Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

August 8, 2003

10 CFR 50.54(f)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20005-0001

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2, 60-DAY RESPONSE TO NRC BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

Reference: NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated June 9, 2003

This letter provides TVA's 60-day response to the subject bulletin for SQN. As stated in the bulletin, all licensees are requested to provide a response to either: (1) state that the emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions have been analyzed with respect to the potentially adverse post-accident debris blockage effects identified in the NRC Bulletin are in compliance with 10 CFR 50.46(b)(5) and all existing applicable regulatory requirements (Option 1), or (2) describe any interim compensatory measures that have been or will be implemented to reduce the risk, which may be associated with the potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance has been completed (Option 2).

Enclosure 1 of this letter contains the SQN response for Option 2 of the subject bulletin. Enclosure 2 contains the list of TVA commitments.

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This letter is being sent in accordance with NRC RIS 2001-05. If you have any questions regarding this response, please J. D. Smith at (423) 843-6672 or Pedro Salas at (423) 843-7170.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 8th day of August, 2003.

Sincerely,

James D. Smith
Sequoyah Licensing Supervisor

Enclosures
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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2

RESPONSE TO NRC BULLETIN 2003-01

This enclosure contains the SQN 60-day response to requested information for Option 2 in the subject bulletin.

NRC REQUEST

*Option 2: **Describe any interim compensatory measures that have been implemented or that will be implemented to reduce the risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete. If any of the interim compensatory measures listed in the Discussion section will not be implemented, provide a justification. Additionally, for any planned interim measures that will not be in place prior to your response to this bulletin, submit an implementation schedule and provide the basis for concluding that their implementation is not practical until a later date.***

TVA RESPONSE

Background

In response to NRC Bulletin 2003-01, SQN is addressing the requested information specified in Option 2. The following discussion provides background information to aid in understanding the actions and approach TVA is taking for SQN.

TVA recognized the potential for sump blockage in the design of SQN and included a number of features in the original plant design to reduce the potential for screen blockage. The potential for sump blockage due to coatings failures was addressed during the plant restart efforts in the mid-1980s. Further, TVA has been a participant in the Nuclear Energy Institute (NEI) Sump Task Force since its inception. SQN has taken actions in response to the information that has been available through TVA's participation in the NEI Task Force that are included in the bulletin as compensatory actions.

The bulletin discusses several technical issues. These include the fibrous material matting on the screens, 50% blockage assumption and associated structural adequacy of the screens, flow path choke points, and potential blockage of paths downstream of the screens. TVA has long recognized that fibrous materials in containment could be a source of sump blockage. As such, decisions were made in SQN's original design and through the years to prevent the use of fibrous materials inside containment unless an engineering evaluation was performed and concluded that the material could not reach the sump due to loss of coolant accident (LOCA) break dynamic effects, seismic dislodgement, or spray wash-down. Reflective metallic stainless steel insulation (RMI) is used on the reactor coolant system (RCS) and other insulated piping that could be affected by jet impingement or pipe whip from breaks in the RCS. Fire retardant material is not used inside the primary containment. Fibrous heating, ventilating, and air-conditioning filters are not used in the SQN containment except during refueling outages. Some non-metallic insulation has been used in the ice condenser and on glycol piping associated with the ice condenser cooling piping. This usage was evaluated in the design basis of the plant and it was determined that this insulation was not in locations where it would be damaged by high energy pipe breaks and be a potential source of debris that could reach the sump screens. Other than latent dust fibers and one exception on SQN Unit 2 regarding NUKON fiberglass insulation, there is no fibrous material in the SQN primary containment that could be transported to the sump screens. Regarding the NUKON insulation, a small section of NUKON insulation is present on the Unit 2 pressurizer piping near the safety valves. The NUKON insulation will be replaced with RMI in the fall 2003 refueling outage.

As an ice condenser plant, SQN is compartmentalized inside containment and the upper compartment and most areas outside the crane wall do not see direct effects from high-energy line breaks. These areas do not contribute to the break generated debris source. The upper compartment does experience spray flow and some latent debris could be washed into the sump, but there is no dislodged debris to be washed into the sump.

