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February 23, 2009

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

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

SEQUOYAH NUCLEAR PLANT (SQN) - UNITS 1 AND 2 - GENERIC LETTER 2004-02 - POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN-BASIS ACCIDENTS AT PRESSURIZED WATER REACTORS - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (TAC NOS. MC4717 AND MC4718)

References:

1. NRC letter to TVA dated November 25, 2008, "Sequoyah Nuclear Plant (SQN) Units 1 and 2 - Request For Additional Information Regarding (NRC) Generic Letter (GL) 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors (PWR) – (TAC Nos. MC4717, MC4718)"

2. TVA letter to NRC dated February 29, 2008, "Sequoyah Nuclear Plant (SQN) Units 1 and 2 - Supplemental Response To (NRC) Generic Letter (GL) 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors (PWR) – Notice of Completion (TAC Nos. MC4717, MC4718)

The purpose of this letter is to provide TVA response to NRC's request for additional information (Reference 1) to the February 29, 2008, supplemental response to Generic Letter 2004-02 (Reference 2).

Enclosure 1 provides the SQN response and Enclosure 2 includes the SQN commitment made in this letter. If you have any questions concerning this matter, please contact Beth A. Wetzel at (423) 843-7170.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 23rd day of February, 2009.

Sincerely,

Timothy P. Cleary
Site Vice President

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ENCLOSURE 1

SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2
GENERIC LETTER 2004-02
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

NRC Question 1

Provide the test protocol used for head loss testing and a justification that shows the following aspects of the testing were conservative or prototypical:

A. Addition of debris to the test flume prior to the starting of the recirculation pump.

TVA Response 1A

Addition of debris to the test flume prior to the starting of the recirculation pump was performed as follows for the SQN strainer testing.

1. The flume was filled to an approximate depth of 6 inches. This was performed to keep the debris in suspension by preventing settling on the flume floor.

2. Debris mixed with water was added to the flume. The debris was distributed between 3 to 15 feet upstream of the test strainer. This distribution pattern was conservatively selected to maximize debris transport to the strainer and minimize debris agglomeration; reflective metal insulation (RMI) debris was added before the other debris types (fibrous and particulate). Adding the RMI debris before fibrous/particulate debris was performed to prevent the heavier RMI debris from blanketing or covering the debris and preventing it from transporting to the strainer.

3. Once all of the debris was added, filling of the test flume was resumed using overhead spray nozzles until the full testing water level was reached. The use of overhead nozzles was intended to maintain the debris mixture in the flume and minimize debris agglomeration prior to the start of the recirculation pump.

4. To further ensure mixed debris was introduced in to the strainer flow stream, manual mixing of the test flume was performed before the start of the recirculation pump. The manual mixing was performed to ensure that a debris agglomeration did not form prior to the start of the recirculation pump.

B. Concentration of debris in the test flume with respect to agglomeration and settling.

TVA Response 1B

As discussed in the response to Item 1A above, the debris was introduced to the test flume over an area between 3 and 15 feet upstream of the test strainer. The purpose of spreading the debris over this area was to minimize debris agglomeration. The heavier RMI debris settled readily and was introduced into the test flume before the particulate and fibrous debris. This prevented the heavier RMI from holding down (blanketing) the lighter debris and preventing it from transporting towards the strainer. To further ensure that agglomeration did not occur, manual mixing was performed before the start of the recirculation pump. These methods were used in Tests 1 through 5 described in Item 3.f.4 of the SQN GL 2004-02 supplemental response to minimize debris settling and agglomeration. They were used to conservatively maximize debris transport to the sump strainer.

As discussed in Item 3.f.4 of the SQN GL 2004-02 supplemental response, Test 6 of the SQN strainer test program was performed to address all potential debris transport non-conservatisms associated with the test arrangement. This test was performed as a variation of the "maximum coating inventory test" (Test 3 discussed in Item 3.f.4 of the SQN Generic Letter 2004-02 supplemental response). The debris load and test conditions were identical with the exception that all of the debris was placed on or in the immediate vicinity of the test strainer at the start of the test. This test was performed to evaluate the effect of complete transport of all debris to the strainer on the measured strainer head loss.

