October 2, 2001

Mr. J. A. Scalice
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Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
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SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION RE: TRITIUM PRODUCTION PROGRAM INTERFACE ISSUES 1, 6, 7, 10, 11, and 12 (TAC NO. MB1884)

Dear Mr. Scalice:

The Nuclear Regulatory Commission staff is reviewing Mr. P. L. Pace's letter of May 1, 2001, containing Westinghouse's Report NDP-00-0344 on Watts Bar's Tritium Production Program. We need additional information to complete our review. I discussed the enclosed Request for Additional Information with Mr. Chardos, Tennessee Valley Authority's Tritium Program Manger, and he agreed to respond to this request by October 30, 2001. Please contact me if you have any questions.

Sincerely,

/RA/
L. Mark Padovan, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Request for Additional Information

cc w/ enclosure: See next page

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Request for Additional Information

Tritium Production Program Interface Issues 1, 6, 7, 10, 11, and 12

Watts Bar Nuclear Plant, Unit 1

Docket No. 50-390

Report Section 1.5.1, Interface Issue 1, Handling of Tritium-Producing Burnable Absorber Rods (TPBARs)

1) Tennessee Valley Authority (TVA) states that a preliminary design of the TPBAR consolidation fixture is complete.

   a) Please elaborate on the "preliminary design" and what changes are anticipated, if any. What is the weight of the consolidation frame?

   b) TVA states that it will test the consolidation fixture and tools prior to delivery and after installation at the site. Please describe the testing process to be used to ensure proper operation at the site.

   c) What contingency plans will TVA use in the event a rod becomes stuck in the fixture before placing it in the canister?

   d) Figure 3.2-4 shows that a crimp sleeve secures the TPBAR upper end plug to the baseplate. Describe the TPBAR removal tool and process used to break this crimp.

2) TVA states that it will handle the TPBARs in the spent fuel pool using the burnable poison rod assembly tool. What is the weight limitation for this tool?

3) Section 3.7.3 describes two possible shipping cask designs, and states that TVA will provide information later.

   a) For the casks being considered, what is the loaded weight of the shipping cask which TVA will use to transfer the canisters from the spent fuel pool (SFP)?

   b) How many canisters are shipped per cask?

4) TVA states that the consolidation process will begin 30 days after completion of refueling. How long does it take to complete consolidation, cask loading, and handling operations?

5) TVA says that Section 2.15.6.6 addresses the consequences of a breached TPBAR as a result of mishandling in the SFP. This section is not complete. Please provide a summary of the conclusions from this study, including any assumptions not addressed in this report.

ENCLOSURE

6) TVA states that the 125-ton auxiliary building crane “is considered equivalent single-failure proof” when handling the TPBAR transport cask.

   a) NUREG-0612 indicates a single-failure proof crane, must meet the requirements of NUREG-0554 and NUREG-0612. Does the auxiliary crane at Watts Bar meet all these requirements?

   b) If not, then Sections 5.1.1 and 5.1.2 of NUREG-0612 provide specific guidelines which must be met. Does Watts Bar comply with each of these? If not, what exceptions does TVA take?

   c) TVA says that the consolidation fixture will normally be stored in the cask lay-down area when not in use. NUREG-0612, Section 5.1.1 discusses general guidelines to minimize the potential impact of heavy loads on spent fuel stored in the pool. Enclosure 2 states that TVA takes precautions when handling the fixture and cask due to the close proximity to the fuel. What special precautions does TVA take to minimize this potential (e.g., shuffling fuel such that none are stored adjacent to the cask handling area)?

7) What is the licensed storage capacity of the SFP, and the current inventory of spent fuel assemblies?

8) TVA states that it will handle the cask in accordance with NUREG-0612. Please verify that TVA will comply with the guidelines of NUREG–0612 Section 5.1.1 (e.g., operator training, crane inspection and maintenance, and safe load paths).

<u>Report Section 1.5.6, Interface Issue 6, Specific Assessment of Hydrogen Source and Timing or Recombiner Action</u>

1) This section states a time to start a hydrogen recombiner train at 3% containment volume concentration:

   a) Is this recombiner start time controlled by technical specifications (TSs) or an emergency operating procedure?

   b) At what time after initiation of a design basis accident is it necessary to start a recombiner train for a non-TPBAR core to keep the containment hydrogen concentration below 4%? This may be shown on Figure 6.2.5-7a.

2) The submittal shows that amount of Zr available for a metal-water reaction appears to be 300 grams per TPBAR. Does this amount include any Zr present in the burst node volume from the Zircaloy liner? Additionally, if the lithium aluminate pellets are also part of the burst node volume, has TVA considered the potential chemical reactions of the lithium with reactor coolant to produce hydrogen?

<u>Section 1.5.7, Interface Issue 7, Light-Load Handling</u>

Similar to the description used for the auxiliary crane, the spent fuel bridge crane is described as “single-failure proof equivalent.” Elaborate on this description. What is the load limit for the bridge crane?

Section 1.5.10, Interface Issue 10, New and Spent Fuel Storage

1) Enclosure 2, Section II.1, states that the SFP racks are seismically qualified to store loaded canisters. Is there any restriction regarding how many loaded canisters can be stored in a rack?

2) Enclosure 2, Section II.2, discusses the heat produced by the consolidated TPBARs in a canister, and the slots located on the bottom and sides of the canister for natural circulation. Does the canister design account for blockage of these slots, and if so, what percentage of the slots can be blocked and still provide adequate heat dissipation?

