refueling. Two 50 percent capacity supply fans take air from the auxiliary building air supply system to the containments and can be used to purge the annulus. The fans and the primary containment purge isolation valves will automatically shutdown upon receipt of a containment isolation signal. Primary containment exhaust radiation monitors will automatically isolate the purge system should radioactivity be detected. No fuel handling or movement inside the primary containment is allowed unless the radiation monitors and isolation valves are operable or the containment is isolated.

The normal Auxiliary Building Ventilation System serves all areas of the auxiliary building, including the radwaste and fuel handling areas. The system includes four 50 percent capacity supply and exhaust fans, supply filters with a nominal efficiency of 85 percent, heating and cooling units, and isolation dampers. Exhaust air from the fuel handling area is discharged by one of two 100 percent capacity fans to the auxiliary building exhaust stack. The system is designed to form an air curtain across the spent fuel pool. Inlet dampers for each auxiliary building and fuel handling area fan modulate the air flow to maintain approximately 0.25 inches of water negative pressure in the auxiliary building. The fans trip and dampers isolate upon smoke detection, auxiliary building exhaust high radiation, fuel handling area high radiation, containment isolation signal, or high auxiliary building air intake high temperature.

An Emergency Gas Treatment System, consisting of an Annulus Vacuum Control Subsystem and the Air Cleanup System, is designed to keep the air pressure within each Shield Building annulus below atmospheric during normal operation. It is also designed to reduce the concentration of radioactive nuclides in the annulus air that is released to the environs during a loss of coolant accident, based on 10 CFR 100 guidelines.

The Annulus Vacuum Control Subsystem is designed to establish and maintain approximately 5 inches of water negative pressure within the annular space between the two containment structures. The system is operating anytime containment integrity is required and isolates when containment isolation is required. Any air leakage will be from the auxiliary building into the shield building. It is not required to be operable during shutdown/refueling.

The Air Cleanup Subsystem consists of two independent air cleanup units that include fans, heaters, demister, prefilter, HEPA filters, and carbon adsorbers. The subsystem is designed to keep the secondary containment annulus air volume below atmospheric pressure (0.5 inches of water) and to remove airborne particulates and vapor from air drawn from the annulus following a loss of coolant accident. It discharges air to the emergency gas treatment air system and routes treated air back to the annulus. A fan will start automatically on low flow from the operating fan if a Phase A containment isolation signal is present. Both trains will be started by a Phase A containment isolation signal from either reactor unit, manually from the control room.

The Auxiliary Building Gas Treatment System (ABGTS) consists of two independent, full-capacity, trains that include a prefilter, HEPA filter, and a carbon filter. They draw air from all parts of the auxiliary building to maintain a negative pressure (0.25 inches relative to the outside environment) within the portion of the Auxiliary Building that serves as a secondary containment during accidents. As a result, virtually no unprocessed air passes from the secondary containment enclosure to the atmosphere. The system provides filtration of the secondary containment and auxiliary building atmosphere to mitigate the effects of a fuel handling accident (FHA) occurring in the spent fuel pit (which is common to both units). It would also serve to filter any airborne contamination that might originate in the containment and migrate through the airlocks when the PAL doors are open. One train is required to be operable during fuel handling, two during power operation.

The ABGTS fans operate in one of two modes - both running simultaneously or one in operation and the other in standby. The fan in standby will start upon failure of the operating fan if a Phase A containment isolation signal is present. If the Phase A signal is not present, the standby fan will only start on low flow by manual operation. The Phase A signal is generated by either unit to isolate all non-essential lines on receipt of a safety injection signal, high radiation from the fuel handling area radiation monitors, high radiation from the auxiliary building radiation monitors, or high auxiliary building air intake temperature. Power for both trains is supplied by the emergency power system. Tests have confirmed that a negative pressure of 0.25 inches of water can be obtained in less than one minute of operation of the ABGTS.

The containment and spent fuel pool radiation monitors are TS instruments consisting of redundant safety circuitry. The auxiliary building vent monitor is safety related, but is not redundant. Therefore, Abnormal Operating Instruction (AOI) 29, Dropped or Damaged Fuel Assembly or Loss of Reactor Cavity Water, will be revised to assure closure of the PAL door as an immediate operation in the event of an auxiliary building isolation.

3.0 EVALUATION

To determine the acceptability of the licensee's proposal to permit airlocks to be open to the auxiliary building during core refueling, the staff reviewed the possible effects on the potential changes in fission product transport and the radiological consequences of a FHA in the containment.

Containment isolation during core alterations and movement of irradiated fuel is designed to limit offsite radioactive releases should a postulated fuel handling accident (FHA) occur. However, outage related work is performed in the containment during core alterations and when irradiated fuel is being moved. To satisfy both conditions requires the PAL door to be opened and closed as personnel enter and exit the containment. The proposed TS change would allow both PAL doors to remain open during core alterations and movement of irradiated fuel, which would reduce door wear and increase their reliability. In addition, radiation exposure to personnel working inside the containment would be reduced since the containment could be exited more readily once work is completed or should an emergency situation develop.

