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Docket Nos. 50-390
and 50-391

Tennessee Valley Authority
ATTN: Mr. James E. Watson
Manager of Power
818 Power Building
Chattanooga, Tennessee 37401

Gentlemen:

In reviewing your application for a construction permit for the proposed Watts Bar Nuclear Plant, Units 1 and 2, we find that we need additional information to complete our evaluation of the proposed facility as described in your Preliminary Safety Analysis Report (PSAR). The additional information requested has been collected into groups which generally correspond to applicable PSAR section headings.

I would like to call to your attention a matter relating to the use of references in the PSAR. If a topical report, classified as proprietary, is to be used as a reference, it will be necessary to provide a nonproprietary summary of the report in compliance with our regulations (10 CFR Part 2, Paragraph 2.790(b).

We have not completed our review of the PSAR. Shortly, we will issue a further request for additional information covering other areas of the application.

We recognize that some of the information requested may be available in the public record in the context of our regulatory review of similar features of other facilities. If such is the case, you may wish to incorporate the information by reference in your application.

OFFICE ▶						Appl.
SURNAME ▶						LB
DATE ▶						

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Please contact us if you have any questions regarding the enclosed requests.

Sincerely,

Original Signed By
R. C. DeYoung

Richard C. DeYoung, Assistant Director
for Pressurized Water Reactors
Division of Reactor Licensing

Enclosure:
Request for Additional Information

cc:
Mr. Robert H. Marquis
629 New Sprankle Building
Knoxville, Tennessee 37919

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SURNAME ▶	PSCheck:ng	CGLong	RCDeYoung			
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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

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Sincerely,

Richard C. DeYoung, Assistant Director
for Pressurized Water Reactors
Division of Reactor Licensing

Enclosure:
Request for Additional Information

cc:
Mr. Robert H. Marquis
629 New Sprankle Building
Knoxville, Tennessee 37919

REQUEST FOR ADDITIONAL INFORMATION

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2

DOCKET NOS. 50-390 & 50-391

2.0 SITE AND ENVIRONMENT

2.1 Specify the point on the exclusion area boundary that presents the minimum exclusion distance. Specify the locations at which the limiting doses from normal effluents are expected which satisfy the requirements of 10 CFR Part 20.105. Identify the location of all gaseous effluent release points for normal operating conditions.

2.2 On page 2.2-1 you state that the access road passes within 1625 feet of the plant location and is used for access to recreational areas. Indicate the location and respective uses of these recreational areas.

2.3 Indicate the nature of barge and truck traffic past the site, in particular, any shipments of hazardous chemicals. Evaluate the consequences, if any, of the collision of river traffic with the intake structure.

2.4 Justify your exclusion of gross alpha analysis of particulate filters from your environmental monitoring program.

2.5 Tabulate the ten isotopes for which specific gamma scan analyses will be performed on air filters (Table 2.10-1). Specifically, will the analysis be performed for I-131? Will the gamma analysis be quantitative or qualitative?

2.6 Provide a basis for the proposed frequency of analysis of food crops, soil, and vegetation in your environmental monitoring program.

2.7 In the discussion of terrestrial monitoring on page 2.10-2 you state that thermoluminescent dosimeters will be used to measure environmental gamma radiation levels. How often will this be done?

2.8 Justify the omission of sampling of aquatic vegetation and biota and mussels at Station X (Table 2.10-2).

2.9 Describe in detail the instrumentation to be used in each phase of your environmental monitoring program. Include instrument type, sensitivity, range, and type and location of readout.

2.10 Provide a detailed description of proposed sampling techniques. Provide at least as much information as is included in the Environmental Statement.

2.11 Flood protection of safety-related facilities is of major concern at the site because of the proximity of Watts Bar Dam. A seismically or hydrologically induced failure of the dam may be postulated unless it can be proven that the structure can withstand a probable maximum flood (PMF), severe earthquake, or a reasonable combination of flood and earthquake. The ability to withstand a PMF (as defined by the Corps of Engineers), and the postulated failure of Watts Bar Dam are discussed in the PSAR. However, to allow an independent analysis to be made of the vulnerability of safety-related components to flooding provide the following:

2.11.1 Provide verification of the hydrologic model used to determine the PMF. The verification could be in the form of comparative hydrographs for at least two historical storms at two basin locations that depict actual and simulated runoff hydrographs. Also provide a table or description that summarizes routing coefficients used to compute the PMF. Summarize, either in a tabulation or graphically, the reservoir inflow-outflow-storage relationships used. Describe reservoir regulation assumptions made for all the gated upstream reservoir structures in the PMF determination.

