Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

March 8, 2012

10 CFR 50.4
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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Sequoyah Nuclear Plant, Unit 2
Facility Operating License No. DPR-79
Docket No. 50-328

Subject: **Response to NRC Third Request for Additional Information Regarding the Proposed Technical Specification Changes to Allow Use of Shield Building Dome Penetrations During Modes 1 Through 4 (TAC NO. ME7026)**

Reference:

1. Letter from TVA to NRC, "Application for Temporary Change to Technical Specifications to Allow Use of Penetrations in Shield Building Dome During Modes 1 through 4; and Request for Specific Usage of Alternate Source Term methodology for Calculating Radiation Doses Associated with the proposed Temporary Change to Technical Specifications (TS-SQN-2011-03)," dated August 31, 2011
2. Letter from TVA to NRC, "Request for Expedited Review of a Licensing Amendment Request Supporting the Sequoyah Nuclear Plant, Unit 2, Steam Generator Replacement Project," dated November 28, 2011
3. Letter from NRC to TVA, "Sequoyah Nuclear Plant, Unit 2 - Request for Additional Information Regarding the Propopsed [sic] Technical Specification Changes to Allow Use of Shield Building Dome Penetrations During Modes 1 Through 4 (TAC NO. ME7026)," dated December 29, 2011
4. Letter from TVA to NRC, "Response to NRC Request for Additional Information Regarding the Proposed Technical Specification Changes to Allow Use of Shield Building Dome Penetrations During Modes 1 Through 4 (TAC NO. ME7026)," dated January 27, 2012

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5. Letter from NRC to TVA, "Sequoyah Nuclear Plant, Unit 2 - Request for Additional Information Regarding The Proposed Technical Specification Changes to Allow Use of Shield Building Dome Penetrations During Modes 1 Through 4 (TAC NO. ME7026)," dated January 30, 2012
6. Letter from TVA to NRC, "Response to NRC Second Request for Additional Information Regarding the Proposed Technical Specification Changes to Allow Use of Shield Building Dome Penetrations During Modes 1 Through 4 (TAC NO. ME7026)," dated February 29, 2012
7. Electronic Mail from NRC to TVA, "Sequoyah, Unit 2 - Allow Use of Dome Penetrations in SB During Modes 1 through 4 (TAC NO. ME7026)," dated February 7, 2012

By letter dated August 31, 2011 (Reference 1), the Tennessee Valley Authority (TVA) submitted a request for amendment to the Technical Specifications (TSs) for Sequoyah Nuclear Plant (SQN), Unit 2. The amendment request proposed to allow SQN, Unit 2, to open one of the penetration hatches in the Shield Building dome for up to five hours per day, six days per calendar week while in Modes 1 through 4 during Unit 2 Cycle 18 from receipt of Nuclear Regulatory Commission (NRC) approval for the request until entering Mode 5 at the start of Unit 2 refueling outage 18 (U2R18). The U2R18 refueling outage is scheduled to commence in the fall of 2012. In a letter dated November 28, 2011 (Reference 2), TVA requested that the NRC expedite their review of the Reference 1 amendment request for approval by May 1, 2012 to support work in advance of the U2R18 refueling outage to facilitate the Steam Generator Replacement Project (SGRP).

By letter dated December 29, 2011 (Reference 3), the NRC forwarded a request for additional information (RAI) regarding the proposed changes to the TSs. TVA responded to this first RAI by letter dated January 27, 2012 (Reference 4). In a letter dated January 30, 2012 (Reference 5), the NRC forwarded a second RAI regarding the proposed changes to the TSs and TVA provided a response on February 29, 2012 (Reference 6). Subsequently, by electronic mail dated February 7, 2012 (Reference 7), the NRC forwarded a third RAI regarding the proposed changes to the TSs and noted that a response was requested within 30 days. Enclosure 1 to this letter provides the TVA response to the NRC third RAI.