3) Provide the analysis supporting the assumption that all the neutronics characteristics of the fresh fuel containing TPBARs which affect vault criticality are conservatively bounded by the fuel assemblies included in the current new fuel storage vault criticality analysis.

4) Provide the re-analysis of the spent fuel storage racks for fuel containing TPBARs including the basis for taking credit for integral fuel burnable absorber and fuel burnup.

5) Provide the basis for concluding that the storing fuel containing TPBARs does not require changes to the TSs.

Section 1.5.11, Interface Issue 11, Spent Fuel Pool Cooling and Cleanup System

1) TVA states that it will perform outage-specific decay heat analysis for each outage (non-scenario based) rather than use the U.S. Nuclear Regulatory Commission (NRC) approved scenario-based approach.

   a) The NRC Standard Review Plan (SRP) 9.1.3 recommends the SFP bulk water temperature be kept below140°F with a single failure for the maximum normal heat load. However, Table 1.5.11-1 refers to159.24°F as the maximum SFP temperature: Please explain how this temperature is selected.

   b) The NRC SRP 9.1.3 recommends that the SFP cooling system should have the capacity to remove the decay heat from one full core and one refueling load after 36 days of decay (i.e., emergency full core offload) without SFP bulk water boiling (single failure need not be considered). How does the non-scenario-based approach address this recommendation?

   c) Please provide an analysis showing (describe) how the maximum SFP temperature is calculated given the decay heat, heat exchanger fouling factors and component cooling system (CCS) temperature. Please list major assumptions if any (such as a single failure assumption.)

2) TVA refers to “an alternate method,” which allows varying heat exchanger fouling and varying SFP heat exchanger coolant (CCS) temperature to perform thermal balance on the SFP. Please provide the following additional information regarding this method:

a) In Sections 1.5.8 and 1.5.9, TVA states that the increase in allowable decay heat associated with the reduced SFP heat exchanger fouling factors and lower CCS temperatures is approximately 10 MBTU/hr. However, Table 1.5.11-1 shows the maximum allowable decay heat load is varied by 14.8 MBTU/hr (32.6 – 47.4). Please explain this discrepancy.

b) Is the maximum allowable decay heat load shown in Table 1.5.11-1 (e.g., 47.4 MBTU/hr) the decay heat at the beginning of core offload, or is it the peak decay heat in the SFP during the core offload operation?

c) In the subsection "Results of Alternate Analysis," TVA states that "series of curves have been developed to provide operator guidance for an increase in allowable SFP decay heat." What criteria were used to determine the allowable decay heat for the given heat exchanger fouling and CCS temperature when preparing the curves? Is each point in the curves the maximum decay heat which would maintain the SFP temperature below 159.24°F for the given heat exchanger fouling and CCS temperature? Please provide this graph.

d) Please explain the procedures for operators to determine the heat exchanger fouling and CCS temperature for each outage. Are these procedures currently in place?

e) How does the alternate method account for the time to boiling, SFP heat-up rate, boil-off rate, etc? How is it assured that the each point in the curve meets the NRC SRP guidelines for these parameters?

3) Table1.5.11-1 shows the average time to SFP boiling, average SFP heat-up rate, and average boil-off rate.

a) Please explain "average" (i.e., what quantities are averaged?).

b) Please explain why "average" is a more appropriate quantity to be presented in this table rather than the minimum time to SFP boiling, maximum SFP heat-up rate, and maximum boil-off rate?

c) When is time zero when the "time to boiling" and "time until 10 feet of water" are calculated (e.g., are they calculated from the time of loss of cooling)?

d) When is the loss of cooling assumed to occur (e.g., at the peak SFP temperature)?

4) Table1.5.11-1 refers to the make-up rate of 55 gpm, while the calculated boil-off rate is 102 gpm. In view that the boil-off rate exceeds the make-up rate, please list various sources of other make-up water available which can be aligned to the SFP, their make-up rates, and time required to align them to the SFP. Please also explain whether any operating procedures are in place to align these water sources to the SFP under this circumstance.

5) On page 1-37 ("Component Cooling System Maximum Water Temperature"), TVA states that "By the time the core will be completely off-loaded (about 136 hours after shutdown), the residual heat removal heat load is essentially zero, and that the CCS temperature

would be less than the maximum design temperature, 95°F." What value of the CCS temperature is used between these times (between beginning and end of the core off-load) - is the CCS temperature varied or constant during this period?

Section 1.5.12, Interface Issue 12, Component Cooling Water System

1) In the sub-sections "Tritium Impact on Spent Fuel Pool Decay Heat" of Section 1.5.8 (Station Service Water System) and Section 1.5.12 (Component Cooling Water System [CCS]), TVA referred to "a quantitative analysis of expected spent fuel decay heat." Please provide this analysis or a summary of the analysis, which should include the scenarios evaluated, the methodology, the code used, important assumptions and results.

2) In the sub-sections "Increased Spent Fuel Pool Cooling Heat Rejection" of Section 1.5.8 and Section 1.5.9 (Ultimate Heat Sink [UHS]), TVA says that "the increase in decay heat load is well within the design bases limiting heat load imposed on the ERCW [Essential Raw Cooling Water] (UHS) during other modes of operation," and "the increased heat load rejection to the CCS will not result in a significant temperature increase in ERCW (UHS)."

   a) Please provide the design heat load of the ERCW, UHS and CCS.

   b) Please provide the overall heat load to the ERCW, UHS and CCS from all sources during the refueling outage period for the tritium production cores (TPCs) and non-TPCs (peak heat load or as a function of time) with the proposed increase of heat load associated with the reduced heat exchanger fouling and lower CCS temperature.

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