Similarly, most areas outside the crane wall drain to an inactive sump. Water in the inactive sump does not communicate with the active sump where the sump screens are located. Thus, debris in these areas is not a potential source for sump blockage. Temporary shielding material used during outages is stored in the area outside the crane wall. Therefore, they do not represent a potential source for sump blockage.

The emergency core cooling system (ECCS) and containment spray system (CSS) suction piping is located approximately 12 feet below the containment floor elevation. The water level in the lower compartment will reach 13 feet above the floor elevation resulting in a total water level above the suction piping of approximately 25 feet.

A debris transport analysis was performed for the SQN sump. As part of this evaluation, it was determined that adequate net positive suction head (NPSH) is available even with screen blockages as high as 90 percent. The potential for small debris passing through the sump screens has been considered. The containment spray nozzles are larger than the sump screen mesh opening. There are no restrictions in the injection path that are smaller than the screen mesh openings. Potential debris ingestion by the ECCS and containment spray pumps (CSP) was evaluated by Westinghouse Electric Company. It was determined that ingestion is not a concern. Debris either is passed through or is chopped up by the impellers. Any small high-density particles such as metal, settles out at the bottom of the sump or in the bottom of the reactor vessel. In a parametric evaluation of pressurized water reactor recirculation sump performance (NUREG/CR-6762, "GSI-191 Technical Assessment: Parametric Evaluations for Pressurized Water Reactor Recirculation Sump Performance"), SQN was categorized as not likely or very unlikely to experience sump blockage for any of the LOCAs. It is recognized that these categorizations were based on a review of plant parameters and not a plant specific analysis, but the report does recognize that steps were taken in the design of SQN that reduce the likelihood of the sump screen blockage.

Other design and administrative considerations that reduce or eliminate debris sources are discussed in the following responses that address each of the six possible compensatory measures described in the subject bulletin.

1. Operator training on indications of and responses to sump blockage

   As discussed in Item 2 below, a new plant emergency procedure was developed and a revision was made to the radiological emergency procedure that provides guidance to the technical staff manning the Technical Support Center (TSC) at the site and TVA's Central Emergency Command Center (CECC). The procedure revisions relate to the potential for sump screen blockage.

Classroom training on containment sump blockage was conducted for licensed operators during re-qualification training (summer 2003). This training covered the following topics:

- mechanism for sump blockage
- available indications
- actions in response to sump blockage
- associated emergency operating instruction (EOI) revisions.

Similar training was conducted for plant personnel who are designated responders to the site TSC during an emergency Radiological Emergency Procedure EPIP-6, "Activation and Operation of the Technical Support Center," was also revised to add information regarding sump blockage including indications and recommendations for responding to blockage.

2. Procedure modifications, if appropriate, that would delay the switchover to containment sump recirculation

A new plant emergency procedure, EA-63-8, "Monitoring for Containment Sump Blockage," was issued to address the potential for blockage of the emergency sump. This procedure is initiated from ES-1.3, "Transfer to RHR Containment Sump," after the manual realignment for sump recirculation is complete. This procedure directs recording a set of baseline data on ECCS and CSS pump parameters for use in evaluating subsequent changes, which may indicate the onset of sump blockage. If changes in monitored parameters indicate potential sump blockage, the operating crew is directed to request assistance from the plant engineering staff in the TSC. If continued changes indicate a degrading trend, operators are directed to evaluate stopping one train of CSS and ECCS pumps (if both trains are running). If ECCS or CSP suction is lost, a new step in ES-1.3 directs transitioning to ECA-1.1, "Loss of RHR Sump Recirculation."

The guidance provided to the TSC and CECC personnel raises the awareness of the potential for sump blockage and the steps that can be taken if blockage appears to be occurring. The revised procedure provides guidance on evaluating CSS and ECCS flow reductions, if necessary, to reduce the effects of sump clogging, evaluating refueling water storage tank (RWST) refill, and evaluating the need to perform ECA-1.1.

Based on the above, TVA does not consider additional preemptive actions to be warranted at this time. This position is based on the following considerations:

Requiring operators to take preemptive actions during large break LOCAs is a major change in the philosophy used in the development of the Emergency Operating Procedures. For large pipe breaks or plant events where the progression of the event is difficult to determine, reducing ECCS flow as a preemptive measure is not considered prudent or appropriate. Such a change would require a significant modification to the plant licensing and design basis. The likelihood of sump blockage at SQN is considered to be low, given the actions taken to assure containment cleanliness and the lack of known fibrous material to support the formation of a fine filter bed on the sump screens.