Another purpose of keeping the PAL doors open would be to allow cables or hoses to pass through the airlock and PAL doors, provided quick-disconnects are supplied. Thus, performance of outage-related containment work could be handled more efficiently. Quick-disconnects would be used to ensure the cables and hoses could be removed quickly in the event immediate containment closure became necessary.

The basis for not allowing simultaneous opening of both airlock doors during core alterations and movement of irradiated fuel, according to Section 15.7.4 of the Standard Review Plan, is to limit fission product leakage to the environs in the event of a FHA. If fuel handling is prohibited when the containment is open, radiological consequences need not be considered. If the containment will be open during fuel handling operations, automatic isolation by radiation detection instrumentation must be provided for the open penetrations and calculations must demonstrate acceptable consequences. However, automatic isolation of airlock doors is not practicable. Therefore, airlock integrity must be maintained during fuel handling in the containment.

However, the design of the SQN containment is such that even though the primary and secondary containments are connected together when the PAL doors are open, the normal auxiliary building ventilation system and ABGTS continue to provide the same FHA mitigation capability. With the PAL doors open, the consequences of a FHA in the containment will be mitigated by the design of the ventilation systems (maintenance of a negative pressure during normal and applicable abnormal conditions, automatic isolation on high radiation in the auxiliary building, and automatic startup of emergency ventilation systems) and the leak-tight design of the auxiliary building.

In the submittal, the licensee indicated that the secondary containment design can provide filtration coverage with one unit's containment open. Therefore, the consequences of a FHA will be no different with the doors open or with the doors shut, and the offsite dose analysis described in the SQN Updated Final Safety Analysis Report Section 15.5.6, Environmental Consequences of a Postulated Fuel Handling Accident and the original staff Safety Evaluation Report Section 15.4.2, Fuel Handling Accident, remain valid and applicable. Therefore, no new offsite dose analysis is needed to demonstrate compliance with the acceptance criteria.

In addition, TS 3.9.12, Auxiliary Building Gas Treatment System, requires one train of this system to be operable for Modes 1 through 4. Since both units will typically not be in a refueling outage at the same time, both trains of ABGTS will normally be operable to comply with the TS for the operating plant. Also, to ensure that at least one train is operable when the PAL doors are open, the proposed TS change would incorporate the requirement that at least one ABGTS be operable.

The licensee has established programmatic controls to ensure that postaccident doses are minimized in the event of a FHA. Also, administrative guidelines would be established to describe the responsibilities and appropriate actions of the designated individual, in the event of an FHA with the PAL doors open. However, the number of lines and hoses that run through the PAL doorway(s) should be minimized to ensure timely closing of a PAL door. The licensee should also ensure that these lines and hoses do not serve any personnel or equipment safety function that would be jeopardized if the service is interrupted. The administrative guidelines should clearly identify the method and responsibility for disconnecting these lines, and provisions for venting or draining if necessary. The quick disconnects must be located near the PAL doorway(s) to allow timely closure of the PAL doors.

4.0 ACCEPTABILITY

As shown above, the design of the various ventilation and containment systems cause no change in the validity and applicability of the original fission product transport assessment or the radiological consequences of an FHA with the PAL doors open. Therefore, SQN will continue to meet the applicable acceptance criteria, which ensures that the health and safety of the public is protected. Consequently, the staff finds the proposed changes acceptable.

The licensee also proposed changing the wording of SR 4.9.4 from "closed/isolated" to "required." This change is necessary in order to facilitate the changes described above to the PAL doors, to recognize that the difference exists. In addition, the new wording is consistent with NUREG-1431. Therefore, the staff finds the proposed change acceptable.

The licensee also proposed deleting from SR 4.9.4, the requirement to perform the containment ventilation isolation valve surveillance test within 100 hours prior to the start of core alterations or movement of irradiated fuel within the containment. The requirement to perform the test once per 7 days during core alterations or movement of irradiated fuel in the containment building would be retained. The staff finds this change acceptable since it is redundant to the normal requirement to perform the SR before entering the applicability of the Limiting Condition for Operation (i.e., prior to core alterations or movement of irradiated fuel within the containment). In addition, the proposed change is consistent with NUREG-1431.

5.0 STATE CONSULTATION

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

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (60 FR 37100). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

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

Principal Contributor: David E. LaBarge

Dated: September 6, 1995

cc:
Mr. O. J. Zeringue, Sr. Vice President
Nuclear Operations
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Dr. Mark O. Medford, Vice President
Engineering & Technical Services
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. D. E. Nunn, Vice President
New Plant Completion
Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Site Vice President
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

General Counsel
Tennessee Valley Authority
ET 11H
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. P. P. Carier, Manager
Corporate Licensing
Tennessee Valley Authority
4G Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Ralph H. Shell
Site Licensing Manager
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

TVA Representative
Tennessee Valley Authority
11921 Rockville Pike
Suite 402
Rockville, MD 20852

Regional Administrator
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW., Suite 2900
Atlanta, GA 30323

Mr. William E. Holland
Senior Resident Inspector
Sequoyah Nuclear Plant
U.S. Nuclear Regulatory Commission
2600 Igou Ferry Road
Soddy Daisy, TN 37379

Mr. Michael H. Mobley, Director
Division of Radiological Health
3rd Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

County Judge
Hamilton County Courthouse
Chattanooga, TN 37402-2801