During pre-outage work activities supporting the fall 2012 SGRP outage, TVA will employ a hydraulic crane, in addition to the Liebherr crane as described in the "Use of Crane" section of the Enclosure to Reference 1, in order to stage materials on the Shield Building roof. Enclosure 2 of this letter provides additional information regarding the use of the mobile hydraulic crane. With respect to the scope of the TS amendment request submitted in Reference 1, the crane used to stage materials on the Shield Building roof has no impact on the operation of the penetration hatches in Modes 1 through 4.

No changes have been made to the enclosure and attachments of the proposed amendment to the TSs in Reference 1, or to the first or second RAI responses of References 4 and 6.

There are no regulatory commitments included in this submittal. If you have any questions, please contact Clyde Mackaman at (423) 751-2834.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of March 2012.

Respectfully,

J. W. Shea
Manager, Corporate Nuclear Licensing

Enclosures:

1. Response to NRC Third Request for Additional Information Regarding the Proposed Technical Specification Changes to Allow Use of Shield Building Dome Penetrations During Modes 1 Through 4
2. Additional Crane Information Regarding the Proposed Technical Specification Changes to Allow Use of Shield Building Dome Penetrations During Modes 1 Through 4

cc (Enclosures):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Sequoyah Nuclear Plant
Director, Division of Radiological Health, Tennessee State Department of Environment and Conservation

ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT
UNIT 2

RESPONSE TO NRC THIRD REQUEST FOR ADDITIONAL INFORMATION REGARDING THE PROPOSED TECHNICAL SPECIFICATION CHANGES TO ALLOW USE OF SHIELD BUILDING DOME PENETRATIONS DURING MODES 1 THROUGH 4

NRC Question 1

Given the relatively high rate of injury and death from rigging and crane operations, what precautions have been taken to prevent human errors in the rigging and crane operations proposed in this license amendment request?

TVA Response

It is important to note that the rigging and crane operations associated with this License Amendment Request (LAR) are independent from the control and operation of the temporary Shield Building hatches (i.e., the reason for the LAR). The rigging and crane operations are limited to staging material in designated areas on top of the Shield Building. This material will then be handled using manually operated or electric hoists to pass the material through the temporary hatches.

The rigging and crane operations in this LAR primarily involve the handling of small material taken from the ground elevation to designated staging locations on top of the Shield Building. The majority of the loads handled are relatively small. These small miscellaneous loads will be grouped and loaded into skip pans in order to control the weight, while minimizing the total number of lifts for the support crane. Use of skip pans for handling these loads also eliminates the need for multiple rigging configurations, reduces the potential for dropped and/or slipped loads, eliminates the need for riggers to compensate for unusual center of gravity locations, and eliminates the need for intermediate hoists (used for leveling) when handling the loads.

Handling the loads in this manner reduces the potential for human error specifically by; 1) reducing the total number of lifts, 2) simplifying the lifts, 3) simplifying the rigging configurations, and 4) eliminating additional potential failure modes caused by intermediate hoists.

From a more general perspective, human error reduction is taken very seriously with regard to high risk activities such as rigging and crane operation. The implementing personnel are trained on human error reduction techniques upon arrival at the site and provided with Human Performance Tools to be used when implementing work activities on site. These Human Performance tools consist of Fundamental Tools such as Situational Awareness (Task Preview, 2-Minute Rule, Stop When Unsure), Self-Checking (Stop-Think-Act-Review), Procedure Use and Adherence, and Effective Communication, augmented with conditional human performance tools such as Detailed Pre-Job Briefing, Verification Practices (Peer-Checking and Concurrent Verification), Flagging, and Post-Job Critique. Use of these Human Performance tools in the implementation activities is encouraged by management and supervision, monitored for implementation in the field, and coached as required.

NRC Question 2

Will the crane operator be qualified per American National Standards Institute [ANSI] B30.2-1976 (Chapter 2-3), "Overhead and Gantry Cranes"? If not, what qualifications will be required of the crane operator?

TVA Response

The crane operator will be qualified to American Society of Mechanical Engineers (ASME) B30.5, "Mobile and Locomotive Cranes."

