MAY 21 1986

Docket No. 50-416

LICENSEE: Mississippi Power & Light Company (MP&L)

FACILITY: Grand Gulf Nuclear Station, Unit 1

SUBJECT: SUMMARY OF MAY 7, 1986 MEETING REGARDING SPENT FUEL POOL COOLING

The purpose of the meeting was to discuss spent fuel pool cooling for spent fuel stored in high density spent fuel racks. Enclosure 1 is a list of attendees. Enclosure 2 is a handout prepared by the licensee.

The licensee provided in Enclosure 2 the heat loads for various cases of off load plans. The licensee also provided results of its calculated fuel pool temperature for the 14th refueling outage based on a 12 month fuel cycle. This calculation resulted in a peak pool temperature of about 140°F. The licensee described its method of calculating pool temperature. NRC staff agreed that the heat loads and method of calculating fuel pool temperature appeared to be conservative.

The licensee plans to file supplemental information regarding decay heat loads and temperature calculations. In addition, changes to Technical Specifications will be submitted to limit the number of fuel assemblies which can be stored in the spent fuel pool and to limit the pool temperature to 140°F. The specification will require the plant to be in shut down condition if temperature less than 140°F cannot be maintained without the use of the residual heat removal system to supplement spent fuel pool cooling. The spent fuel pool cooling capability will be increased prior to the fifth refueling outage to ensure the spent fuel pool will be kept below 140°F and this commitment will be included in the supplemental information filed on the docket.

Original signed by

L. L. Kintner, Project Manager
BWR Project Directorate No. 4
Division of BWR Licensing

Enclosures:
As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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Enclosure 1

ATTENDEES

May 7, 1986 Meeting Between NRC Staff and
Mississippi Power & Light Co.

Name	Affiliation
Steve Thomas	MP&L
Dan Marshall	MP&L
Matt Crawford	MP&L
John Ridgely	NRC
L. Kintner	NRC
W. Butler*	NRC

*Part Time

Draft

RESPONSE TO THE NRC CONCERNS ABOUT THE SPENT FUEL POOL BULK TEMPERATURE ANALYSIS FOR THE HIGH DENSITY SPENT FUEL RACKS

The NRC requested that the Pool Bulk Temperature Analysis for the high density spent fuel storage racks be reanalyzed assuming the failure of a spent fuel pool heat exchanger train at a time when RHR was not available to supplement fuel pool cooling. The NRC also expressed concern that the heat loads for the pool bulk temperature analysis were not correctly calculated.

To verify that spent fuel decay heat loads have been correctly calculated the NRC requested that the heat loads be calculated for two offload scenarios prescribed by the NRC. The spent fuel off-load scenarios and their associated heat loads are delineated in Tables 4 and 5.

The reanalysis of the spent fuel pool bulk temperatures was performed using Revision 2 of Branch Technical Position ASB 9-2 to calculate decay heat loads and the failure of one spent fuel cooling train. Analysis of the spent fuel pool bulk temperatures for the projected refueling outages show that Fuel Pool and RHR Cooling Systems can keep the bulk temperatures at or below 140°F for the first fourteen refueling outages. Tables 1 and 2 delineate the refueling scenario and heat loads for the fourteenth projected refueling outage. The pool bulk temperature, the decay heat, and the heat removed by the cooling systems for the fourteenth refueling scenario are delineated in Table 3 and Figure 1. All spent fuel discharged to the spent fuel pool in the analyzed outages is assumed to be moved over a three hour period starting at 110 hours after shutdown. Time zero in Figure 1 represents the start of fuel movement 110 hours after shutdown. The fourteenth projected refueling scenario was analyzed assuming that one fuel pool cooling heat exchanger is in continuous service and RHR train is used for 35 days starting at shutdown.

The analysis of the spent fuel pool bulk temperatures (Figure 1) shows that the heat removed by the cooling systems varies with pool temperature, since the heat transfer rate of the heat exchanger is increased with the increase in the temperature difference between the pool water and the cooling water. The maximum pool bulk temperature is reached when the heat removed from the pool equals the decay heat load of the spent fuel. The actual maximum pool bulk temperature calculated was 140.04°F.

