TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

October 30, 1981

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Ms. Adensam:

| | | |
|---|---|---|
| In the Matter of the Application of | ) | Docket Nos. 50-390 |
| Tennessee Valley Authority | ) | 50-391 |

Enclosed for NRC review are TVA's responses to the following NRC questions on Watts Bar Nuclear Plant.

| | |
|---|---|
| 31.119 | 212.63 |
| 40.77 | 212.121 |
| 40.121 | 321.21 |
| | 450.2 |

This information will be included in the final safety analysis report in Amendment 45.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

M. R. Wisenburg
Nuclear Engineer

Sworn to and subscribed before me
this 30th day of Oct, 1981
Bryant M. Lowery
Notary Public
My Commission Expires 4/4/82

Enclosure

RECEIVED NOV 03 1981 U.S. NUCLEAR REGULATORY COMMISSION

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A PDR

ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2

RESPONSES TO NRC QUESTIONS

31.119 Question
(Q31.44)
(T3.11-2B)

The response to Question 31.44(2) indicates that there are areas within the primary containment (e.g., steam generator enclosure and pressurizer enclosure) where accident conditions may exceed the values given in FSAR Table 3.11-2B. For each such area within the primary containment, please provide the following information:

(1) The name of the area,

(2) The maximum and minimum pressure and temperatures which are expected to occur before or during any design basis event,

(3) A listing of all Class 1E equipment which is located in that area,

(4) The extremes of temperature and pressure for which each such piece of equipment has been qualified, and

(5) A justification for the use of each piece of equipment which is listed in Part 3 above and which is not qualified for the environment described in Part 2 above.

Response

There are three areas within the containment where local conditions obtained from short-term subcompartment analyses may exceed the values given in FSAR Table 3.11-2B. These areas are the steam generator compartment, the pressurizer enclosure, and the reactor cavity area. There is no safety-related equipment located within the steam generator compartment or the pressurizer enclosure. There are neutron detectors located in the reactor cavity area, but they are not used following a high energy line rupture. There is no other Class 1E equipment in the reactor cavity area.

40.77 <u>Question</u>
(9.5.2)

The information regarding the onsite communications system (Section 9.5.2) does not adequately cover the system capabilities during transients and accidents. Provide the following information:

(a) Identify all working stations on the plant site where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents (including fires) in order to mitigate consequences of the event and to attain a safe cold plant shutdown.

(b) Indicate the maximum sound levels that could exist at each of the above identified working stations for all transients and accident conditions.

(c) Indicate the types of communication systems available at each of the above identified working stations.

(d) Indicate the maximum background noise level that could exist at each working station and yet reliably expect effective communication with the control room using:

1. the page party communications system, and

2. any other additional communication system provided that working station.

(e) Describe the performance requirements and tests that the above onsite working stations communication systems will be required to pass in order to be assured that effective communication with the control room or emergency shutdown panel is possible under all conditions.

(f) Identify and describe the power source(s) provided for each of the communications systems.

(g) Discuss the protective measures taken to assure a functionally operable onsite communication system. The discussion should include the considerations given to component failures, loss of power, and the severing of a communication line or trunk as a result of an accident or fire.

Response

(a) During or following transients or accidents, communications with the control room or the Auxiliary Control Room from the following listed work stations may be necessary to mitigate the consequences of the event and attain a safe cold plant shutdown:

1. 6900-V Shutdown Board Rooms
2. 480-V Shutdown Board Rooms
3. Diesel Generator Building
4. Reactor MOV and Vent Board Rooms
5. Reactor Coolant Pump Boards
6. CVCS Boron Blender (Elevation 713)

(b & e) The communication systems listed in Question 40.77(C) are used during operation of the plant. This includes plant trips, cooldown, full power, refueling, startup, and testing. Telephone locations with high sound levels are equipped with sound dampening phone booths. We believe that using the communications systems during these modes of operation qualifies the communication system for all possible operation modes including accident and transient conditions. In addition, during hot functional and startup testing, cooldown and plant operation from the backup control room are required. This testing requires establishing and maintaining effective communications with plant employees throughout the plant.