C. The fibrous debris preparation and introduction with respect to prototypical sizing (transport and bed formation).

TVA Response 1C

The fibrous debris tested for SQN included latent fiber and paper. For each test, finely shredded NUKON insulation was used as a surrogate material for latent fiber. Large sheets of NUKON insulation were shredded using a wood chipper. The shredded NUKON material was then separated by hand to further reduce the size. The fibers were mixed in water separately from other debris using a mixing device. Following RMI debris introduction into the test flume, the fibrous debris was added to the test flume. Manual mixing of the test flume was performed before the recirculation pump was started.

The fiber from paper included in the testing consisted of 15 pieces of standard paper cut into 2-inch squares. The paper squares were added to the test flume in a uniform distribution to simulate equipment tags, which are part of the design basis debris mix.

D. Flume velocity and turbulence.

TVA Response 1D

The test flume flow velocity was 0.048 feet per second (ft/sec). As discussed in the response to Item 1F below, the target flow rate for the test was 82.2 gallons per minute (gpm) or 0.18 cubic feet per second (ft^3/sec) (the actual test flow rates were conservatively kept slightly higher than the target flow rate) to match the maximum strainer approach velocity. The test flume width was 27 inches or 2.25 feet and the water height in the test flume was 19.75 inches or 1.65 feet (velocity equals flow divided by cross sectional area) $0.18\ ft^3/sec \div (2.25 \times 1.65)\ ft^2 = 0.048$ ft/sec).

With respect to flume turbulence, overhead spray nozzles were used to fill the flume after debris introduction was completed to help maintain the debris in suspension and maximize debris transport to the strainer. The spray was not used after the recirculation pump started. The Reynolds Number (Re) for the flow in the test flume was 2280. For open channels such as the test flume, this value represents transitional flow between laminar conditions (Re less than 500) and turbulent conditions (Re greater than 12,500). Turbulence from transitional flow in the test flume helps to prevent debris agglomeration. The turbulence associated with transitional flow is not sufficient to cause debris breakup or prevent debris bed formation on the strainer surfaces.

E. Any near-field settling that occurred during the test.

TVA Response 1E

As discussed in Item 3.f.4 of the SQN GL 2004-02 supplemental response, Test 6 of the SQN strainer test program was performed to address potential “near field” testing affects involving debris settling during scaled flow testing. The debris load and test conditions were identical to the “maximum coating inventory test” (Test 3 discussed in Item 3.f.4 of the SQN GL 2004-02 supplemental response) with the exception that all of the debris was placed on or in the immediate vicinity of the test strainer at the start of the test. The test was used to establish the maximum effect of any debris settling associated with testing conditions on the test results. This test established acceptable strainer performance for beyond design basis debris loading and transport conditions with significant operating margins.

F. Test scaling including debris amounts and strainer flow velocity.

TVA Response 1F

The scaling factor used in the SQN strainer qualification testing was computed based on debris per unit screen area as follows:

$$\text{Scaling Factor} = \frac{\text{Strainer Test Screen Area}}{\text{Design Stainer Screen Area}} = \frac{6.74\ \text{ft}^2}{1{,}537.5\ \text{ft}^2} = 0.00438$$

The strainer screen area used to develop the testing scaling factor (i.e., 1,537.5 ft^2) was reduced by approximately 5 percent from the actual strainer flow area of 1609 ft^2 for conservatism.

This scaling factor was applied to each of the constituent debris types used in the SQN strainer test program. The design basis debris amounts (Test 1) are described in Item 3.e.6 of the SQN GL 2004-02 supplemental response. The debris amounts used in Tests 2 through 6 are as outlined in Item 3.f.4 of the SQN GL 2004-02 supplemental response. Debris scaling based on strainer screen area is consistent with the design of the SQN sump strainers. The strainer design includes central core tube, which creates uniform flow across the strainer arrays. This results in uniform debris loading on the strainer surfaces.