As a conservatism to the pool bulk temperature analysis, the number of fuel assemblies which can be off-loaded to the spent fuel pool will be limited to the number projected through the ninth refueling outage (which is 2096 assemblies). This limit will be observed until equipment modifications have been made which will enable the cooling systems to keep the temperature associated with greater amounts of spent fuel below 140°F. Design changes for the modifications to the cooling systems will be defined before the third refueling outage and implemented prior to restart after the fifth refueling outage.

FIGURE 1

POOL BULK TEMPERATURE ANALYSIS FOR
THE FOURTEENTH REFUELING OUTAGE

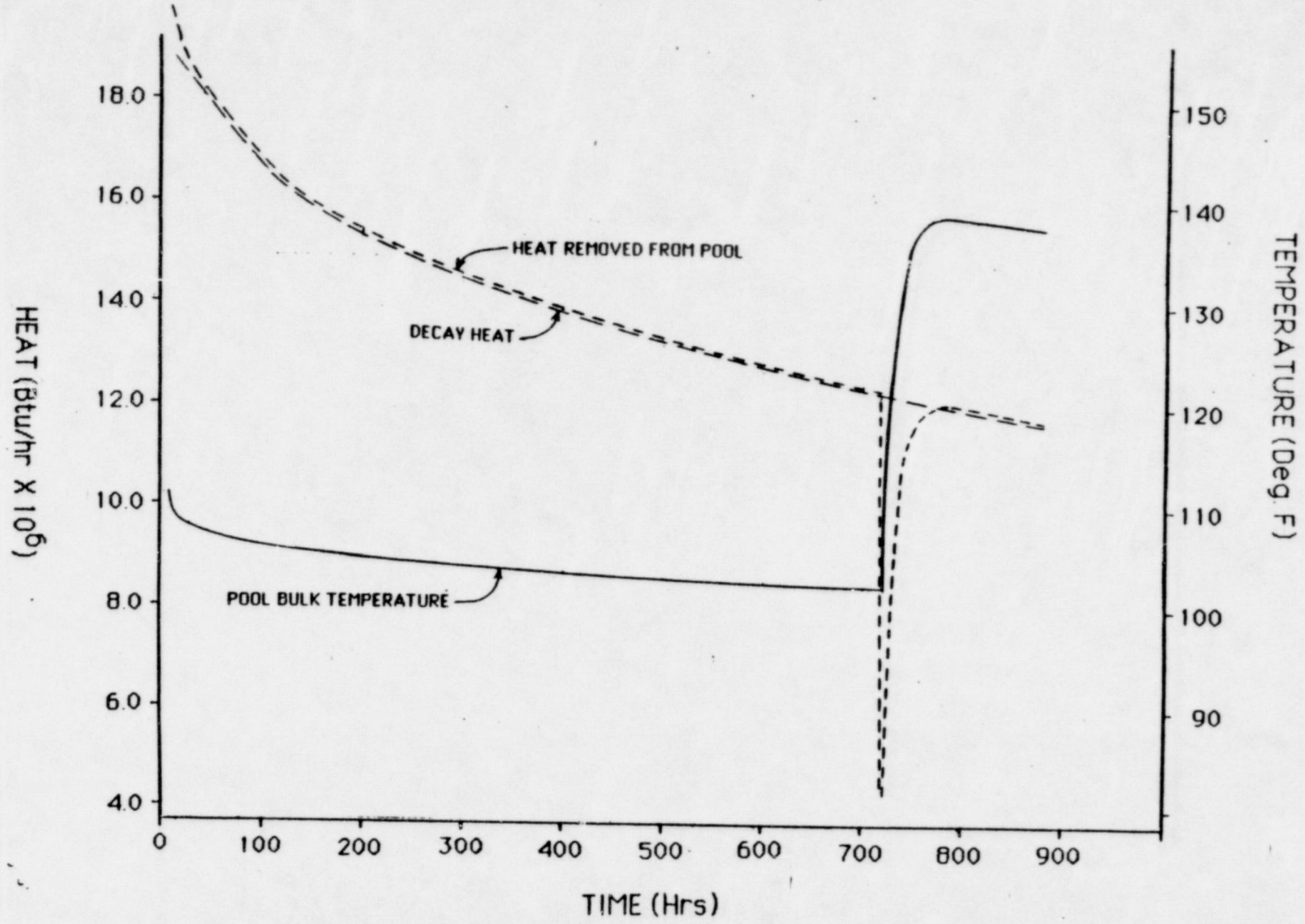

TABLE 1

Heatloads for the First 13 Projected Fuel Cycles
on the Eve of the Fourteenth Refueling Outage