The only test performed on communications equipment is done on the sound-powered phone system primarily because this system is seldom used. It is our position that the use of PAX and paging systems during normal and simulated emergency conditions verifies the suitability of these communications systems and no additional testing is required.

(c) The general descriptions of the communication systems are already described in FSAR Section 9.5.2.2. In addition, an inplant two-way radio system operating on frequencies in the 160-175 MHz range provides another means of communications. The types of systems available in the control room, Auxiliary Control Room, and at or nearby the working stations are as follows:

Main Control Room
1. Sound Power Systems SP-1, 2, 3, 4, 5, and 6
2. PAX
3. Paging

4. Radio
5. Direct Sound Power to the Diesel Generator Building

Auxiliary Control Room
1. Shutdown Control Center Communications Systems, both Primary and Alternate
2. Sound Power Systems SP-1, 2, 3, 4, 5, and 6
3. PAX
4. Paging
5. Radio

6900-V and 480-V Shutdown Boards
1. Shutdown Control Center Communications Systems, both Primary and Alternate
2. PAX
3. Paging
4. Radio

Diesel Generator Building
1. Shutdown Control Center Communications Systems, both Primary and Alternate
2. PAX
3. Paging
4. Direct Sound Power to the Main Control Rooms

Reactor MOV and Vent Board Rooms
1. PAX
2. Paging
3. Radio

Reactor Coolant Pump Boards and CVCS Boron Blender
1. PAX
2. Paging
3. Radio

(d) The background noise level that can normally be expected at a working station will vary from station to station during plant operation. For this reason, during preoperational testing each paging (CAP) speaker-amplifier will be adjusted to the optimum sound level for its particular area. This is done by listening to the audible signal and using a multimeter to measure and set voltage levels for peak performance.

The sound-powered telephones that are used for communications with the control room are preoperational tested during normal operating conditions to assure that they are functional during highest ambient noise levels.

PAX telephones at working stations with high background noise levels are equipped with noise-canceling transmitters and are installed in acoustical booths with sound absorbing walls.

(f) The paging (CAP) system is powered by a 24V DC power board which is backed by a 24V battery which has an 8 hr capacity of 1200 AH.

The sound-powered system requires no external power source.

The power source for the PAX telephone system is a 48V DC power board which is backed by a 48V battery with an 8 hr capacity of 900 AH.

(g) CAP SYSTEM

The paging system (CAP) speaker amplifiers are divided into two groups, designated as 'A' and 'B.' 'A' and 'B' speaker-amplifiers are located in all plant areas so as to assure audible paging from either the 'A' or 'B' speakers. Each group is fed from a different fuse panel with cable to the 'A' group being physically separated from cable feeding the 'B' group. If power is lost to either group of speaker-amplifiers, there is sufficient coverage from the remaining group to maintain the integrity of the system. In the event that a speaker-amplifier fails in such way that the signal input leads become shorted, a fuse blows immediately, isolating it from the rest of the system. The 'A' and 'B' groups form two completely redundant systems.

SOUND POWERED SYSTEM

The sound powered system designated for emergency communications with the control room consists of a primary system and an alternate system. These are wired independent of each other with a different cable routing for each system. If an individual telephone is lost because of fire or an accident, that station will be isolated from the system. However, the remaining sound powered telephones will perform in the normal way.

PAX TELEPHONE SYSTEM

The PAX telephone system is designed with a redundant power source. It is also designed so that failure of a major component (excluding total power loss) will not affect greater than 50% of the system. The equipment is such that if a faulty path is encounted when making a call, the act of hanging up the receiver and again removing it will provide a different path.

40.121 Question
(10.4.4)

Provide additional description (with the aid of drawings) of the turbine bypass valves and associated controls. In your discussion include the number, size, principle of operation, construction, set points, and capacity of each valve and the malfunctions and/or modes of failure considered in the design of the turbine bypass system. (SRP 10.4.4, Part III, Item 1.)