2.11.2 Wind induced set-up and waves may readily be assumed coincident with any reasonably severe flood. Provide an estimate of the set-up, wave height and runup which could be expected on both the upstream face of Watts Bar Dam and at the plant site concurrent with the PMF maximum reservoir level for a sustained wind speed of 45 mph from the most critical direction. If the estimated statistical 1% wave in the spectrum of anticipated waves would cause runup over Watts Bar Dam, discuss the ability of the structure to withstand such an occurrence.

2.11.3 The ability of Watts Bar Dam to withstand severe earthquakes without causing a loss of any nuclear power plant safety functions may be demonstrated in either of two ways; either by showing in detail that the dam can withstand severe earthquake induced stresses, or by proving its arbitrarily assumed failure would not cause a loss of safety-related functions. The PSAR indicated the assumption was made to postulate the arbitrary failure of the dam, but a detailed analysis of the effects on safety-related structures and equipment was not presented. Substantiate that sufficient protection will be provided to safety-related structures and equipment to prevent a loss of function due to the static and dynamic effects of the postulated failure.

2.11.4 The discharge-elevation relationship at the site is a function of both the flow rate and Chickamauga Reservoir level, as well as the local flood plain geometry. Describe in detail the method used to determine high water levels at the site, and provide verification of the method by demonstrating the analytical reproduction of historical flood levels.

2.12 For analyses of accidental liquid releases, what low, intermediate and high dilution and dispersion characteristics can be assumed for the Tennessee River between the site and water supply intakes as far downstream as the Chattanooga facilities?

2.13 Provide a low flow-elevation relationship, its basis, and describe the corresponding minimum intake pump submergence criteria to assure a dependable cooling water supply. If the low flow-elevation relationship at the intake would be affected by Chickamauga Reservoir, estimate a similar "open river" relationship, i.e., assume the absence of Chickamauga Reservoir. It is noted that sufficient pump submergence should be provided to assure a dependable water supply during a very severe drought.

2.14 What steps will be taken to assure that the proposed intake channel will not be silted-in during a flood? What precautions will be taken to assure the channel will not be silted gradually?

2.15 What local storm drainage facilities will be provided, and what will be their hydrologic design basis? Would a local PMF cause flooding of plant structures and the loss of function of any safety-related structures or equipment? Provide typical cross sections and top elevations of the proposed holding pond dikes. If the pond is at a higher elevation than any safety-related structures or equipment, describe the hydrologic engineering design criteria for the holding pond.

2.16 Provide the location, depth, water elevation, casing size and maximum pumping capability of all local wells within 2 miles of the site. Provide the depth, water elevation, casing size and maximum pumping capability of public water supplies numbered 4, 9, and 21 in Table 2.7-1. Provide similar information for any proposed site wells. Present anticipated horizontal and vertical permeabilities expected in site surface and underlying soils. Are there any springs within 2 miles of the site that are presently utilized for water supply, or could be in the future? Will all subsurface explorations be sealed to eliminate potential pathways to subsurface ground water resources?

2.17 Provide a joint frequency distribution of wind direction and wind speed by representative vertical temperature difference (stability) classes for the 7-month period of record during 1951 at the site using wind measured at the 150-foot level and vertical temperature difference between the 4- and 150-foot levels. Compare these joint frequency data to similar Oak Ridge records (X-10 for instance) taken at the same time and also over a 1-year period of record that includes this 7-month period.

2.18 Provide more details about your onsite meteorological program. Include the installation and operational dates, location of tower(s), location of instruments, type and characteristics of the instruments, method(s) of recording and processing of data and type of data analysis.

5.0 STRUCTURAL AND CONTAINMENT DESIGN

5.1 The description of the loads that will be acting upon the analytical model for the base slab are partially described on page 5.1-81 of the PSAR. The description does not address how the effects of the ice compartment inner walls, that support the polar crane, and how the effects of the equipment loads will be imposed on the model. Describe how these forces will be utilized in the analysis so as to more nearly represent the actual structure and its loadings.

5.2 Provide references or sufficient details on the analytical methods that will be used to determine the internal forces at the various locations of the divider barrier.

5.3 Describe the analytical method to be used in the analysis of the divider barrier under loads resulting from localized pressure build-ups and indicate how these results will be incorporated into the design.

5.4 Table 5.1.2-2 does not indicate what allowable value will be used for shear stress in the concrete. Indicate the allowable shear stress or describe the method of shear transfer that will be used for the divider barrier.

5.5 The section of the PSAR related to the design analysis of the shield building does not describe the structural analysis technique(s) that will be utilized to determine the internal forces imposed on the structure. Describe these techniques.

5.6 In order to evaluate the structural configuration and adequacy of the intake pumping station, additional information in the form of plans, elevations, and sections should be submitted.

5.7 Indicate the methods of analysis that will be used to determine the internal forces (e.g., member section axial, shear and moment forces) for the Class I structures other than containment.

