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July 29, 1986

O. D. KINGSLEY, JR.
VICE PRESIDENT · NUCLEAR OPERATIONS

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
File: 0260/0840/L-860.0
SSW Analysis Additional Information
AECM-86/0232

In a letter to the Nuclear Regulatory Commission (NRC) from Mississippi Power & Light (MP&L) dated May 19, 1986 (AECM-86/0150), MP&L provided two standby service water (SSW) system analyses. Attachment 1 to AECM-86/0150 provided an analysis of the SSW system based on a first refueling outage (RF01) scenario while in Attachment 2 a SSW analysis based on an eighteenth refueling outage scenario was provided.

During discussions with the NRC staff, it was requested that MP&L provide for each scenario a tabulation of the worst 30 day analyses. It was requested that this information be presented in the same format as table 9.2-6 of the FSAR. In addition, for the eighteenth refueling outage scenario it was requested that a worst one day analysis be provided similar to the information in table 9.2-5 of the FSAR. It was MP&L's understanding that this worst one day analysis would not be required for the RF01 scenario since this particular case would be bounded by the eighteenth refueling outage scenario.

The RF01 analysis is bounded since this analysis assumed no spent fuel in the spent fuel pool and thus no heat load is being placed on the SSW system, while the eighteenth refueling outage assumed a heat load of 13.13 million BTU/hr. Therefore, the total heat load placed on the SSW system for the eighteenth refueling outage analysis is greater than for the RF01 analysis and thus the SSW water temperature would be higher.

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The results for the RF01 and the eighteenth refueling outage analysis are provided as Attachment 1 and 2 respectively. If additional information is required please feel free to contact members of my staff.

Yours truly,

ODK:bms
Attachment

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SSW RF01 ANALYSIS SUMMARY

Regulatory Guide 1.27 requires that the Ultimate Heat Sink (UHS) be capable of providing sufficient cooling water to dissipate residual heat after a design basis accident (DBA) for a period of 30 days without inventory replenishment. To assure this requirement is met, a Standby Service Water (SSW) system analysis was performed to verify the capability of the SSW/UHS to dissipate the residual heat associated with a DBA in Unit 1 with Unit 2 not in operation. Analysis results indicated that the total evaporative and drift losses from the UHS cooling tower for the 30 day period following the DBA in Unit 1 exceed the total usable volume of a single basin, necessitating the use of basin transfer capabilities (basin siphon).

During the First Refueling Outage (RF01), however, SSW Basin A will be taken out of service and drained to allow modification of the loop A SSW pump and piping. Therefore to satisfy the requirements of Regulatory Guide 1.27 without basin transfer capabilities, an RF01 specific SSW system analysis has been performed to verify the capability of the SSW/UHS to dissipate the residual heat associated with a DBA in Unit 1 with Unit 2 not in operation and with SSW Basin A drained.

The system analysis is based on the following assumptions:

1) Unit 1 is experiencing a loss of coolant accident (LOCA) coincident with a loss of offsite power (LOP),

2) Unit 2 is not operational,

3) SSW loop A is removed from service and SSW Basin A is drained (Inventory transfer between Basin A and Basin B is not possible),

4) Makeup to the SSW system is not available from normal means of supply,

5) Worst 30 day meteorology (per Regulatory Guide 1.27), and

6) The spent fuel pool contains no fuel from previous discharges.

These assumptions will result in the greatest heat rejection rate for the UHS during the most severe meteorology following the DBA for the RF01 scenario. These assumptions are conservative since fuel movement to the spent fuel pool is not presently scheduled to begin until approximately 5 days after reactor shutdown.

ANALYSIS RESULTS - Analysis results indicate the total water losses from the SSW UHS cooling tower will be 6,209,798 gallons for the 30 day post LOCA period. The total usable Basin B volume from elevation 84'-6" to elevation 130'-3" is 6,638,508 gallons. With the total water loss, evaporative and drift, calculated to be 6,209,798 gallons, there will be 428,710 gallons remaining at the end of the 30 day period. Therefore, the RF01 specific performance analysis verifies the 30 day post LOCA inventory requirement. The analysis also verifies the capability of the UHS to dissipate the residual heat since that even with a gradual depleting basin water inventory due to evaporation and drift, the maximum cold water temperature of 86.1^{o}F will still not exceed the design temperature of 90^{o}F.

