July 13, 1998

Mr. J. A. Scalice
Chief Nuclear Officer
and Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: UNRESOLVED SAFETY ISSUE A-46 – REQUEST FOR ADDITIONAL INFORMATION: BROWNS FERRY NUCLEAR PLANT, UNITS 2 AND 3 (TAC M69431 AND M69432)

Dear Mr. Scalice:

By letter dated June 28, 1996, the Tennessee Valley Authority (TVA) provided the plant-specific summary report in accordance with its commitment relating to Generic Letter 87-02 on the resolution of unresolved safety issue A-46 program at the Browns Ferry Nuclear Plant Units 2 and 3. The staff has continued its review of the summary report and has determined that additional information is necessary to complete the review of TVA's A-46 submittals. The enclosure identifies the additional information needed. Please provide your response by August 31, 1998.

Sincerely,
Original signed by

Albert W. De Agazio, Sr. Project Manager
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-260, 50-296
Serial No. BFN-98-015

Enclosure: Request for Additional Information

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BROWNS FERRY NUCLEAR PLANT, UNITS 2 & 3
DOCKET NUMBERS 50-260 and 50-296

REQUEST FOR ADDITIONAL INFORMATION
REGARDING THE VERIFICATION OF SEISMIC ADEQUACY
OF MECHANICAL AND ELECTRICAL EQUIPMENT

1. Referring to the in-structure response spectra (ISRS) discussed in your response (Reference 1) to the Nuclear Regulatory Commission (NRC's) request in Supplement No. 1 to Generic Letter 87-02, dated May 22, 1992, the following information is requested:

   (a) Identify structure(s) which have ISRS (5% critical damping) for elevations within 40-feet above the effective grade, which are higher in amplitude than 1.5 times the Seismic Qualification Utilities Group bounding spectrum.

   (b) With respect to the comparison of equipment seismic capacity and seismic demand, indicate which method in Table 4-1 of GIP-2 was used to evaluate the seismic adequacy for equipment installed on the corresponding floors in the structure(s) identified in Item (a) above. If you have elected to use method A in Table 4-1 of the GIP-2, provide a technical justification for not using the ISRS provided in
   Reference 1.

   (c) For the structure(s) identified in Item (a) above, provide the ISRS designated according to the height above the effective grade. If the ISRS identified in Reference 1 were not used, provide the response spectra that were used to verify the seismic adequacy of equipment within the structures identified in Item (a) above. Also, provide a comparison of these spectra to 1.5 times the bounding spectrum.

   (d) Identify all the safe shutdown equipment list (SSEL) equipment installed in the Diesel Generator Buildings identified in Item (a) above, and provide information in a tabular form with the pertinent information similar to those in Appendix D of Enclosure 1 and Appendix A of Enclosure 2 to Reference 2, for the verification of seismic adequacy of each equipment identified, in view of the concerns identified in Items (b) and (c) above.

2. In Section 5.1.3 of Enclosure 1 to Reference 2, you indicated that bounding calculations were performed to address the seismic adequacy of the anchorage. State whether you followed the guidelines provided in Appendix C of the GIP-2 procedure in determining nominal allowable capacities and capacity reduction factors. Submit sample

**ENCLOSURE**

calculations for each of the following anchor types: expansion anchor, welded anchor, cast-in-place bolt and headed studs, cast-in-place J-bolt; and grouted-in-place bolt, using the worst-case bounding anchorage evaluations for various equipment classes (MCC, switchgear, transformers, distribution panels, battery chargers, electrical cabinets and mechanical equipment, etc.).

3. Indicate whether an anchor type, e.g., lead cinch anchor, not covered by the GIP-2 was used for SSEL equipment anchorage at Browns Ferry Nuclear Plant (BFN) Units 2 & 3 during the Unresolved Safety Issue (USI) A-46 walkdown. If yes, how did you resolve the issue?.

4. You indicated in Appendix E of Enclosure 1 to Reference 2 that an anchorage evaluation was performed for equipment (CRD/hydraulic control unit, I.D. Nos. 2-HCU-85,1-185 and 3-HCU-85,1-185), which was not specifically addressed by the GIP-2. Provide detailed information (equipment dimension, anchorage type and dimension, etc.) with your evaluation for the verification of seismic adequacy of this equipment and anchorage.