5.8 Provide the details of the anchorages for the hatches in the operating deck and the removable slabs over the reactor cavity. In addition, state what the maximum loads will be on these components.

5.9 Figure 5.1.2-9 of the PSAR illustrates the detail of the steel cylinder to foundation connection and the bottom liner plate. Indicate the sequence of construction of the various components and concrete lifts that are shown in the figure.

5.10 Indicate the program of sampling for fresh concrete that will be used. ASTM C-172 does not indicate the sampling location except to state that it is normally performed as the concrete is delivered from the mixer of the conveying vehicle. Provide information on the type of concrete delivery systems to be used, such as a central mix plant with agitator trucks, conveyors and pumps or other combinations in order to permit an evaluation of the adequacy of the systems and controls exercised to assure the quality and proper placement of the cast-in-place concrete. Indicate at what location the concrete compression and slump test samples will be taken during construction.

5.11 Since fly ash concrete will be used, furnish typical chemical analyses of the fly ash and demonstrate that any deleterious substances such as sulphides and chlorides which may facilitate corrosion will not, in the quantities in evidence, increase the probability of the degradation of the reinforcing steel.

5.12 Present additional information on the specific quality control procedures defined in the specification entitled, "General Construction Specification G-2 for Plain and Reinforced Concrete." In particular define the tests, frequency of test, and other pertinent details related to user testing of reinforcing steel. Substantiate the desirability and the level of assurance gained by testing the concrete only in each 400 cubic yards.

5.13 Indicate your basis for applying applicable sections of the 1963 edition of ACI 318 instead of using the newly adopted 1971 edition. If sections of the 1971 edition are intended to be used, specify which of these have undergone changes of significance to safety. Provide a comparison between the two editions of the Code and justify the selection of rules that will be applied in the design of concrete structures.

5.14 The shield building is to be designed for an internal pressure of 3 psig due to tornado loading and a pressure rise in the annulus due to the DBA. To assure that the building will meet the design requirements an acceptance strength pressure test should be considered for the shield building and the design should permit tests to be performed during the lifetime of the plant, in the event that such tests are needed. In this regard provide the following information:

5.14.1 Specify the planned test pressure and provide the basis for its selection. This test should be representative, insofar as practicable, of the actual pressure conditions that will exist during design basis events.

5.14.2 Describe the measurements and the inspection procedures that will be used during the test.

5.14.3 Describe the acceptance criteria for the test.

5.14.4 Describe the permanent installations that will be provided to ensure a sufficient degree of accessibility to all the critical parts of the shield building.

5.15 With regard to the containment ventilation system, what are the anticipated releases to the environment when purging the instrument room? Give the basis for your estimate, the activity in the instrument room when purging, and the specifications for any radionuclide reduction system used.

5.16 What will be the residence time, flow rate, face velocity, and bed depth of the charcoal filters in the emergency gas treatment system described in Section 5.1.6? What will be the "predicted amount of organic and elemental halogens" that each filter can accommodate? Include stable halogens.

5.17 On page 5.1-98 you state that cross-connections are provided between the redundant filter trains enabling the active subsystem to draw air through the shutdown filter thereby removing fission product decay heat. Describe the provisions that have been made to eliminate the possibility that these cross-connections become filter bypass routes under the assumption of either a single component failure or an inappropriate operator action.

6.0 ENGINEERED SAFETY FEATURES

6.1 The proper functioning of the ECCS accumulators is required to control the consequences resulting from many postulated loss-of-coolant accidents. If the motor-operated isolation valve in the line connecting the accumulator to the primary coolant system should be closed inadvertently prior to or during an accident, the ECCS might fail to perform in an acceptable manner. In our view, the control circuit for those motor-operated isolation valves as designed does not provide an acceptable degree of protection against inadvertent closure. In our opinion, an acceptable degree of protection would be provided if the control circuit for the motor-operated isolation valves between the accumulators and the primary coolant system were designed to meet the intent of IEEE-279 and to incorporate the following features.

a. Automatic opening of the valves when the primary coolant system pressure exceeds a preselected value (specified in the Technical Specifications).

b. Valve position visual indication that is actuated by sensors on valve ("open" and "closed").

c. An audible alarm, independent of item b, which is actuated by a sensor on the valve when the valve is not in the fully open position.

d. Utilization of a safety injection signal to automatically remove (override) any bypass feature that may be provided to allow a motor-operated valve to be closed, for short periods of time, when the primary system is at pressure (in accordance with the provisions of the Technical Specifications).

Provide a discussion of the design of the control circuit for those motor-operated isolation valves, and indicate your plans to modify the design either to provide the above features or to conform to other criteria that provide an equivalent degree of protection.