RF01 ANALYSIS

STANDBY SERVICE WATER COOLING TOWERS
GRAND GULF NUCLEAR STATION
ANALYSIS BASED ON MAXIMUM 30-DAY AVERAGE WET BULB

Day	WBT °F	DBT °F	Avg. Heat Load 10^7 BTU/HR	Evaporation GPM	Cold Water Temperature °F
1	74.4	78.1	17.46	277.45	86.1
2	75.7	81.0	13.68	215.06	84.9
3	74.8	81.0	12.25	194.60	83.6
4	76.1	81.0	11.36	178.84	84.1
5	76.0	79.6	10.61	163.95	83.7
6	75.7	81.7	9.92	159.54	83.1
7	77.5	83.4	9.42	153.12	84.1
8	77.1	82.0	9.08	145.07	83.7
9	78.0	83.1	8.64	139.60	84.1
10	77.9	82.7	8.50	136.63	84.0
11	78.5	82.5	8.32	132.23	84.3
12	78.4	81.5	8.17	127.52	84.2
13	78.7	84.7	8.06	133.69	84.3
14	78.1	81.4	8.03	125.74	83.9
15	77.6	81.9	7.99	127.44	83.5
16	77.5	83.2	7.96	130.61	83.4
17	77.1	80.1	7.92	122.63	83.0
18	75.2	79.4	7.88	123.92	81.6
19	73.1	77.0	7.85	121.24	79.9
20	74.5	79.2	7.81	123.73	80.9
21	75.0	80.9	7.79	126.95	81.3
22	75.7	81.0	7.78	128.06	81.9
23	77.2	81.7	7.74	123.96	83.0
24	76.7	79.7	7.70	119.60	82.6
25	75.7	78.6	7.67	117.69	81.8
26	76.7	81.1	7.63	121.72	82.6
27	76.5	80.6	7.60	120.35	82.4
28	76.4	78.5	7.56	114.40	82.3
29	77.7	81.9	7.52	120.19	83.3
30	77.2	80.0	7.49	115.73	82.9

SSW ANALYSIS SUMMARY

Regulatory Guide 1.27 requires that the Ultimate Heat Sink (UHS) be capable of providing sufficient cooling water to dissipate residual heat (e.g. RHR, High Density Spent Fuel Storage Rack decay heat, etc.) after a design basis accident (DBA) for a period of thirty (30) days without inventory replenishment. To assure this requirement is satisfied, a Standby Service Water (SSW) system analysis has been performed to verify the capability of the SSW/UHS to dissipate the residual heat associated with a DBA in Unit 1 with Unit 2 not in operation.

The total evaporative and drift losses from the UHS cooling towers for the 30 day period following the DBA in Unit 1 with Unit 2 not in operation has also been determined to verify the 30 day inventory requirement.

The system analysis is based on the following assumptions:

1) Unit 1 is experiencing a loss of coolant accident (LOCA) coincident with a loss of offsite power (LOP) at day 30 after shutdown for the eighteenth refueling outage,

2) Unit 2 is not operational,

3) Worst single active failure occurs. The worst active failure for this analysis is the loss of one of the standby diesel generators which removes one of the SSW loops from operation (Standby diesel generator A is assumed to fail),

4) Makeup to the SSW system is not available from normal means of supply (Transfer between basin A and basin B is possible),

5) Worst 1 and 30 day meteorology (per Regulatory Guide 1.27), and

6) Basin temperature is in near equilibrium with the cold water return temperature of the UHS cooling towers (No basin mixing).

These assumptions will result in the greatest heat rejection rate for the UHS during the most severe meteorology following the DBA.

