TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

REGULATORY DOCKET FILE COPY

May 5, 1978

Director of Nuclear Reactor Regulation
Attention: Mr. O.D.T. Lynch, Jr., Project Manager
Environmental Projects Branch 2
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Lynch:

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

Enclosed for your information is additional data submitted to EPA concerning the Watts Bar Nuclear Plant NPDES permit. This information was requested by Charles H. Kaplan of EPA to the staff of TVA on February 28, 1978, and was submitted to EPA in a letter from Harry G. Moore, Jr., to John C. White dated April 14, 1978.

Very truly yours,

J. E. Gilleland
Assistant Manager of Power

Enclosure

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Additional Data Concerning Watts Bar Nuclear Plant

NPDES Permit Requested by Charles H. Kaplan of EPA

1. Maximum Nuclear Plant Blowdown Temperature

The instantaneous maximum blowdown temperature is 95°F and is based on a maximum instantaneous dry bulb temperature of 101°F and a maximum instantaneous wet bulb temperature of 83°F. These wet bulb and dry bulb temperatures did not occur simultaneously.

2. Cross-sectional Data at Diffuser Site

See Table 1.

3. Duration of No Release Periods - Watts Bar Dam

The frequency and duration of zero flow periods for 1959-1968 is shown in Table 2, indicating that five hours is the most frequent duration of no flow through the dam. Longer periods of no flow through Watts Bar Dam would be expected to occur during dry periods, typically during the late spring, summer, or early fall. The maximum expected period of no flow is 12 hours and would likely occur during these seasons. Additional information is discussed on page 2.6-9, 10 of TVA's Final Environmental Statement.

Further studies of the duration and frequency of no flow periods would have to be conducted to determine whether the maximum expected period of no flow of 12 hours could be reduced. However, reduction of the maximum no flow period would likely result in the redistribution of hydropower generation to off-peak periods of

power demand. Besides being an inefficient use of hydropower, a reduced maximum no flow period through Watts Bar Dam would likely become constraining during months of warm weather, when the demand for peaking power is large. Report No. WM28-1-85-100 shows that Tennessee water temperature change and rate of change standards can be met during a 12 hour shutdown period. Therefore, no reduction in the maximum period of no flow through Watts Bar Dam seems necessary.

4. Tailrace Temperature Observations > 30°C

   One temperature greater than 30°C has been measured at Watts Bar tailrace (See Table 3)

5. Maximum Temperatures at Edge of Diffuser Mixing Zone for Summer Conditions

   See Table 4.

6. Generation Data, Watts Bar Steam Plant

   See Table 5 for steam plant operating data corresponding to the October 30, 1977, survey discussed in Report No. WM28-1-85-100. Table 5 shows that plant output is lowered during off-peak hours because the cost of generation at Watts Bar Steam Plant is relatively high compared to other TVA plants. These periods of low generation generally correspond to periods of no release through Watts Bar Dam, which also generally occur during off-peak hours. The period of no release during the October 30, 1977, survey occurred during the 12 hours preceding 1000 hours. Reduced generation at Watts Bar Steam Plant occurred concurrently and during most of this period and represented a worst case condition.

7. Historical Data Showing Ambient River Temperatures Approaching 30.5°C

When water temperatures exceed 83°F, the maximum temperature at the edge of the diffuser mixing zone caused by both plants could exceed 86.9°F. Slightly higher river temperatures could cause the maximum temperature at the edge of the diffuser mixing zone to exceed 86.9°F when only one of the plants is operating. Table 3 shows all the historical temperature data which exceeds 83°F (28.33°C) and compares the data to the total number of temperature observations during the given month.

8. Tailrace Temperature Variations

No other accurate temperature data is available to check for tailrace temperature variations at Watts Bar Dam between the weekly observations used in Tables 7 and 8 of Report No. WM28-1-85-100. Water temperatures are measured within the hydroplant, but factors other than the temperature of the incoming water seem to be affecting the measurements. Thermal monitoring and/or field tests could be conducted to study tailrace temperature variations.

9. Watts Bar Steam Plant Deactivation Schedule

At present, there is no deactivation schedule for Watts Bar Steam Plant.

Table 1

Cross-Sectional Information, TRM 527.8

Mixing Zone Width = 240 feet
Nominal River Width = 1100 feet

Water Surface Elevation (ft)	Cross-Sectional Area (sq. ft.)	Mixing Zone		
		Depth (ft)	Cross-Sectional Area (sq. ft.)	Percent of Reservoir Cross-Section
675	13,800	22	5,280	38
683	23,500	30	7,200	31

Table 2

Duration of Zero-Flow Periods Per Year

At Watts Bar and Chickamauga Dams

1959-1968

Duration (hours)	Ave. No. of Occurrences Per Year	
	Watts Bar	Chickamauga
1	14.0	2.5
2	21.2	2.9
3	29.9	6.2
4	31.7	7.5
5	32.0	6.9
6	26.6	6.7
7	17.0	4.2
8	9.9	2.4
9	4.5	1.1
10 or greater	3.2	1.0

Note: Table obtained from Tennessee Valley Authority, "Final Environmental Statement, Sequoyah Nuclear Plant, Units 1 and 2," Chattanooga, Tennessee.