NRC Question 3

Will specific rigging procedures be used by the dedicated individuals?

TVA Response

In the response to Question 1 of the RAI response submitted by Reference 4 of the cover letter, TVA defined the "dedicated individuals" as Steam Generator Replacement Project (SGRP) individuals who have received formal training with respect to their duties to perform the Shield Building dome hatch closure mission. These individuals will have no other duties and will be responsible for ensuring the hatch is closed in response to a reactor trip. The only "rigging operations" expected of the dedicated individuals will be to lower any load preventing closure of the hatch penetrations as described in the response to Question 3 of the RAI response submitted in Reference 4 of the cover letter. Furthermore, as described in the response to Question 5 of the previous (Reference 4 of the cover letter) RAI response, work implementing documents for the dedicated individuals will be prepared and approved in accordance with the site's work control process. Training for the dedicated individuals will be completed after preparation of the work implementing documents.

Although the dedicated individuals will not be involved in rigging operations, other project personnel will be required to perform rigging operations using mobile cranes to stage material on top of the Shield Building in support of transfer of material through the temporary hatch. Rigging operations will also be performed using manual or electric hoists to transfer the material through the temporary hatch. These rigging operations are controlled by TVA approved SGRP contractor rigging procedures.

NRC Question 4

Will specific rigging training be given to the dedicated individuals?

TVA Response

As described in the response to Question 3, the dedicated individuals will be trained to the work implementing documents.

Although the dedicated individuals will not be involved in rigging operations, other project personnel will be required to perform rigging operations using mobile cranes to stage material on top of the Shield Building in support of subsequent transfer of the material through the temporary penetration hatch. Rigging operations will also be performed using manual or electric

hoists to transfer the material through the Shield Building temporary penetration hatch. These rigging activities are performed under the direction of project personnel that have completed specific rigging training.

As described in Section 5.2 of Technical Report, SQN2-SGR-TR1, "Sequoyah Unit 2 Steam Generator Replacement Rigging and Heavy Load Handling Technical Report," (submitted in support of SGRP heavy load lifts; Reference: ADAMS Accession Number ML11273A169), personnel involved in operating the mobile cranes will receive the following instruction:

- "Operators and riggers will receive the applicable Sequoyah site-specific training specified in:

  - TVA Safety Manual Procedure 721, "Rigging"
  - TVA Safety Manual Procedure 721A, "TVA Rigging Manual"
  - TVA Safety Manual Procedure 721B, "Rigging Equipment – Standard Procurement Specifications"
  - TVA Safety Manual Procedure 802, "Requirements for the Safe Operation of Cranes"

- Personnel will undergo hands on training with the equipment before a load is attached to the equipment.

- ... Operation of the crane shall be in accordance with crane operator's manual, and crane operators will be trained in accordance with subcontractor [Environmental, Safety, and Health] ES&H procedures ..."

NRC Question 5

Will the controlling procedure or training include the actions of the crane operator?

TVA Response

The controlling procedure or training will not include the actions of the crane operator. The controlling procedures referenced in the LAR (Reference 1 of the cover letter) are associated with the procedures for events requiring Shield Building integrity and the procedures for operation of the annulus vacuum control system or Emergency Gas Treatment System (EGTS). Procedures for the events requiring Shield Building integrity will not require revision to initiate closure of the open Shield Building dome penetration hatches, since the dedicated individual in the Control Room will initiate closure immediately following an announcement of a reactor trip over the Public Address (PA) system, regardless of the reason for the trip. Procedure revisions are anticipated for operation of the annulus vacuum control system, and operation of the EGTS. Training will be conducted for any procedure revisions, interim procedure revisions, and new procedures either through training classes, "hands-on" training, and/or required reading. None of these procedures require any actions of the crane operator during implementation, so training of the crane operator in accordance with the requirements of these procedures is not necessary.