The strainer flow velocity used in the test program was not scaled. The approach velocity for the test strainer screen surfaces was the same as the strainer design basis velocity. The velocity was determined as follows:

$$\text{Strainer Velocity} = \frac{\text{Design Flow Rate}}{\text{Design Strainer Area}} = \frac{18{,}750\ \text{gpm}}{1{,}537.5\ \text{ft}^2} * \frac{1\frac{\text{ft}^3}{\text{sec}}}{448.83\ \text{gpm}} = 0.0272\frac{\text{ft}}{\text{sec}}$$

Using the velocity of the 0.0272 ft/sec and the test screen area of 6.74 ft^2, the test flow rate was established as follows:

$$0.0272\frac{\text{ft}}{\text{sec}} * 6.74\ \text{ft}^2 * \frac{448.83\ \text{gpm}}{1\frac{\text{ft}^3}{\text{sec}}} = 82.2\ \text{gpm}$$

The flow rate was conservatively kept slightly higher than 82.2 gpm during the test to ensure that the flow rate would not drop below 82.2 gpm due to flow fluctuations.

G. How partial submergence of the strainer affects the scaling of flow and debris amounts.

TVA Response 1G

The SQN sump strainers will be fully submerged during the design basis large break loss-of-coolant accident (LOCA). The testing performed for the SQN strainers was performed in the fully submerged condition. As such, there were no scaling adjustments associated with a partial submergence strainer test. Partial submergence of the strainers for a small break LOCA was addressed as outlined in the response to Item 5 below.

NRC Question 2

Provide information that shows the applicability of the Performance Contracting Inc., clean strainer head loss correlation to pressurized-water reactor (PWR) strainers.

TVA Response 2

As discussed in the Item 3.f.9 of the SQN GL 2004-02 supplemental response, the clean strainer head loss across the SQN strainer assemblies was based in part on prototype strainer head loss test data. The Boiling Water Reactor Owners Group (BWROG) performed testing on a number of advanced design containment sump strainers at the Electric Power Research Institute (EPRI) Charlotte Non-Destructive Examination Facility in 1995. Included in the testing was a prototype “stacked disc” strainer designed and manufactured by Performance Contracting Incorporated (PCI). This testing established that the clean strainer head loss for the basic PCI strainer design is a function of (1) the kinematic viscosity of water (a function of water temperature) and (2) the strainer exit velocity (a function of strainer flow rate and exit area). Based on the testing results, the following relationship was established for the PCI clean strainer head loss.

$$HL_{Strainer} = K_1 \gamma V_{exit} + K_2 (V_{exit}^2 / 2g)$$

Where: γ = kinematic viscosity of water, ft^2/sec (a function of water temperature)
g = gravitational constant (32.2 ft/sec^2)
V_{exit} = strainer exit velocity, ft/sec (determined by dividing the strainer flow rate by the exit area defined as the cross sectional area of the strainer central flow channel)
K_1 = 1,024 (coefficient determined by regression analysis of test data)
K_2 = 0.8792 (coefficient determined by regression analysis of test data)

To confirm the applicability of this head loss relationship to strainers designed for pressurized water reactor (PWR) service, PCI fabricated a series of prototype strainers with internal flow channels consistent with a range of PWR service conditions and physical configuration constraints. These prototype strainers were tested for clean strainer head loss at the Alden Research Laboratory (ARL). The test results were then compared to those calculated using the clean strainer head loss relationship established from the earlier testing. For a strainer comparable to those provided for SQN, the test results were as follows.

Clean Strainer Head Loss Calculated Data vs. ARL Test Data		
Test Flow Rate (gpm)	Calculated Head Loss (ft of water)	Measured Head Loss (ft of water)
40.52	0.011	0.0101
60.78	0.018	0.0137
76.95	0.025	0.0202
100.66	0.036	0.0284
120.99	0.048	0.0385

As shown above, the PCI clean strainer regression equation developed from the BWROG testing provides comparable and conservatively bounding results for the tested PWR strainer.

Recognizing that the single most important variable in establishing the calculated head loss value using the PCI equation is exit velocity, the exit velocity used in the 1995 BWROG testing was compared to SQN service conditions. The strainer exit velocity for the test prototype was 7.723 ft/sec. The exit velocity for the SQN strainers is 2.53 ft/sec (short strainers) and 6.53 ft/sec (tall strainers). Because the SQN strainer exit velocities are less than that for the tested prototype, the SQN calculated values contain an additional measure of conservatism.