Table 3

Summary of Temperature Data Exceeding 28.33°C (83.0°F)

TRM 529.9

Date	Temperature °C	°F
07/01/52	29.0	84.2
06/29/54	29.0	84.2
07/15/54	30.0	86.0
08/03/54	30.5	86.9
08/02/55	28.5	83.3
08/09/55	30.0	86.0
08/16/55	28.5	83.3
08/30/55	29.5	85.1

Month	Total No. of Observations	No. of Observations >28.33°C (83.0°F)
June	102	1
July	113	2
August	115	5
September	110	0

Notes

1. Data set same as that used for Tables 7 and 8 of Report No. WM28-1-85-100. These data were acquired by measuring the temperatures of weekly tailrace grab samples during a 27-year period (1950-1977).
2. Errata on Table 7 of Report No. WM28-1-85-100: Maximum August temperature is 86.9°F.

Table 4

Maximum Temperatures at Edge of Watts Bar Nuclear Plant Mixing Zone Summer Conditions

Month	T_{Rmax} (°F)	T1 (°F)	T2 (°F)	T3 (°F)
June	84.2	84.9	86.7	87.2
July	86.0	86.6	88.5	88.9
August	86.9	87.4	89.4	89.8
September	81.5	82.3	84.0	84.7

Notes

1. Maximum river temperatures from Table 7, Report No. WM28-1-85-100.
2. T1 = maximum temperature at edge of diffuser mixing zone due to nuclear plant only

$$= \frac{T_D - T_{Rmax}}{16} + T_{Rmax}$$

where T_D = maximum nuclear plant discharge temperature = 95°F.

3. T2 = maximum temperature at edge of diffuser mixing zone due to steam plant only

$$= T_{Rmax} + \frac{\Delta Tc}{4}$$

where ΔTc = maximum steam plant condenser rise = 10°F

4. T3 = maximum temperature at edge of diffuser mixing zone due to both plants

$$= \frac{T_D - (T_{Rmax} + \Delta Tc/4)}{16} + (T_{Rmax} + \Delta Tc/4)$$

5. Assumed Minimum River Flow of 3500-5000 cfs, maximum thermal discharge from both nuclear and steam plants, maximum drybulb and wetbulb temperatures and maximum river temperatures.

Table 5

Watts Bar Steam Plant Operating Characteristics

October 30, 1977

Condenser flow (cfs)	Unit A 197.9			Unit B 189.8			Unit C 193.9			Unit D 193.9		
Time (hrs)	T_{out} (°F)	ΔTc (°F)	Gen. (MW)	T_{out} (°F)	ΔTc (°F)	Gen. (MW)	T_{out} (°F)	ΔTc (°F)	Gen. (MW)	T_{out} (°F)	ΔTc (°F)	Gen. (MW)
0100	68	6	38	70	8	38	70	8	40	70	8	33
0200	68	6	45	70	8	35	70	8	47	70	8	32
0300	68	6	38	70	8	43	70	8	45	70	8	40
0400	68	6	40	70	8	34	70	8	41	70	8	21
0500	68	6	42	70	8	38	70	8	45	70	8	33
0600	68	6	40	70	8	40	70	8	39	70	8	29
0700	68	6	46	70	8	36	72	10	48	72	10	46
0800	72	10	54	70	8	50	72	10	48	72	10	56
0900	72	10	58	72	10	44	72	10	58	72	10	60
1000	72	10	56	72	10	54	72	10	58	72	10	54
1100	72	10	56	72	10	44	72	10	56	72	10	56
1200	72	10	60	72	10	52	72	10	50	72	10	58
1300	72	10	52	72	10	44	72	10	56	72	10	56
1400	72	10	57	72	10	49	72	10	52	72	10	55
1500	70	8	38	72	10	37	72	10	43	71	9	38
1600	70	8	38	70	8	40	72	10	46	71	9	35
1700	72	10	43	70	8	40	71	9	46	71	9	41
1800	72	10	54	71	9	41	71	9	46	71	9	57
1900	72	10	58	71	9	49	71	9	45	71	9	59
2000	72	10	58	71	9	44	71	9	46	71	9	60
2100	70	8	41	71	9	39	71	9	49	71	9	40
2200	--	--	38	69	7	37	71	9	40	71	9	33
2300	70	8	40	69	7	31	71	9	51	71	9	38
2400	--	--	34	69	7	40	71	9	42	71	9	38

Inlet temperature = 62°F