For the small break LOCAs, any preemptive actions during an accident would also be contrary to SQN's current design basis and emergency operating procedures. Additional licensing review is required to support a change to SQN's design basis and emergency operating procedures. Accordingly, TVA will perform a licensing evaluation to consider pre-emptive actions that delay or reduce containment spray flow during a loss of coolant accident. A licensing evaluation will be completed by December 15, 2003.

3. Ensuring that alternative water sources are available to refill the RWST or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere

Guidance currently exists in ECA-1.1 to initiate RWST refill once it has been determined that loss of safety injection recirculation capability exists. This procedure initiates EA-63-2, "Refilling the RWST," which provides detailed plant-specific actions for refilling the RWST using the chemical volume control system blender. This action may also be initiated by the TSC staff, if manned.

If the RWST is empty and ECCS pumps must be stopped due to loss of suction, ECA-1.1 currently provides direction to initiate RCS makeup via an alternate source (normal charging with centrifugal charging pump suction aligned to volume control tank).

TVA also notes that, generally, sump blockage is more likely for large breaks than for small breaks due to the larger amount of debris generated and the shorter times for initiation of recirculation from the sump. However, large

breaks result in large amounts of ice melt very early in the event. The ice melt water, plus the water in the RWST, floods both the lower compartment and the reactor cavity up to the hot and cold leg nozzles on the reactor vessel. This water level provides for reactor-vessel cooling and, if sump recirculation is lost for any reason, evaluations associated with risk assessments show that the core will remain within the reactor vessel even if core damage occurs. Thus, no additional actions are warranted until the new transport analyses are completed.

4. More aggressive containment cleaning and increased foreign material control

SQN has formal programs for inspecting and cleaning areas inside containment. TVA considers these programs and the actions taken to date satisfy the interim compensatory actions requested in the subject bulletin. TVA's programmatic elements at SQN are discussed below (listed by procedure number and title).

0-SI-OPS-000-187.0, "Containment Inspection"

This surveillance instruction was recently revised for use during SQN's Unit 1 Cycle 12 (U1C12) refueling outage to implement the guidance in NEI 02-01. The instruction provides guidelines and criteria for containment inspections at the end of a refueling/forced outage prior to Mode 4 entry. It also includes acceptance criteria for housekeeping/cleanliness to ensure no loose debris is left in containment and for storage of materials inside containment during Mode 4 and higher. Debris identified during the inspection is cleaned up at the time it is discovered during the walkdown for final cleanliness prior to restart. Cleaning during the last outage on both units included sweeping, vacuuming, and pressure washing. When the plant is in Modes 1 through 4, any material taken into containment is logged in and out to provide assurance that loose materials are not left in containment during the operation cycle.

0-SI-OPS-000-011.0, "Containment Access Control During Modes 1-4"

This surveillance instruction provides guidelines and criteria for maintaining housekeeping/cleanliness during plant operation (i.e., Modes 1-4). This instruction controls entry and exit of containment to ensure no loose debris (rags, trash, clothing, flaked paint, tools, etc.) is present inside containment.

0-TI-DXX-000-010.0, "Protective Coating Program for Coatings Service Level I and II and Corrosive Environment Applications"

Appendix A of this procedure provides instructions for planned preventive maintenance and coatings inspections. Appendix B of the procedure provides instruction for maintenance of the unqualified protective coating inventory. Appendix A is performed in conjunction with surveillance instructions each outage, and Appendix B provides programmatic requirements for maintenance of the unqualified protective coating inventory. The inspections include general containment spaces and the "Radius of Influence" which is the space around and above the containment sump as defined in WCAP-11534 (i.e., the distance from the sump beyond which debris will settle out to the floor area and not be transported through the pool to the sump).

A coating inspection was performed during the U1C12 refueling outage. No coating degradation was identified during the U1C12 inspections in areas where failed coatings have potential to adversely impact operability of the containment sump. In accordance with the technical instruction (TI) procedure, TVA is conducting a similar inspection of Unit 2 in the upcoming U2C12 refueling outage.