The crane operators that will be involved in staging equipment and material in the designated areas on top of the Shield Building will receive training for general crane operator actions in accordance with the TVA Safety Manual Procedure 802, "Requirements for the Safe Operation of Cranes."

Additionally, crane operators receive certification for the equipment they will be operating. As part of the certification requirements, a skills test is required with actual operation of the equipment under the direction/observation of a certified operator. The test must include the requirements necessary for a safe lift specified in Occupational Safety and Health Administration (OSHA) and ASME standards and must include all aspects of making a lift. Competence will, of necessity, be a matter of judgment on the part of the certifier, but failure to conduct a pre-operational inspection or errors/incompetence in any of the critical aspects for a safe lift that could cause the load to be dropped, tipping of the crane, or overload of the crane will be cause for failure. A checklist will be used to conduct the skills test to ensure the key elements of crane operation are tested and evaluated.

Finally, pre-job briefings will be required to reinforce crane operator actions for the specific lifts to be performed to ensure the lift parameters remain within the design basis for the lift. Examples of the lift parameters covered in the pre-job briefings include the safe load paths and lifted weight limitations.

NRC Question 6

What kind of communication will the crane operator and the dedicated individuals use?

TVA Response

As described in the response to Question 3, the dedicated individuals' tasks will not involve the crane operator; therefore, no communication between the crane operator and the dedicated individuals is necessary during lift operations.

The primary mode of communication between the crane operator(s), the Person-In-Charge, personnel monitoring crane position, and load tenders during the lift operations is by using radio communication. Provisions are made to use visual signals in order to secure the load should radio communications be lost.

NRC Question 7

Were any relevant insights applied from Sequoyah Nuclear Plant's operating experience (OE) with slipped or dropped loads, NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36", or other industry OE regarding rigging and crane operations?

TVA Response

The Sequoyah relevant operating experience (OE) or lessons learned associated with rigging and handling have been provided to the SGRP subcontractor and have been incorporated in the subcontractor's lessons learned database and evaluated for applicability to the project. No Sequoyah OE has been identified associated with slipped or dropped loads that would provide relevant insights to be incorporated into the planned rigging and handling activities. OE from other TVA operating units has been identified, and the pertinent information has been incorporated into the subcontractor's rigging program. Examples include events from Browns Ferry Nuclear Plant where an overhead crane trolley was being lowered using synthetic slings that were cut, and the load dropped. Another event was from Browns Ferry Nuclear Plant where a cooling tower fan was lifted using an inadequate eyebolt supplied by the manufacturer. The eyebolt failed, and the load dropped. Considering these events, the subcontractor's rigging

plans were developed ensuring synthetic slings are only used in configurations where the slings are not susceptible to cutting, and all rigging components are inspected prior to each lift to ensure adequate rigging components are used.

Relevant insights from NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36," have been incorporated into the rigging program. NUREG-0612 provides seven guidelines to provide a defense-in-depth approach to minimize the potential risk or consequences of a load handling event. These guidelines are focused toward prevention of the major causes of load handling accidents, namely operator errors, rigging failures, lack of adequate inspection, and inadequate procedures. These guidelines were specifically developed for handling heavy loads over, or in close proximity, to nuclear fuel and safe shutdown equipment using overhead cranes. While the guidelines of NUREG-0612 are not directly applicable in all aspects, they provide guidance that is applicable to minimizing the potential risk or consequences of a load handling event using an outside crane.

These guidelines are implemented with respect to outside crane usage as follows:

Guideline #1, Safe Load Paths

Guideline: "Safe load paths should be defined for the movement of heavy loads to minimize the potential for heavy load, if dropped, to impact ...safe shutdown equipment. The path should follow, to the extent practical, structural floor member, beams, etc. such that if the load is dropped, the structure is more likely to withstand the impact. These load paths should be defined in procedures, shown on equipment layout drawings, and clearly marked on the floor in the area where the load is to be handled. Deviations from defined load paths should require written alternative procedures approved by the plant safety review committee."