Analysis results indicate the total water losses from the SSW/UHS cooling towers will be 7,784,971 gallons for the 30 day post LOCA period. The total usable basin B volume from elevation 84'-6" to elevation 130'-3" is 6,638,508 gallons. The total basin A volume from elevation 84'-6" to elevation 130'-3" is also 6,638,508 gallons. The total basin A usable volume, however, is limited to the volume above elevation 105'-0" (the inlet elevation of the basin siphon line) when utilizing the basin siphon. Therefore, the total basin A volume is reduced by 2,974,632 gallons (i.e. basin A volume from elevation 84'-6" to elevation 105"-0") so that the total usable basin A volume is 3,663,876 gallons. Thus, the total combined basin usable volume is 10,302,384 gallons. With the total water loss, evaporative and drift, calculated to be 7,784,971 gallons, there will be 2,517,413 gallons remaining at the end of the 30 day period.

For the worst one day analysis, the cooling tower return temperature was based on a 3-hour average heat rejection rate for the DBA. In each 3-hour period, the SSW pump suction temperature was assumed to be in near equilibrium with the cooling tower cold water return temperature for the heat rejection rate at that time. In the initial 3-hour period the cold water temperature of 88^{o} F was conservatively based on a SSW pump suction temperature also of 88^{o} F. Similarly, for the highest cold water temperature of 90.5^{o} F, a pump suction temperature of 90.5^{o} F was assumed. A similar conservative assumption was used for the 30-day analysis. In all cases no credit was taken for mixing with the actual cooler basin water throughout the analyses. As a result, the cold water return temperatures will not actually be as high as indicated for the worst 1-day analysis.

Therefore, the analyses verify the 30-day post LOCA water inventory requirement and the capability of the UHS to dissipate the residual heat since even with a gradual depleting basin water inventory due to evaporation and drift, the maximum cold water temperature will not exceed the design temperature of 90^{o} F.

STANDBY SERVICE WATER COOLING TOWERS
GRAND GULF NUCLEAR STATION
WORST ONE DAY ANALYSIS

HR	WBT °F	DBT °F	Avg. Heat Load 10^7 BTU/HR	Evaporation GPM	Cold Water Temperature °F
00	77	78	18.56	293.8	88.0
03	76	77	22.89	349.0	88.0
06	76	77	21.93	333.6	87.8
09	79	86	20.93	336.5	89.3
12	81	92	20.01	334.2	90.3
15	81	94	19.17	325.7	90.1
18	82	90	18.35	301.4	90.5
21	78	84	17.83	283.5	87.8
			AVERAGE	319.7	89.0

STANDBY SERVICE WATER COOLING TOWERS
GRAND GULF NUCLEAR STATION
ANALYSIS BASED ON MAXIMUM 30-DAY AVERAGE WET BULB

Day	WBT °F	DBT °F	Avg. Heat Load 10^7 BTU/HR	Evaporation GPM	Cold Water Temperature °F
1	74.4	78.1	19.96	318.53	87.0
2	75.7	81.0	16.17	253.64	85.9
3	74.8	81.0	14.75	232.94	84.7
4	76.1	81.0	13.83	216.73	85.2
5	76.0	79.6	13.04	201.10	84.8
6	75.7	81.7	12.38	196.90	84.3
7	77.5	83.4	11.88	190.61	85.3
8	77.1	82.0	11.50	181.85	84.9
9	78.0	83.1	11.21	178.69	85.4
10	77.9	82.7	10.96	174.01	85.2
11	78.5	82.5	10.79	169.82	85.6
12	78.4	81.5	10.55	163.72	85.4
13	78.7	84.7	10.48	170.44	85.6
14	78.1	81.4	10.40	161.70	85.1
15	77.6	81.9	10.37	163.44	84.7
16	77.5	83.2	10.33	166.40	84.6
17	77.1	80.1	10.30	158.58	84.3
18	75.2	79.4	10.26	159.55	82.9
19	73.1	77.0	10.22	156.40	81.4
20	74.5	79.2	10.19	159.22	82.4
21	75.0	80.9	10.15	162.17	82.7
22	75.7	81.0	10.12	163.07	83.2
23	77.2	81.7	10.08	159.23	84.3
24	76.7	79.7	10.04	154.30	83.9
25	75.7	78.6	10.01	152.78	83.1
26	76.7	81.1	9.97	157.73	83.4
27	76.5	80.6	9.94	155.50	83.7
28	76.4	78.5	9.90	149.58	83.6
29	77.7	81.9	9.86	155.50	84.5
30	77.2	80.0	9.83	151.00	84.1