5. In Section 6.1.1 of Enclosure 1 to Reference 2, you stated that no large vertical flat-bottom tanks are on the BFN Seismic Review SSEL. Since USI A-40 is a part of USI A-46 for BFN, clarify whether this statement is still true. If not, provide the resolution of these large vertical flat-bottom tanks for closure of USI A-40. Indicate whether you used the SMA methodology described in the Electric Power Research Institute NP-6041 report for the resolution of tanks and heat exchangers. The staff has noted that the SMA methodology is known to yield analytical results which may not be as conservative as those obtained by following the GIP-2 guidelines, hence, it is generally not acceptable for the USI A-46 program. Describe the extent to which the method was used in your USI A-46 program. For each deviation from the GIP-2 guidelines, in situations where the margin methodology is utilized, identify the nature and the extent of the deviation, and provide a technical justification for its acceptance.

6. You indicated in Section 6.1.2 and Appendix H-2 of Enclosure 1 to Reference 2 that a heat exchanger (Equipment I.D. No. 3-HEX-74-900D) was not covered by the GIP-2 procedure and was classified as an outlier. Provide, for staff review, the calculation (Calc. 50147-C004) for the resolution of the outlier. Provide also the information concerning the seismic adequacy of the following tanks, including the Screening Evaluation Work Sheets (SEWS) for each item: (1) CAD/Nitrogen tanks, (2) DG 7-day fuel oil tanks, and (3) diesel generator starting air receivers.

7. The GIP-2 procedure recommended that the licensee perform a limited analytical evaluation for selected raceways and cable trays. The procedure recommended that when a certain cable tray system can be judged to be ductile and if the vertical load capacity of the anchorage can be established by a load check using three times the dead weight, no further evaluation is needed to demonstrate lateral resistance to vibration from earthquakes.

a) Provide descriptions of typical configurations of your ductile raceways (dimension, member size, supports, etc.).

b) Discuss the configuration of raceways and cable trays that are outside of the experience data, and provide an estimate of the percentage of these installations with respect to the whole population of raceways. Discuss your approach for the evaluation and disposition of these installations.

8. Section 7.3 and Appendix I-2 of Enclosure 1 to Reference 2 presents cable tray and conduit raceway outliers and their resolutions. Provide calculations for the following outliers: #19-02, #44-01, #22-03 and #35-01.

9. If thermal-lag panels are attached to a cable tray system, discuss how the changes in weight have been incorporated in the GIP evaluation of these systems and their supports.

10. In Appendix C of Enclosure 1 to Reference 2, there are equipment items designated as "ROB" class, which were seismically verified using the "rule of box" as outlined in GIP-2. Identify which "Box" each of the following equipment items belongs to and provide, for staff review, the evaluation performed to determine the seismic adequacy of each item, including mounting and/or anchorage evaluations:

| | SSEL No. | Equipment I.D. | Description |
|---|---|---|---|
| a. | 1018 | 2-FT-74-50 | RHR LOOP I Flow Transmitter |
| b. | 1018 | 2-BKR-402 | RHR LOOP I Flow Indicator Breaker |
| c. | 3053 | 2-LT-3-58B | RPV Level Transmitter |
| d. | 3065 | 2-NM-92-7/41A | Channel "A" IRM Indicator |
| e. | 9168 | 2-PX-64-67B | Power Supply (PNL 2-9-19; Supports 2-PL-64-67B) |
| f. | 9393 | 2-AMP-092-0007/41A | IRM CH. "A" Voltage Preamplifier 7-34A |
| g. | 33055 | 3-XR-64-159 | Torus and Drywell Pressure Instrument |

11. Appendix F-1 of Enclosure 1 to Reference 2 provides a list of instances where a special exception to enveloping the seismic demand spectrum is used, i.e., the seismic capacity spectrum of an equipment envelops the seismic demand spectrum only at, and above, the conservatively-estimated lowest natural frequency of the equipment. In Section II.4.2.1 of the staff's Supplemental Safety Evaluation Report No. 2 (SSER-2) dated May 22, 1992, the staff provided some cautions with regard to the use of this

exception. Submit, for each of the following sample equipment items, (1) descriptions of the equipment including, at the least, the dimensions, internal components, mounting or anchorage conditions, and special features, (2) comparison of seismic capacity spectrum with the seismic demand spectrum, (3) natural frequencies of the equipment including equipment assembly, subassemblies, door panels, internal structures and components as applicable, and how they were estimated, (4) justification of the adequacy of partial enveloping of the demand spectra, and (5) SEWS sheets:

