April 6, 1994

Docket Nos. 50-390
and 50-391

Mr. Oliver D. Kingsley, Jr.
President, TVA Nuclear and
Chief Nuclear Officer
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

Dear Mr. Kingsley:

SUBJECT: WATTS BAR NUCLEAR PLANT - REQUEST FOR ADDITIONAL INFORMATION RELATING TO FSAR CHAPTER 11, RADIOACTIVE WASTE MANAGEMENT (TAC NOS. M87197 AND M87198)

We have completed our review of FSAR Chapter 11, as updated by Amendment 77. The chapter addresses liquid, gaseous and solid radioactive waste management systems, and process and effluent monitoring and sampling systems. Based on our review, we find that TVA has made significant changes to the radwaste management systems. Consequently, we will revise our safety evaluation documented in the Watts Bar SER (NUREG-0847) and Supplement 4. Our evaluations in Supplements 5, 6, and 10, which deal with TMI items II.F.1(1), II.F.1(2) and III.D.1.1, do not require any change.

Based on our review we have prepared the enclosed request for additional information (RAI). We propose that your staff discuss the RAI with us either in a conference call or a meeting, before TVA formally responds to the RAI.

This requirement affects nine or fewer respondents and, therefore, is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerely,

Original signed by

Peter S. Tam, Sr. Project Manager
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Enclosure:
Request for Additional Information

cc w/enclosure:
See next page

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION
AMENDMENT 77 TO WATTS BAR NUCLEAR PLANT FSAR
CHAPTER 11, RADIOACTIVE WASTE MANAGEMENT

1. Radionuclide specific activities in the secondary coolant given in Final Safety Analysis Report (FSAR) Table 11.7-1 do not account for iodines, Cs and Rb and others going preferentially with the pumped forward fraction of the main steam flow (i.e., the fraction of steam flow that is directly pumped forward to the feedwater). Therefore, these values are non-conservative. Correct these as appropriate (see footnote on Page 2-8 of NUREG-0017, Rev. 1). For example, I-131 specific activity should be 2.56×10^{-6} μCi/gm in the secondary coolant (water) and not 1.41×10^{-6} μCi/gm as given in Table 11.1-7.

2. Provide a detailed discussion of how the liquid, gaseous and solid waste management systems meet Regulatory Guide (RG) 1.143, Positions C.1 through C.5 (the text provides very little information on the waste management systems' compliance with RG 1.143).

3. Resolve the following inconsistencies among FSAR tables relating to thermal power level (MWT), reactor coolant mass (lb.) and shim bleed rates (gpd). These parameters are used for calculating radionuclide source terms in the primary reactor coolant.

	FSAR TABLES			
	11.1-1	11.1-6	11.2-1	11.3-8
a. Thermal Power Level	3579	3582		
b. Reactor Coolant Mass	5.2×10^5	5.4×10^5		5.02×10^5
c. Shim Bleed Rate		2433.6	1332	

4. Regarding the liquid waste management system, provide information on the following:

   a. The collection and process times given for the various liquid waste streams in FSAR Table 11.2-1 do not seem to be based on NUREG-0017, Rev. 1 methodology for computing such times. Revise these times, as appropriate, or explain the basis for the values given in the table.

   b. Explain the basis for the floor drain waste generation of 7493 gpd per unit given in FSAR Table 11.2-1, which is much higher than the expected generation of the wastes as given in NUREG-0017, Rev. 1, Table 2-26, which is based on industry standards.

   c. Explain the basis for the regeneration time of 46.6 days implied by the data given in Table 11.2-1 (Regeneration Waste 2.13×10^6 gal/yr) and FSAR Section 10.4.6.2 (10 condensate regenerant polishing demineralizers for 2 units). The staff finds the above regeneration time compares with the regeneration time of 6 days calculated by using NUREG-0017, Rev. 1 methodology.

d. Include the mobile demineralizer system components and CVCS monitor tank in Table 11.2-3.

e. Explain why the CVCS monitor tank is not included in the list of equipment provided for tritiated water processing (see Page 11.2.3). Also, clarify whether the tritiated drain collector tank collects the flow from reactor coolant drain tank (equipment drains) and CVCS letdown (shim bleed) in addition to the clean wastes (840,000 gal/yr).

f. Explain why the two holdup tanks, each of capacity 126,000 gallons (shown in Figure 11.2-2), are not included in Table 11.2-3 and in the list of equipment provided for tritiated water processing. Clarify whether normally the reactor coolant drain tank contents and CVCS letdown are collected in the above holdup tanks.

g. Explain the functions provided by waste condensate tanks and cask decontamination collector tank in non-tritiated water processing.

h. Clarify whether the liquid waste releases provided in Table 11.2-7 take credit for possible processing of various liquid waste streams (tritiated wastes, floor drains and regenerant wastes) for Unit 2 by the condensate demineralizer waste evaporator.