Response

Section 10.4.4 and Figures 10.3-1 through 10.3-7 provide a description of the turbine bypass system (condenser steam dump valves). There are 12 condenser dump globe valves which are air actuated, carbon steel, 8 inch, 900 pound valve class. The valve air supply is controlled by solenoid valves and the dump valves fail closed upon loss of air or loss of power to the control system. As discussed in Section 10.4.4.2, the capacity of each valve is 532, 170 lb/hr. Section 7.7.1.8 and Figures 7.2-1, Sheet 10 and 10.3-5 through 10.3-7 describe and depict the associated instruments and controls. The malfunctions and failure modes considered in the system design and their effect on the NSSS and turbine system are addressed in the analysis provided in response to Question 31.149. The results of this analysis indicate that for any of the postulated events, the Condition II accident analyses given in Chapter 15.0 of the FSAR are bounding.

Concerning details of the postulated events in the response to Question 31.149 consider the following references. For the effects on the system of loss of single instruments, see Table 1; for sensors measuring steam header pressure, $T_{avg}$, steamline pressure, turbine impulse chamber pressure, condenser vacuum, and $T_{avg}$ high auctioneer. For effects of the loss of power to instrumentation and control racks, see Table 2. For loss of power to inverters, see Tables 11 through 14. For loss of common instrument lines, see Table 15. For loss of power to control or protection groups, see Tables 3 through 10.

212.63 Question
(15.4.4)

FSAR analyses include study of a locked RCS pump rotor accident, but do not address RCS pump shaft breaks. Discuss why a shaft break accident would be less limiting than a locked rotor event.

Response

A shaft break leads to slightly worse results since the core flow is slightly reduced. The magnitude of the change is an increase of approximately 20 psi in pressure and approximately 10°F in clad temperature. As seen in Table 15.4-10, these increases will not cause any safety violations and the conclusions in Section 15.4.4.3 are still valid.

212.121 Question

Locked Rotor/Shaft Break - In response to Question 212.63, the applicant stated that the 'consequences of a shaft break would be no worse than those of a locked rotor.' Our experience in reviewing other Westinghouse designs does not corroborate this statement. Provide justification that the shaft break event is no worse or provide an analysis of this event. Recent PWR reviews have found that locked rotor and shaft break event analyses had not considered loss-of-offsite power. Discuss the impact of this assumption for both events. Give percents of fuel failure for events mentioned above.

Response

Refer to the revised response to Question 212.63.

The consequences of a shaft break are slightly worse than those of a locked rotor due to a slightly lower core flow. The difference in results amounts to approximately 20 psi in pressure and 10°F in clad temperature. This would not cause any safety violation (see Table 15.4-10) and the conclusions in Section 15.4.4.3 would remain valid.

Consideration of a locked rotor or shaft break coincident with a loss of offsite power would result in a very small increase in the number of rods in DNB (and peak clad temperature and peak RCS pressure). This increase is well within the number of failed rods assumed for the dose evaluation. Therefore, there is no material impact on these transients in terms of DNB and dose.

In all cases, the number of failed fuel rods is much less than 10 percent.

321.21 Question
(3.2.2)
(11.0)

As in our review of the Sequoyah radwaste management systems, we will compare the seismic design and classification to the guidelines in Regulatory Guide 1.143. Does the TVA Class D Designation apply to the nine gas storage tanks in the gaseous waste process system? List the components of the liquid, gaseous, and solid radwaste systems that do not meet the positions in Regulatory Guide 1.143 and explain the difference in 'limited' seismic design TVA Class G and K at the Watts Bar and Sequoyah plants.

Response

The plant was not designed to satisfy any of the requirements of NRC Regulatory Guide 1.143. However, the following conditions are provided:

TVA Class D designation (ASME Code, Section III, Class 3) does apply to the nine gas storage tanks in the gaseous waste process system.