0-TI-SXX-061-001.0, "Ice Condenser Loose Debris Listing"

This procedure is performed every refueling outage to log debris that is left in the ice condenser system to ensure that this debris is evaluated to verify that it cannot adversely impact sump operation.

Experience from inspections described above over several outages supports the conclusion that the SQN containment is thoroughly cleaned and free of debris and dust prior to entering Mode 4 (or higher).

0-SI-MIN-061-107.0, "Ice Condenser Floor Drains"

This procedure is performed every refueling outage to verify operability of the ice condenser floor drains. There are 20 ice condenser floor drains which drain to the floor in lower containment. The performance of this instruction verifies the following:

a) The valve gate opening is not impaired by ice, frost, or debris,

b) The valve seat is not damaged

c) The valve gate opens when a force of less than or equal to 48 lbs is applied, and,

d) The drain line from the ice condenser floor to the containment lower compartment is unrestricted.

Walkdown Inspection of Unit 1

In addition to the above standard programs, and to assure containment cleanliness, a containment walkdown utilizing the guidelines of NEI 02-01 was conducted on Unit 1 during the U1C12 refueling outage (spring 2003) to assess debris sources to support resolution of GSI-191. A similar containment walkdown of Unit 2 will be conducted during the U2C12 refueling outage (fall 2003).

The quantity of identified miscellaneous sources of debris is relatively small and is spaced randomly through-out containment. Accordingly, only a small fraction could become credible dislodged debris from direct effects of LOCA blowdown forces. TVA is planning to evaluate or remove identified miscellaneous sources of debris in the next refueling outage for each unit.

5. Ensuring Containment Drainage Paths Are Unblocked

The emergency sump at SQN is located in the lower compartment of containment. There are no walls or opening in the lower compartment inside the polar crane wall that could serve as blockage points to prevent water from reaching the sump. The spray system discharges into the upper compartment of containment. The primary path to the sump is through drains that are located in the bottom of the refueling canal. A technical specification surveillance requirement is performed to assure that the drains are not blocked and is controlled by procedure (0-SI-OPS-000-020.0, "Containment Refueling Canal Drains"). The drains are required to be visually inspected every 92 days in accordance with this surveillance instruction.

There are two additional drainage paths available to supply water to the containment sump (area inside the polar crane wall). These paths are floor drains that are located in accumulator rooms 3 and 4. Both of these floor drains are protected by a screened enclosure. These drain paths are required by American Society of Mechanical Engineers code to be verified clear and free flowing once a "period," (i.e., every other refueling outage by the current procedure [0-SI-SXI-000-200.0]). In response to the bulletin, the inspection frequency will be increased to each refueling outage.

6. Ensuring Sump Screens Are Free of Adverse Gaps and Breaches

0-SI-SIN-063-009.0, "Containment Sump Inspection" is performed each outage to ensure that the containment sump pocket is free of debris and that the sump components (screens, trash racks, etc.) show no evidence of degradation. This inspection proves the operability of the containment sump and field condition of the sump hardware (screens, interior condition, etc.) prior to startup from each refueling outage. This inspection includes identification of any corrosion due to boric acid deposits and dissimilar metals from any metallic debris that may have entered the stainless steel lined sump though screen openings.

To date, experience from inspections performed during previous outages supports the conclusion that SQN's sump is clean, free of debris and is not degraded.

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2

60-DAY RESPONSE TO NRC BULLETIN 2003-01,
"POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

TVA COMMITMENTS

1) TVA will remove NUKON insulation on the Unit 2 pressurizer prior to startup from the Unit 2 Cycle 12 refueling outage (fall 2003).

2) TVA will conduct a walkdown of Unit 2 containment utilizing the guidelines in NEI 02-01 prior to startup from the Unit 2 Cycle 12 refueling outage (fall 2003).

3) TVA will revise 0-SI-SXI-000-200.0 to require inspection of drains in accumulator rooms 3 and 4 each refueling outage. This will be completed prior to startup from the Unit 2 Cycle 12 refueling outage.

4) TVA will perform a licensing evaluation to consider pre-emptive actions that delay or reduce containment spray flow during loss of coolant accident. A licensing evaluation will be completed by December 15, 2003.