i. Clarify whether the liquid waste management system includes design features to recover boric acid by appropriate processing of borated wastes. If it includes such design features, identify them.

j. Provide minimum dilution available for liquid radwaste discharges (FSAR Section 11.2-8 information is non-quantitative and is, therefore, inadequate).

k. Provide a cost-benefit analysis to demonstrate that the liquid waste management system complies with applicable 10 CFR 50, Appendix I, requirements.

l. Assuming primary coolant source terms corresponding to 1 percent of core inventory, show that the sum of the ratios of annual average concentrations of radionuclides in liquid effluent in any unrestricted area to their respective effluent concentration limits given in 10 CFR 20, Sections 1001-2402, Appendix B, Table 2, Column 2, does not exceed 1.

5. The staff has the following concerns with respect to liquid effluents given in Table 11.2-7:

   a. The table does not sum up the releases given in seven columns of the table to give the total release for each radionuclide.

   b. The staff's calculation shows more than 20 Ci/yr of liquid release for the 2 units. This is about 2 orders of magnitude higher than the calculated value, 0.022 Ci/yr, given in NUREG-0498, Final

Environmental Statement (FES) for Watts Bar Units 1 and 2, December 1978. In this context, the staff notes that a survey of all the operating PWR's in the U.S. during the period 1981-1990 shows that no more than 50 percent of the reactors release more than 1 Ci/yr in any 1 year; no more than 27 percent of the reactors release more than 2 Ci/yr in any 1 year; and very few reactors, if at all, release more than 5 Ci/yr. The staff further finds that the operating experience with TVA's Sequoyah plant reinforces the above findings. For the above reasons, the staff cannot understand why TVA currently expects that the liquid effluent for Watts Bar would be substantially higher than what TVA anticipated for the plant in the late seventies, or what operating PWR's indicate.

c. FSAR Table 11.2-1 assumes that the steam generator blowdown is released without processing. This seems to contradict FSAR Section 10.4.6.1.

d. The staff finds a lot of liquid waste processing equipment (Tables 11.2-1 and 11.2-3) provided for the two units are grossly undersized or inadequate in comparison with industry practice. For example, the reactor coolant drain tank, floor drain collection tank, high-crud low conductivity tank and neutralization tank provided for two units have limited capacity compared to the expected waste generation they are to collect and hold for processing. Further, the mobile demineralizer system is inadequate. The staff had previously accepted the limited capacity of the processing equipment mentioned above (SER for Watts Bar, NUREG-0847, June 1982), because the condensate demineralizer waste evaporator was then identified as available for processing the various liquid waste streams for both the units. With the proposed deletion of the evaporator usage for Unit 1 and preferred avoidance of the evaporator usage for Unit 2, there is need to upgrade the processing equipment. The staff considers that this can be achieved by increasing the quantity and size of all the collection and sample tanks (this will increase the process time), and providing a demineralizer system that consists of at least one special ion bed, one cation bed and two mixed beds in series (this will enhance the capability for radioactivity removal from liquid streams).

e. Table 11.2-1 does not give any discharge fraction for the various liquid waste streams, and, therefore, implies that there will be no recycling of processed waste streams. This is at variance with industry practice.

f. Table 11.2-3 shows that the high-crud low conductivity pump (used for recirculating the waste) flow rate is 150 gpm whereas the flow rate for most of the other pumps is 100 gpm. Note that this high flow rate decreases the processing time for the subject wastes.

g. Neither Section 11.2 nor Table 11.2-7 adequately deals with the disposition of radioactive turbine building drains (Section 11.2.6.4.2 information is inadequate).

h. Table 11.2-7 does not include the adjustment factor of 0.16 Ci/yr per reactor to account for unplanned liquid waste releases (see NUREG-0017, Rev.1, Section 2.2.23.1).

Please resolve all the above concerns.

6. Regarding the gaseous waste management system, provide information on the following:

   a. Explain the basis for the calculated decay time of 60 days for noble gases in the waste gas decay tanks (see NUREG-00017, Rev. 1, Page 1-26 for the methodology for calculating the decay time).

   b. Identify the containment purge parameters used to determine the containment purge releases included in Table 11.3.9 (Table 11.3-8 information is inadequate. See pages 3-7a of NUREG-0017, Rev. 1 for the type of containment purge and internal cleanup information required to determine containment purge releases).

   c. Discuss in detail how the charcoal adsorbers and HEPA filters provided to reduce gaseous releases to the environs meet the guidelines of Regulatory Guide 1.140.