The components listed below are seismically analyzed/designed for design basis earthquake (DBE) plus normal operating occurrences:

1) Liquid Radwaste System

   a) Waste Holdup Tanks

   b) Auxiliary Waste Evaporators

   c) Waste Evaporator Packages

   d) Waste Evaporator Feed Pumps

2) Solid Radwaste System

   a) Spent Resin Tank

3) Gaseous Radwaste System

   a) Gas Decay Tanks

   b) Waste Gas Compressors

The components of the liquid and solid radwaste systems comply with the equipment codes (classification) as set forth in Regulatory Guide 1.143. The gaseous system is designated TVA Class D, which corresponds to ASME Code, Section III, Class 3.

The remaining portions of the liquid, gaseous, and solid radwaste systems are analyzed/designed for operating basis earthquakes (OBE).

Therefore, the components of the liquid, gaseous, and solid radwaste systems exceeds or meets the minimum requirements for seismic design and classifications as established by NRC Regulatory Guide 1.143.

As an aid to overall plant design, all piping systems within the plant are given a TVA classification and associated code requirements. In addition, seismic requirements are associated with each TVA classification. Both the TVA Class G and K are Seismic Category 1(L). All piping system or component in this category are designed and constructed to ensure limited structural integrity (failure would jeopardise to an unacceptable extent the achievement of a primary safety function) concurrent with a safe shutdown earthquake. In addition, TVA Class G piping systems or components are designed to those codes listed in Table 321.21-1, while Class K piping systems or components are designed to those codes which the design engineer considers consistent with the safety-related aspects of the system or component.

Table 321.21-1 - Code Requirements

| TVA Class | Seismic Category | Code Classification<br>Piping | <br>Pumps | <br>Valves | <br>Vessels |
|---|---|---|---|---|---|
| G | 1(L) | ANSI B31.1 | Manufac- tures Standards | ANSI B31.1, B16.5, or MSS-SP-66 | AMSE Code, Sec. VIII, Div. 1 |
| K | 1(L) | * | * | * | * |

*Design engineers shall determine the specific code or standard (i.e., TEMA, API, etc.).

450.2 Question

The meteorological measurements tower is located close enough to the cooling towers that the measurements may be obstructed during down valley airflow. Provide analysis that will show the extent of the cooling tower influence on meteorological measurements made at the meteorological tower. This information should include data collected at the tower before and after the cooling tower construction.

Response

The distances from the meteorological facility to the closest points of the two cooling towers are 3030 ft and 3360 ft. For these towers (478 feet high) this gives distance to height ratios of 6.3:1 and 7.0:1, respectively. Wind blowing from 36 to 51 degrees can be considered to be blowing from the cooling towers toward the meteorological tower. This corresponds well with the northeast sector (34 to 56 degrees).

The present meteorological facility at Watts Bar began operation on May 23, 1973. Construction on the unit 1 cooling tower began on June 4, 1973 and was half-completed by July 1974. This tower was completed in November 1974 and the unit 2 tower was completed in August 1975.

A one-year period of data, from June 1, 1973 through May 31, 1974 was compared with a five-year period, from January 1, 1976 through December 31, 1980. Tables 1 and 2 are joint percentage frequency distributions of 10-meter wind speeds by wind direction, for the one and five-year periods, respectively.

Since the cooling towers are not yet in operation, any impacts on meteorological measurements, thus far, will have been restricted to wind speeds and wind directions.

The maximum impact, if any, could be expected to occur at the lowest measurement level. As indicated in Tables 1 and 2, there is very close agreement in the wind speed frequencies of the two groups at this level.

For wind direction, it is reasonable to assume that, with the indicated height and separation, any effect of the cooling towers would occur only with moderate to strong winds. For wind speeds in excess of 7.4 miles per hour (mph), only 1.7 percent of the one-year and 0.9 percent of the five-year observations were from the northeast. Not only is this change in frequency small, but considering accompanying changes for other directions, the data give no reason to believe that there has been a systematic change in the relative frequency of northeast winds since the towers have been built.