Application of Guideline: Safe load handling areas are defined that eliminate or minimize handling of heavy loads over safe shutdown equipment. To the extent practical, loads are handled over areas that do not contain safe shutdown equipment, such that if the load is mishandled there will not be an adverse affect. These load paths are defined on drawings that are available to the crane operator, and are identified by markings or distinct outside landmarks. Deviations from defined load paths require written alternative procedures approved by engineering.

Guideline #2, Load Handling Procedures

Guideline: "Procedures should be developed to cover load handling operations for heavy loads that are or could be handled over or in proximity to ... safe shutdown equipment. At a minimum, procedures should cover handling of those loads listed in Table 3-1 of NUREG-0612. Those procedures should include: Identification of required equipment; inspection and acceptance criteria required before movement of the load; the steps and proper sequence to be followed in handling the load; defining the safe path; and other special precautions."

Application of Guideline: Lift Plans are developed to control heavy loads handled over, or in proximity to safe shutdown equipment. The Lift Plans contain identification of required equipment, inspection and acceptance criteria, the steps and proper sequence for handling the load (as applicable), the safe load path, equipment operating limitations, and other special precautions.

Guideline #3, Crane Operator Training

Guideline: "Crane Operators should be trained, qualified and conduct themselves in accordance with Chapter 2-3 of ANSI B30.2-1976, 'Overhead and Gantry Cranes'."

Application of Guideline: TVA requires the operators to be trained, qualified, and to conduct themselves in accordance with ASME B30.5, Mobile and Locomotive Cranes. This is the appropriate standard for operation of outside crawler cranes, hydraulic cranes, etc.

Guideline #4, Special Lifting Devices

Guideline: "Special lifting devices should satisfy the guidelines of ANSI N14.6-1978, 'Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials.' This standard should apply to all special lifting devices which carry heavy loads in areas as defined above. For operating plants certain inspections and load tests may be accepted in lieu of certain material requirements in the standard. In addition, the stress design factor stated in Section 3.2.1.1 of ANSI N14.6 should be based on the combined maximum static and dynamic loads that could be imparted on the handling device based on characteristics of the crane which will be used. This is in lieu of the guideline in Section 3.2.1.1 of ANSI N14.6 which bases the stress design factor on only the weight (static load) of the load and of the intervening components of the special handling device."

Application of Guideline: TVA does not anticipate using any special lifting devices, so this guideline is not applicable. Lifting is performed using standard components.

Guideline #5, Lift Devices (not Specially Designed)

Guideline: "Lift devices that are not specially designed should be installed and used in accordance with the guidelines of ANSI B30.9, Slings. However, in selecting the proper sling, the load used should be the sum of the static and maximum dynamic load. The rating identified on the sling should be in terms of the 'static load' which produces the maximum static and dynamic load. Where this restricts slings to use on only certain cranes, the sling should be clearly marked as to the cranes with which they may be used."

Application of Guideline: Lift devices that are not specially designed are installed and used in accordance with the guidelines of ASME B30.9, Slings; ASME B30.16, Overhead Hoists (Underhung); ASME B30.20, Below-the-Hook Lifting Devices; and ASME B30.21, Manually Lever Operated Hoists. In selecting the proper component sizes, the static load is used. In applications that require additional margin due to the sensitive nature of the lift, the components are sized as directed by the Lift Plan, such as using a rated capacity of at least twice the rated capacity for a static load.

Guideline #6, Cranes (Inspection, Testing and Maintenance)

Guideline: "The crane should be inspected, tested, and maintained in accordance with Chapter 2-2 of ANSI B30.2-1976, 'Overhead and Gantry Cranes,' with the exception that test and inspection should be performed prior to use where it is not practical to meet frequencies of ANSI B30.2 for periodic inspection and test, or where frequency of crane use is less than the specified inspection and test frequency (e.g., the polar crane inside a PWR containment may only be used every 12 to 18 months during refueling operations, and is generally not accessible during power operation. ANSI B30.2, however, calls for a certain inspection to be performed daily or monthly. For such cranes having limited usage, the inspections, test, and maintenance should be performed prior to their use)."