The PCI clean strainer head loss equation cited above (with an additional 6 percent margin applied to bound test measurement uncertainty) was used to establish the nominal head loss across the SQN strainers. The nominal head loss was then adjusted to conservatively account for additional head losses associated with specific aspects of the SQN design including (1) strainer length (tall strainers), (2) strainer discharge to the flow plenum, and (3) flow plenum discharge to the sump pit. These additional head losses were based on a conservative application of standard hydraulic analysis techniques and did not use any information developed from the BWROG strainer testing.

NRC Question 3

Clearly state the design inputs for the head loss testing and calculation and provide the basis for these inputs.

TVA Response 3

The design inputs used for the SQN strainer head loss testing included (1) the strainer flow area and maximum opening size, (2) existing plant emergency core cooling system (ECCS) flow requirements, (3) minimum containment sump recirculation inventory levels, and (4) the design basis large break LOCA debris load. The specific design values used as inputs for the head loss testing were as follows.

Design Input Parameter	Value
1. Total Strainer Flow Area	1,609 ft^2
2. Maximum Strainer Opening Size	0.095" Diameter
3. ECCS Flow Rate - Total Flow	8,400 gpm
4. Containment Spray System (CSS) Flow Rate - Total Flow	10,350 gpm
5. Post - LOCA Pool Height	
Minimum pool height at ECCS switchover initiation	9.06 ft.
Minimum pool height at CSS switchover initiation	13.22 ft.
Min/Max pool height for long-term recirculation	13.22 ft.
6. Post - LOCA Pool Temperature	
Minimum pool temperature	133ºF
Maximum pool temperature	190ºF
7. Design Basis Debris Load	
Insulation	
RMI	67,199 ft^2
Coatings	
Phenolic	56 lb
Inorganic Zinc	1,752 lb
Alkyds	5 lb
Silicone	49 lb
Carboline 295	392 lb
Latent debris	
Latent Fiber	12.5 ft^3
Dust and Dirt	170 lb
Tags and Tape	850 ft^2

The basis for these design input values is as follows:

Strainer Parameters - The total strainer flow area and the maximum strainer opening size are consistent with the final SQN strainer configuration. As discussed in the response to Item 1F above, the strainer screen area used to develop the testing scaling factor (i.e., 1,537.5 ft^2) was reduced by approximately 5 percent from the actual strainer flow area of 1609 ft^2 for conservatism.

ECCS and CSS Flow Parameters - The ECCS and CSS flow values represent the design maximum pump capacity for single train pump operation, which has been doubled to reflect a maximum flow rate for two train pump operation. The flow rate values are conservative in that the doubling of the single train maximum flow rate ignores the increase in piping flow resistance expected for two train pump operation.

Post-LOCA Recirculation Pool Level - The recirculation pool levels represent minimum levels based on conservative assumptions, which minimize the water volume introduced into the containment sump. The basis for the recirculation pool water inventory used to establish these levels is summarized in the response to Item 3.g.12 of the SQN GL 2004-02 supplemental response.

Post-LOCA Pool Temperature - The recirculation pool temperatures are based on the current SQN long-term containment integrity analysis for the large break LOCA transient. The values are consistent with Figure 6.2.1-18 of the SQN Updated Final Safety Analysis Report (UFSAR).

Design Basis Debris Load - The design basis debris load was established to bound the results of the debris generation evaluation described in Item 3.b.4 of the SQN GL 2004-02 supplemental response. As discussed in Item 3.e.6 of the SQN GL 2004-02 supplemental response, the design basis debris load represents the maximum amount of debris transported to the sump intake for each constituent part of the debris mix based on the various primary system pipe break locations evaluated. For the design basis strainer test, the total mass of the coating debris listed above was increased by approximately 6 percent and the total area of the insulation load (RMI) was decreased by approximately 9 percent. The latent debris load was not changed. The adjustments to the test debris load were made to add conservatism to the debris transport and strainer blockage by (1) increasing the amount of readily transported particulate/chip debris, and (2) reducing the potential for debris capture by settling of the heavier RMI material (which did not transport to the strainer during testing). Additional changes to the debris load were made during subsequent tests to establish the sensitivity of the strainer head loss to changes in the debris loads as described in Item 3.f.4 of the SQN GL 2004-02 supplemental response.