Considering wind directions for all wind speeds combined, there was a 2.8-percent decrease in the frequency of northeast winds, with a concomitant increase of 1.2 and 0.7 percent in the north-northeast and east-northeast directions, respectively. However, there was a decrease of 1.8 percent in east winds. On the other hand, the frequency of southwest winds increased from 6.3 to 11.7 percent. The frequencies of four directions changed by more than 2.5 percent. Again, there is no recognizable pattern which would indicate a systematic change in the frequency of northeast winds.

Obviously, the data do not prove that there has been no effect of the cooling towers on wind direction frequencies. However, if there has been any effect, it must have been very small or it would have been more recognizable. Since it is so small, a more sophisticated statistical approach does not seem justified.

Table 1

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

WATTS BAR NUCLEAR PLANT

JUN 1, 73 - MAY 31, 74

| WIND DIRECTION | WIND SPEED (MPH) 0.6-1.4 | 1.5-3.4 | 3.5-5.4 | 5.5-7.4 | 7.5-12.4 | 12.5-18.4 | 18.5-24.4 | >=24.5 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| N | 1.39 | 1.87 | 0.85 | 0.92 | 0.90 | 0.22 | 0.0 | 0.0 | 6.15 |
| NNE | 0.99 | 1.90 | 1.36 | 1.12 | 1.72 | 0.13 | 0.0 | 0.0 | 7.22 |
| NE | 1.23 | 2.73 | 2.00 | 1.35 | 1.67 | 0.05 | 0.0 | 0.0 | 9.03 |
| ENE | 0.92 | 2.59 | 1.19 | 0.77 | 0.42 | 0.0 | 0.0 | 0.0 | 5.89 |
| E | 1.05 | 2.63 | 1.55 | 0.58 | 0.44 | 0.0 | 0.0 | 0.0 | 6.25 |
| ESE | 0.59 | 1.22 | 0.49 | 0.13 | 0.09 | 0.0 | 0.0 | 0.0 | 2.52 |
| SE | 0.36 | 1.18 | 0.44 | 0.08 | 0.03 | 0.0 | 0.0 | 0.0 | 2.09 |
| SSE | 0.65 | 1.31 | 0.54 | 0.14 | 0.24 | 0.08 | 0.01 | 0.0 | 2.97 |
| S | 0.65 | 1.86 | 0.74 | 0.24 | 0.47 | 0.21 | 0.01 | 0.0 | 4.18 |
| SSW | 0.59 | 3.04 | 2.72 | 1.83 | 2.84 | 1.46 | 0.19 | 0.0 | 12.67 |
| SW | 0.38 | 2.44 | 2.76 | 2.75 | 2.57 | 0.72 | 0.12 | 0.0 | 11.74 |
| WSW | 0.77 | 1.64 | 1.67 | 0.99 | 0.92 | 0.27 | 0.03 | 0.0 | 6.29 |
| W | 0.90 | 1.91 | 0.83 | 0.47 | 0.58 | 0.17 | 0.06 | 0.0 | 4.92 |
| WNW | 1.10 | 1.94 | 0.59 | 0.35 | 0.63 | 0.15 | 0.06 | 0.0 | 4.82 |
| NW | 1.53 | 2.28 | 0.51 | 0.68 | 0.91 | 0.21 | 0.0 | 0.0 | 6.12 |
| NNW | 2.16 | 2.21 | 0.59 | 0.80 | 1.04 | 0.06 | 0.0 | 0.0 | 6.86 |
| SUBTOTAL | 15.26 | 32.75 | 18.83 | 13.20 | 15.47 | 3.73 | 0.48 | 0.0 | 99.72 |

| | |
|---|---|
| TOTAL HOURS OF VALID WIND OBSERVATIONS | 7795 |
| TOTAL HOURS OF OBSERVATIONS | 8760 |
| RECOVERABILITY PERCENTAGE | 89.0 |
| TOTAL HOURS CALM | 23 |

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY:MET FACILITY LOCATED 1.13 MILES SW OF WATTS BAR NUCLEAR PLANT
WIND SPEED AND DIRECTION MEASURED AT THE 10.00 METER LEVEL