9.0 AUXILIARY SYSTEMS

9.1 The proposed design of the Watts Bar residual heat removal (RHR) system contains motor-operated isolation valves in the letdown line connecting the relatively low pressure RHR system to the high pressure primary coolant system. In our view, the valving system as designed does not provide an adequate degree of protection against overpressurization of the RHR system that could result from common mode failures or operator errors. The following design features for the motor-operated valves in the letdown line between the high pressure primary coolant system and the relatively low pressure RHR system would, in our opinion, provide an acceptable degree of protection.

(1) Provision of at least two valves in series, with each valve interlocked to prevent valve opening unless the primary system pressure is below the RHR system design pressure.

(2) Interlocks of diverse principles, and designed to meet the intent of IEEE-279.

(3) Provision for automatic closure of the two series valves whenever the pressure in the primary coolant system exceeds a selected fraction of the design pressure of the RHR system. These closure devices should be designed to the intent of IEEE-279.

Provide information to indicate your plans to modify the design of the Watts Bar RHR system valving either to include these design features or to conform to other criteria that provide an equivalent degree of protection.

11.0 RADIATION PROTECTION

11.1 Confirm that the radiation monitor-controlled valve in the plant radwaste discharge pipe fails closed.

11.2 What control will be used to stop the pond overflow if the monitor indicates excess radioactivity in the overflow? Is the function automatic?

11.3 What analyses will be performed on the shipping cask decontamination tank contents? Will this include analysis for neutrons from spontaneous fission of transuranium elements? What type of filter will be used prior to discharge into the waste discharge line?

11.4 Provide the estimated release concentrations of all isotopes listed in Table 11.1-5 under the same conditions (flow rate, dilution flow rate, and release times) used to calculate the I-131 concentrations listed in Section 11.1.2.

11.5 Provide the estimated annual gaseous release concentrations and compare to MPC.

11.6 What provisions are being made to meet the requirements of the proposed Appendix I to 10 CFR Part 50 with regard to the gaseous and liquid effluent concentrations? Include, in particular the tritium concentrations in liquid effluents.

11.7 What are the bases for the assumptions made in estimating the annual liquid releases? Specify the decontamination factors for each processing step: holdup, decay, filtration, evaporation, and demineralization.

11.8 Describe the release routes of any inadvertent releases from the radioactive waste system for all non-welded parts of the radioactive waste system piping and tanks. Are releases from these areas monitored and is there capability to process gaseous and liquid leaks from the radioactive waste system before the activity is released to the environment?

14.0 ACCIDENT ANALYSIS

14.1 The assumption of holdup and mixing in the shield building annulus in the case of a LOCA is not justified based on the present design. Calculate doses for the LOCA assuming no mixing or holdup in the annulus. Perform similar dose calculations for a LOCA without taking credit for the fission product source reduction effect of the ice condenser. If credit for mixing and holdup in the annulus is required to meet the 10 CFR Part 100 guidelines, propose a system which will, based on conservative assumptions, perform this function.

14.2 We note that, unlike the layout for the Sequoyay containment design, the design of the Watts Bar containment includes walls that separate the fan-accumulator equipment region into distinct compartments (refer to Figure 14.5.2). These walls tend to increase the compartmentation within containment. This compartmentation with the higher steam conditions for the secondary system, may give rise to higher local pressure differentials and to non-symmetric pressure-temperature loadings on the containment shell and substructures should a rupture of the steam or feedwater lines occur within the region of the fan compartment. Since the foregoing matter is not specifically evaluated in the PSAR, the following information should be provided:

14.2.1 Discuss the design criteria and considerations that led to inclusion of walls in the fan accumulator equipment region.

14.2.2 Identify the design basis pipe rupture assumed for the fan compartment.

14.2.3 Provide the preliminary design volume and vent areas for the fan compartment.

14.2.4 Describe the calculational model and assumptions used to determine the pressure-temperature response of the fan compartment to the compartment design basis pipe rupture.

14.2.5 State the maximum mass discharge rates into the fan compartment associated with (1) the rupture of a main steam line and (2) the rupture of a feedwater line. Specify the calculational model and assumptions employed to determine the maximum mass discharge rates.

14.2.6 State the peak transient pressure levels calculated for the fan compartment as a result of the piping ruptures in item 14.2.5 above. Compare these pressure levels to those occurring in the fan compartment as the result of the containment design basis LOCA occurring in the most limiting location of elements 1 through 6 of Figure 14.5.2. State the pressure margin criteria to be employed for the design of the fan compartment.

14.2.7 Describe the impact of non-symmetric pressure-temperature loadings on the containment shell and substructures as a result of the fan compartment design basis pipe rupture and discuss the manner in which the non-symmetrical loadings will be taken into account from the viewpoint of (a) design for local distortion and (b) design for buckling moments on the containment and containment substructures.