NRC Question 4

Provide the basis for the statement that a thin bed (1/8) inch of fiber cannot form on the strainer considering the design basis loading (200 pound latent debris) and design basis strainer size (1000 square feet).

TVA Response 4

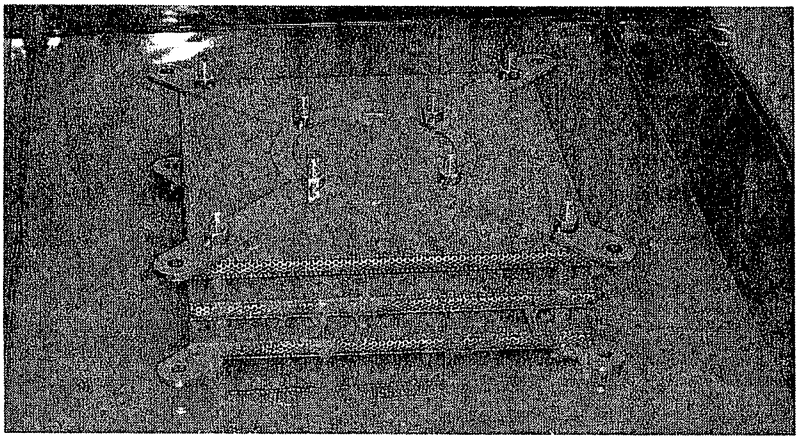
The total quantity of latent debris in the SQN design basis post-LOCA debris inventory is conservatively assumed to be 200 lbs. In accordance with the guidance in NEI 04-07, 15 percent of this debris load (30 lbs) is assumed to be latent fiber. Using a density of 2.4 lb/ft^3, this is equivalent to 12.5 ft^3 of fiber debris.

The total flow area of the SQN sump strainers is 1,609 ft^2. The total quantity of tape, tags and labels in containment has been conservatively established to be 850 ft^2. Assuming total transport of all tape, tags and labels to the sump strainer (and crediting a 25 percent overlap), the tape, tags and labels will cover 637.5 ft^2 of the strainer area. If the fiber in the assumed latent debris inventory were to form a perfectly uniform layer on the remaining 971.5 ft^2 of open strainer area, the fiber bed thickness would be 0.15 inch, which is slightly greater than the theoretical 1/8 inch (0.125 inch) thickness of fiber required to form a thin bed.

The thin bed effect was first encountered in the research effort conducted by NRC in response to the Pilgrim and Limerick incidents (i.e., strainers in the boiling water reactor [BWR] suppression pool suffered severe structural integrity issues during routine operation of the ECCS in the suppression pool cooling mode). The head loss research was conducted on vertical loops with a horizontal flat plate. This test setup was conducive to tight control of important head loss parameters including the formation of a uniform fiber bed across the strainer.

In more prototypical plant conditions; however, a thin bed is much less likely to form. The combination of an advanced strainer design with complicated geometry, the non-uniform bulk flow of water toward the strainer, agglomeration of debris in the pool, turbulence in the vicinity of the strainer from the upper compartment spray drainage and ice condenser drainage, and the presence of larger pieces of debris on the strainer (i.e., tags, tape, and RMI) would prevent the formation of a perfectly uniform fiber bed on the SQN strainers. Since the quantity of fiber is barely large enough to form a theoretical 1/8-inch thin bed, the non-uniform accumulation caused by the factors discussed above would result in large portions of clean strainer surface caused by the factors discussed above would result in large portions of clean strainer surface area.

This is supported by the SQN strainer head loss testing, which demonstrated that for a beyond design basis debris load much of the strainer area was free of fiber debris. The photograph below was taken after completion of Test 5 described in Item 3.f.4 of the SQN GL 2004-02 supplemental response.