| | SSEL No. | Equipment I.D. | Description |
|---|---|---|---|
| a. | 9028 | 2-BDBB-268-002E | 480 RMOV BD 2E |
| b. | 9020 | 2-BDBB-231-0002A | 480 SHDN BD 2A |
| c. | 9014 | 0-BDAA-211-000C | 4KVSHDNBD C |
| d. | 9006 | 2-XFA-253-0002A1 | 480V-120/280V XFMR FOR I&C BUS 2A |
| e. | 9285 | 2-JBOX-268-5991 | MG SET 2DA CONTROL STATION (2-HS-268-0002DA) |
| f. | 9406 | 2-CHGD-283-A1-2 | 24V NEUTRON BATTERY CHARGERS A1-2 |
| g. | 9305 | 2-LPNL-925-247A | LOCAL PANEL 2-25-247A (CAD DRYWELL & SUPP. CHAM. V.) |
| h. | 9040 | 2-PNLA-009-003A | PANEL 9-3A |
| I. | 39117 | 3-PNLA-009-0005 | REACTOR CONTROL PANEL |
| j. | 39216 | 3-LPNL-925-655A | DIV1 LOAD SHED LOGIC PANEL |

12. In Appendix F-2 of Enclosure 1 to Reference 2, SSEL Item Nos. 9119, 9122, 9125, and 9128 (250 V Battery SB-A, B, C, and D) are batteries with multi-tiered racks. You concluded that these batteries on racks met the intent of GIP-2 caveat GR4 for batteries on racks even though the GIP-2 caveat limits the applicability of Generic Equipment Ruggedness Spectra only for batteries supported on two-step or single-tiered racks with longitudinal cross-braces. The items should have been identified as outliers and resolved accordingly. The footnote indicated that these racks are represented in a portion of the seismic experience database. Provide, for staff review, the documentation of this seismic experience database, and justify the seismic adequacy of these battery racks and the batteries at BFN, taking into account the potential amplification through the racks to the center of gravity of the batteries. Also submit the SEWS for these items.

13. Appendix G of Enclosure 1 to Reference 2 provides a summary of outliers and resolution methods for mechanical and electrical equipment. Submit, for staff review, the detailed resolution documentation including SEWS sheets for the following sample items:

| | SSEL No. | Equipment No. | Description |
|---|---|---|---|
| a. | 39008 | 3-BDBB-268-003A | 480 V RMOV BOARD 3A |
| b. | 9160 | 0-XFA-082-000AA | DG-A Neutral Grn XFMR |
| c. | 1004 | 2-PMP-74-5 | RHR/Pump 2A |
| d. | 3001 | 2-FCV-1-14 | MSIV "A" Inboard Iso Valve |
| e. | 39202 | 3-PNLA-082-0003C | DG 3C Elect. Control Cabinet |
| f. | 39204 | 3-PNLA-925-0031 | Local Panel 3-25-31 |

14. In your response (Reference 3) dated January 19, 1993, to NRC request for additional information dated November 19, 1992, you stated in Item No. 6, that Tennessee Valley Authority did not intend to change the licensing basis for BFN, Units 1, 2, and 3, prior to the receipt of the NRC staff's plant-specific safety evaluation. However, in your Amendment No. 10, dated July 22, 1993, to the BFN Final Safety Analysis Report (FSAR), you have revised your licensing basis to use the guidelines and criteria of USI A-46 and associated Seismic Experience Database as an alternative method of equipment seismic qualification (Paragraph C.6.3.3 of Appendix C to Updated FSAR dated July 22, 1993). As of the date of this letter, the staff has not issued its final SE on the USI A-46 implementation at BFN. The staff is unaware whether the GIP-2 procedure has been employed by TVA in actually making a change to the facility outside the scope of USI A-46.

In order for the staff to complete its review of USI A-46 implementation at BFN, the staff requests that you (1) submit, for staff review, the complete documentation associated with your 10 CFR 50.59 evaluation for carrying out the FSAR changes for seismic qualification of equipment at BFN, and (2) identify any actual change to the system or components outside the scope of USI A-46, or any replacements and new equipment items for the facility using the approach described in Paragraph C.6.3.3 of Appendix C to the Updated FSAR dated July 22, 1993.

REFERENCES:

1. Letter, TVA to NRC, "Browns Ferry Nuclear Plant - Supplement 1 to Generic Letter 87-2, Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue A-46 and Supplement 4 to Generic Letter 88-20, Individual Plant Examination of External Events for Service Accident Vulnerabilities," dated September 21, 1992.

2. Letter, TVA to NRC, "Browns Ferry Nuclear Plant - Units 2 & 3 - Generic Letter 87-02, Supplement 1, Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue A-46 and Generic Letter 88-20, Supplement 4, Individual Plant Examination of External Events for Service Accident Vulnerabilities - Submittal of Seismic Evaluation Reports," dated June 28, 1996.

3. Letter, TVA to NRC, "Browns Ferry Nuclear Plant - Units 2 & 3 - Generic Letter 87-02, Supplement 1, 120-day Response, Request for Additional Information," dated January 19, 1993.