DATE PRINTED: 10/01/81

MEAN WIND SPEED = 4.6 MPH

Table 2

JOINT PERCENTAGE FREQUENCIES OF WIND SPEED BY DIRECTION

DISREGARDING STABILITY CLASS

WATTS BAR NUCLEAR PLANT

JAN 1, 76 - DEC 30, 80

| WIND DIRECTION | WIND SPEED (MPH) 0.6-1.4 | 1.5-3.4 | 3.5-5.4 | 5.5-7.4 | 7.5-12.4 | 12.5-18.4 | 18.5-24.4 | >=24.5 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| N | 0.68 | 1.38 | 1.87 | 1.70 | 1.83 | 0.08 | 0.0 | 0.0 | 7.54 |
| NNE | 0.59 | 1.27 | 2.09 | 2.00 | 2.32 | 0.14 | 0.0 | 0.0 | 8.41 |
| NE | 0.63 | 1.71 | 1.73 | 1.30 | 0.85 | 0.01 | 0.0 | 0.0 | 6.23 |
| ENE | 1.00 | 3.09 | 1.62 | 0.63 | 0.22 | 0.0 | 0.0 | 0.0 | 6.56 |
| E | 0.93 | 2.26 | 1.00 | 0.26 | 0.04 | 0.01 | 0.0 | 0.0 | 4.50 |
| ESE | 0.34 | 0.60 | 0.26 | 0.03 | 0.01 | 0.0 | 0.0 | 0.0 | 1.24 |
| SE | 0.47 | 0.87 | 0.42 | 0.09 | 0.07 | 0.02 | 0.0 | 0.0 | 1.94 |
| SSE | 0.73 | 1.71 | 0.68 | 0.23 | 0.18 | 0.05 | 0.0 | 0.0 | 3.58 |
| S | 0.74 | 2.45 | 1.82 | 0.82 | 0.69 | 0.17 | 0.03 | 0.0 | 6.72 |
| SSW | 0.79 | 2.95 | 3.87 | 3.25 | 3.56 | 0.83 | 0.09 | 0.0 | 15.34 |
| SW | 0.79 | 2.21 | 1.63 | 0.88 | 0.68 | 0.07 | 0.0 | 0.0 | 6.26 |
| WSW | 1.10 | 2.34 | 0.67 | 0.34 | 0.32 | 0.11 | 0.0 | 0.0 | 4.88 |
| W | 1.64 | 2.52 | 0.73 | 0.59 | 0.85 | 0.16 | 0.01 | 0.0 | 6.50 |
| WNW | 1.57 | 1.75 | 0.63 | 0.59 | 0.90 | 0.11 | 0.0 | 0.0 | 5.55 |
| NW | 2.28 | 2.64 | 0.81 | 0.81 | 1.05 | 0.13 | 0.0 | 0.0 | 7.72 |
| NNW | 1.41 | 1.87 | 0.95 | 0.86 | 1.21 | 0.09 | 0.0 | 0.0 | 6.39 |
| SUBTOTAL | 15.69 | 31.62 | 20.78 | 14.38 | 14.78 | 1.98 | 0.13 | 0.0 | 99.36 |

| | |
|---|---|
| TOTAL HOURS OF VALID WIND OBSERVATIONS | 42196 |
| TOTAL HOURS OF OBSERVATIONS | 43824 |
| RECOVERABILITY PERCENTAGE | 96.3 |
| TOTAL HOURS CALM | 253 |

ALL COLUMNS AND CALM TOTAL 100 PERCENT OF JOINT VALID OBSERVATIONS

METEOROLOGICAL FACILITY:MET FACILITY LOCATED 1.13 MILES SW OF WATTS BAR NUCLEAR PLANT
WIND SPEED AND DIRECTION MEASURED AT THE 10.00 METER LEVEL

DATE PRINTED: 10/03/81

MEAN WIND SPEED = 4.4 MPH