In Test 5, the amount of latent fiber (fine NUKON) tested was 10 times the design basis debris load. Even with the additional fiber amount, a uniform thin bed was not formed. RMI was not included in this test as it was found not to transport from previous tests. Deletion of the RMI was considered conservative since the only potential effect of the RMI would be to impede the transport of the fibrous/particulate debris.

NRC Question 5

Provide an evaluation of the performance of the strainer under partially submerged conditions.

TVA Response 5

As discussed in the response to Item 3.f.2 of the SQN GL 2004-02 supplemental response, the SQN advanced design containment sump strainers are fully submerged upon initiation of containment sump recirculation operations for a large break LOCA. All of the sump strainers are not fully submerged for ECCS recirculation for a small break LOCA. For a small break LOCA, the "short" strainer stacks will be fully submerged while the "tall" strainer stacks will only be partially submerged. In addition to the net positive suction head (NPSH) margin evaluation described in Item 3.g of the of the SQN GL 2004-02 supplemental response, a vortexing evaluation was performed for the "tall" strainers for the partially submerged service condition.

When fully submerged, the largest opening for water to enter the sump is through the 0.095-inch diameter holes in the strainer perforated plate. The size of the strainer opening is sufficient to preclude vortex formation (i.e., any voids formed would be sufficiently small to be readily collapsed by the adjacent water head). For partially submerged conditions, vortex formation within the strainer can be precluded by demonstrating that the level reduction in the strainer central flow channel is maintained above the top of the discharge plenum. To demonstrate compliance with this criterion for the SQN "tall" strainers, the minimum sump level required to maintain the strainer flow channel level drop above the top of the strainer discharge plenum was established for the combined ECCS and CSS flow rates. For the design basis rate of 12,900 gpm, a minimum sump level of 4.18 feet was calculated to keep the flow channel water level above the top of the discharge plenum. These results compare favorably to the minimum small break LOCA containment sump level of 5.04 feet discussed in Item 3.f.2 of the SQN GL 2004-02 supplemental response.

In addition to the analytical evaluation discussed above, numerous strainer qualification tests have been performed for PCI strainers similar to the SQN strainers for both fully and partially submerged conditions. There have been no vortex formations observed during any of the tests performed including the tests performed for partially submerged strainers.

The results of these evaluations confirm that the minimum sump level for small break LOCA recirculation is sufficiently high to preclude vortex formation for the partially submerged "tall" strainers.

NRC Question 6

Provide an evaluation that shows that flashing across or within the strainer will not occur.

TVA Response 6

For a design basis large break LOCA, the containment sump recirculation inventory can conservatively be assumed to be at saturated conditions at the surface of the water. Similarly, the inventory can be assumed to be sub-cooled below the surface based on the depth of the recirculation pool. At the start of ECCS sump recirculation operation, the maximum ECCS flow rate is 8,400 gpm and the minimum water level is 9.06 ft above the containment floor. The top screen surface of the tallest SQN strainers is 7.15 ft above the containment floor. The minimum water column above the top screen surface of the tallest strainers is therefore approximately 1.91 ft. If flashing were to occur, it would initiate near the top screen surface of the tallest strainer modules. Given that the containment pressurization due to LOCA conditions is conservatively ignored, the head loss across this area of the strainers would have to be greater than 1.91 ft for flashing to occur across or within the strainers. For these conditions, the head loss across the strainers is approximately 0.40 ft. As such, sufficient head margin exists to preclude flashing inside or across the strainer.

Similarly, when the SQN CSS is aligned to the containment sump, the combined ECCS and CSS flow will increase to a maximum rate of 18,750 gpm. The minimum water level at the initiation of CCS sump recirculation operation is 13.22 ft above the containment floor or approximately 6 ft above the top of the tallest strainers. For these operating conditions, the strainer head loss is 1.97 ft. Flashing inside or across the strainer is also precluded for this mode of operation.