   d. The staff finds that Table 11.3-8 consistently uses the highest normalized iodine release rates given in NUREG-0017, Rev. 1 tables rather than the average rates given in these tables, for calculating iodine releases via gaseous effluents for Watts Bar. The staff finds that this conservative assumption, in turn, overpredicts the iodine releases that can be expected during normal plant operation including shutdown. Please recalculate the iodine releases using realistic normalized release rates given in NUREG-0017, Rev. 1.

   e. Assuming primary coolant source terms corresponding to 1 percent of core inventory, show that the sum of the ratios of the annual average concentrations of radionuclides in gaseous effluent in any unrestricted area to their respective effluent concentration limits given in 10 CFR 20, Sections 1001-2402, Appendix B, Table 2, Column 1 does not exceed 1.

   f. Analyze the gaseous waste processing system (GWPS) failure using the assumptions given in BTP ETSB 11-5, "Postulated Radioactive Releases due to a Waste Gas System Leak or Failure," and show that the GWPS failure will not result in a 0-2 hour total body dose at the Exclusion Area Boundary in excess of 500 mrem. Please note that the GWPS failure analyzed previously (FSAR Section 15.5.2) is not sufficient, since the source terms and dose criterion to be used in the analysis are different as spelled out in ETSB 11-5.

   g. Discuss in detail, the design features in the GWPS to comply with General Design Criteria 3 as it relates to the protection of the system against the effects of an explosive mixture of hydrogen and oxygen. Specifically, discuss how the GWPS design meets the guidelines identified in SRP Section 11.3, Acceptance Criterion II.B.6.

h. Provide a cost-benefit analysis to demonstrate the gaseous waste management system (note that GWPS is only part of the gaseous waste management system) complies with 10 CFR 50, Appendix I.

7. Regarding solid waste management system (SWMS), provide information on the following:

   a. Provide expected annual shipment volumes of wet and dry wastes.

   b. The staff finds the single spent resin 300 cubic feet storage tank for the expected generation of spent resins form both the units to be grossly inadequate and contrary to industry practice. It is not clear whether the tank provided can accommodate storage of primary system spent resins generated at normal rates from both units for at least 60 days and other spent resins generated at normal rates from both units for at least 30 days (the above criteria are guidelines spelled out in BTP ETSB 11-3, Position, B.III.1). In this context, the staff notes that even Table 11.5-1 shows that the 2-month generation will be greater than 400 CF, which the staff considers to be an underestimation of expected generation based on operating plant experience. Provide sufficient storage capacity for spent resins to meet the guidelines referred to above.

   c. How will filter sludge be processed? Where will it be collected? Clarify whether the tank provided to accommodate filter sludge can accommodate at least 30 days of filter sludge generated at normal rates from both the units in accordance with above BTP guidelines.

   d. Discuss how the storage area provided for solidified waste meets the above BTP, Position B.III.2.

   e. Provide expected annual curie content of dry waste.

   f. Discuss in detail how the SWMS complies with 10 CFR 61 requirements.

   g. Discuss how the SWMS complies with 10 CFR Part 20, Section 20.1302 in so far as it relates to liquid and gaseous effluents to unrestricted areas that may result due to SWMS operation.

   h. State clearly that the process control program (PCP) developed for Watts Bar units will include the dewatering process for spent resins and filter sludge (the current FSAR writeup refers to PCP only in relation to mobile solidification systems; also it does not discuss the processing of filter sludge). Refer to the CNSI Topical Reports CNSI-DW-11118-01A, "CNSI Dewatering Control Process Containers Topical Report" and RDS-25506-01-P/NP-A, Revision 1, "RDS-1000 Radioactive Waste Dewatering System" in Section 11.5.3.1, since, by letter to NRC dated July 9, 1993, TVA has indicated that the dewatering process will be based on the above NRC approved topical reports.

i. Identify the NRC-approved topical report on which the mobile solidification system for Watts Bar will be based and include this information in Section 11.5.4.2.

8. Regarding process and effluent radiological monitoring and sampling system, provide information on the following:

   a. Identify the corrective action that will be taken on annunciation of high radiation alarm triggered by turbine building sump effluent monitor. Also, explain why no automatic termination of the discharge is provided on detection of high radiation by the subject effluent monitor.

   b. Identify all the liquid and gaseous process streams that will be sampled. Provide details of sampling of these streams (this question arises since the offsite dose calculation manual [ODCM] may not list sampling details for the process streams).

   c. Discuss in detail how the sampling provisions for Watts Bar meets the guidelines of SRP Section 11.5, Tables 1 and 2 as they relate to PWR's.

   d. Discuss tritium sampling provisions in gaseous and liquid effluent streams and include these in FSAR Section 11.4.

   e. Include in Tables 11.4-2 and 11.4-3 pertinent data (like what TVA has provided for condenser vacuum vent exhaust) for shield building vent exhaust low-range, mid-range, and high-range detectors (neither Table 11.4-2 nor the text specifies the detector types and other information on the detectors).