Application of Guideline: The outside cranes are inspected, tested, and maintained in accordance with ASME B30.5, Mobile and Locomotive Cranes. This is the appropriate standard for operation of outside crawler cranes, hydraulic cranes, etc. Additionally, the mobile cranes must comply with OSHA, 29 CFR Part 1926, Subpart CC, Cranes and Derricks in Construction, effective 2010.

Guideline #7, Crane Design

Guideline: "The crane should be designed to meet the applicable criteria and guidelines of Chapter 2-1 of ANSI B30.2-1976, 'Overhead and Gantry Cranes,' and [Crane Manufacturers Association of America] CMAA-70, 'Specification for Electric Overhead Traveling Cranes.' An alternative to a specification in ANSI B30.2 or CMAA-70 may be accepted in lieu of specific compliance if the intent of the specification is satisfied."

Application of Guideline: The outside cranes are designed in accordance with ASME B30.5, Mobile and Locomotive Cranes, as specified in OSHA, 29 CFR Part 1926, Subpart CC, Cranes and Derricks in Construction, effective 2010. This is the appropriate standard for design of outside crawler cranes, hydraulic cranes, etc.

Additional OE that is incorporated in the rigging programmatic requirements, or specific lift requirements, include incorporation of the recommendations of Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report (SOER) 06-01, including Revision 1; recommendations for NRC Regulatory Issue Summary 2005-25, including Supplement 1 (appropriate use of wire rope slings versus synthetic slings and softeners when conditions exist that may subject slings to tearing or cutting and elimination of intermediate hoists that may induce additional failure modes when performing critical lifts); and other industry events associated with mishandled heavy loads such as loads falling from transporters, loads falling from barges, inadvertent release of strand wire from strand jacks due to Electro-Magnetic Interference.

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT
UNIT 2

ADDITIONAL CRANE INFORMATION
REGARDING THE PROPOSED TECHNICAL SPECIFICATION CHANGES TO ALLOW USE OF SHIELD BUILDING DOME PENETRATIONS DURING MODES 1 THROUGH 4

Some scaffolding material has already been staged and assembled on the SQN Unit 2 Shield Building roof for activities supporting the fall 2012 Steam Generator Replacement Project (SGRP) outage. Pre-outage work activities on the SQN, Unit 2, Shield Building roof supporting the SGRP are currently scheduled to resume in April, 2012. These work activities include completion of scaffolding and elevator work on top of the Shield Building. To stage material for these and other types of work activities on the Shield Building roof, a small (90 ton) hydraulic crane has been employed.

As provided in the Enclosure to Reference 1 of the cover letter, in the Section entitled "Use of Crane," TVA stated that a Liebherr Crawler Crane will be used to lift materials to the Shield Building roof. The Liebherr crane is currently scheduled to be ready for use by August 9, 2012.

To efficiently move materials to the Shield Building roof, the small hydraulic crane will also be used until the Liebherr crane is operational. The staging of materials intended for use inside the Shield Building will not commence until approval for use of the penetration hatches has been obtained from the NRC as requested in Reference 1 of the cover letter. With respect to the scope of the Technical Specification amendment request (Reference 1 of the cover letter), which crane used to stage materials on the Shield Building roof has no impact on the operation of the penetration hatches in Modes 1 through 4. Neither of these cranes will be used to pass material from the Shield Building roof through the penetration hatches. The hydraulic crane has equivalent controls associated with the load path limitations, maximum weight of handled material, training, inspections, seismic stability, etc. as described for the Liebherr crane in the "Use of Crane" section.

Control and documentation of work activities for staging materials on the Shield Building roof employing the small hydraulic crane will be in work implementing documents (i.e., work packages) prepared and approved in accordance with the TVA approved SGRP contractor work control process. The work implementing documents will include the proper instructions for rigging and lifting operations, and the use and maintenance of the hydraulic crane in accordance with the TVA approved SGRP contractor procedures.