NRC Question 7

The NRC staff considers in-vessel downstream effects to not be fully addressed at SQN, as well as at other PWRs. The licensee's submittal for SQN refers to the draft Westinghouse topical report, WCAP-16793-NP. The NRC staff has not issued a final safety evaluation (SE) for WCAP-16793-NP. The licensee may demonstrate that in-vessel downstream effects issues are resolved for SQN by showing that the plant conditions are bounded by the final WCAP-16793-NP and the corresponding final NRC staff SE, and by addressing the conditions and limitations in the final SE. The licensee may also resolve this item by demonstrating without reference to WCAP-16793-NP or the staff SE that in-vessel downstream effects have been addressed at SQN. In any event, the licensee should report how it has addressed the in-vessel downstream effects issue within 90 days of issuance of the final NRC staff SE on WCAP-16793-NP. The

NRC staff is developing a regulatory issue summary to inform the industry of the staff's expectations and plans regarding resolution of this remaining aspect of NRC's GSI-191.

TVA Response 7

TVA will complete the SQN in-vessel downstream effects evaluation discussed in the supplemental response to GL 2004-02 following issuance of the final NRC Safety Evaluation Report (SER) for Topical Report No. WCAP-16793-NP, "Evaluation of Long-Term Cooling Considering Particulate, Fibrous, and Chemical Debris in the Recirculating Fluid." Based on available margins, it is anticipated that the remaining in-vessel downstream effects issues can be addressed by demonstrating that SQN plant-specific conditions are bounded by the evaluation in the final report. Following completion of the evaluation the results will be submitted to NRC.

NRC Question 8

The 2004 Edition of the American Society of Mechanical Engineers (ASME) Code is not currently endorsed by the Code of Federal Regulations. Please provide justification and/or re-evaluation for discrepancies, if any, between the applicable portions of the 2004 Edition of the ASME Code that were used in the sump structural analysis and the respective Code Editions that are currently endorsed by the NRC in Title 10 of the Code of Federal Regulations, Section 50.55a, "Codes and standards."

TVA Response 8

The primary design and fabrication standard for the SQN strainer equipment is the American Institute of Steel Construction (AISC), Speciation for the Design, Fabrication, and Erection of Structural Steel for Buildings, 7th Edition, adopted February 12, 1969. This standard is consistent with the SQN design basis for steel structures inside the primary containment building. As noted in the SQN GL 2004-02, supplemental response, the equipment specification for the SQN sump strainer and flow plenum assembly also imposed a number of other standards for materials, component supports, non-destructive examination and welding. The specification indicated that ASME Section III, Division 1, Subsection NF, "Supports" was to be used to in the design and analysis of any vertical or horizontal strainer supports. The supports code was specified to be the edition in effect at the time of the strainer order (i.e., 2004 Edition through July 2005 Addenda).

The strainer equipment structural design and analytical acceptance criteria were established in accordance with the AISC standard. In circumstances where the AISC standard did not provide adequate guidance for a particular component, other codes or standards were used for guidance. In particular, the AISC standard does not provide design guidelines for perforated plate. In lieu of AISC requirements, the equations from Appendix A (Article A-8000) of Section III of the ASME Code, 1989 Edition with no Addenda, were used to calculate the perforated plate stresses. The acceptance criteria were also based on this code. Only the basic acceptance criteria (allowable stresses) were used from the ASME code. Load combinations and allowable stress factors for higher service level loads were not used.

Based on the results of the structural analysis of the strainers and flow plenum assemblies, no horizontal or vertical supports were required or included in the SQN strainer design. As such, the 2004 Edition thru July 2005 Addenda edition of ASME Section III, Division 1, Subsection NF was not used in the design and analysis of the SQN strainers or flow plenum. As discussed above, the only application of Section III of the ASME code was in the calculation of perforated plate stresses. For this application, the 1989 version of the code was used. This version of the ASME code had received regulatory endorsement at the time of application. As such, no reconciliation of later ASME Section III code editions for the SQN strainer and flow plenum design is required.

ENCLOSURE 2

**SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2
GENERIC LETTER 2004-02
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
LIST OF COMMITMENTS**

TVA will complete the SQN in-vessel downstream effects evaluation following issuance of the final NRC Safety Evaluation Report (SER) for Topical Report No. WCAP-16793-NP, "Evaluation of Long-Term Cooling Considering Particulate, Fibrous, and Chemical Debris in the Recirculating Fluid." Following completion of the evaluation the results will be submitted to NRC.