Batch No.	Shutdown Time(yrs)	No. of Fuel Bundles	Heat Load/Bundle (Btu/hr)	Batch Heat Load (Btu/hr)
1	13	280	1306.0	365680
2	12	240	1337.7	321048
3	11	208	1370.2	285002
4	10	228	1403.8	320066
5	9	228	1438.8	328046
6	8	228	1476.3	336596
7	7	228	1518.6	346240
8	6	228	1572.2	358462
9	5	228	1652.9	376861
10	4	228	1801.5	410742
11	3	228	2122.0	483816
12	2	228	2896.9	660493
13	1	228	5312.4	1211227
			TOTAL*	5804279

* All fuel is assumed to have 4 years of reactor operating operating time and 12 month fuel cycles.

TABLE 2

Decay Heat Loads of 228 Fuel Bundles for Shutdown Times Up to 1000 Hours

Shutdown Time(Hours)	Decay Heat Load * (Btu/hr x 10^{-6})
0	322.70
50	18.33
100	14.01
150	11.78
200	10.48
250	9.63
300	9.00
350	8.50
400	8.07
450	7.69
500	7.36
550	7.06
600	6.78
650	6.53
700	6.29
750	6.08
800	5.88
850	5.70
900	5.53
950	5.37
1000	5.22

* All fuel is assumed to have 4 years of reactor operating time and 12 month fuel cycles.

TABLE 3

Pool Bulk Temperature Analysis of the Fourteenth Offload of the Actual Projected Refueling Scenario

Shutdown Time (Hrs)	Pool Temp. (Deg. F)	Decay Heat (Btu/hr X 10^6)	Heat Removed from Pool (Btu/hr X 10^6)
114	110.54	19.00	21.45
118	109.88	18.80	20.72
122	108.50	18.62	19.19
130	107.81	18.28	18.43
150	107.10	17.55	17.65
170	106.55	16.97	17.04
210	105.73	16.08	16.13
310	104.45	14.69	14.72
410	103.63	13.79	13.81
510	103.00	13.09	13.11
610	102.48	12.53	12.54
710	102.05	12.05	12.06
810	101.68	11.64	11.65
822	101.64	11.60	11.61
826	101.63	11.59	11.60
830	101.61	11.57	11.58
834	112.37	11.56	4.38
838	120.16	11.54	6.34
842	125.81	11.53	7.76
846	129.90	11.51	8.79
858	136.53	11.47	10.46
870	138.97	11.43	11.08
878	139.62	11.40	11.24
890	139.99	11.36	11.33
894	140.02	11.35	11.34
898	140.04	11.34	11.35
902	140.03	11.32	11.34
906	140.01	11.31	11.33
914	139.95	11.28	11.32
922	139.87	11.26	11.30
950	139.54	11.17	11.22
990	139.07	11.05	11.10

TABLE 4

Heat Load Analysis of the Normal Discharge Scenario Prescribed by the NRC

Batch No.	Shutdown Time(Years)	No. of Fuel Bundles	Batch Heat Load * (BTU/Hr)
1	18	252	291967
2	17	240	284808
3	16	208	252803
4	15	228	283834
5	14	228	290700
6	13	228	297768
7	12	228	304996
8	11	228	312406
9	10	228	320066
10	9	228	328046
11	8	228	336596
12	7	228	346241
13	6	228	358462
14	5	228	376861
15	4	228	410742
16	3	228	483816
17	2	228	660493
18	1	228	1211227
19	150 Hrs	228	11780000
	TOTAL	4348	TOTAL 18931832

* All fuel is assumed to have 4 years of reactor operating operating time and 12 month fuel cycles.

TABLE 5

Heat Load Analysis of the Abnormal Discharge Scenario Prescribed by the NRC

Batch No.	Shutdown Time(Years)	No. of Fuel Bundles	Batch Heat Load * (BTU/Hr)
1	16	128	155576
2	15	228	283834
3	14	228	290700
4	13	228	297768
5	12	228	304996
6	11	228	312406
7	10	228	320066
8	9	228	328046
9	8	228	336596
10	7	228	346241
11	6	228	358462
12	5	228	376861
13	4	228	410742
14	3	228	483816
15	2	228	660493
16	1	228	1211227
17	150 Hrs	800	41330000
	TOTAL	4348	TOTAL 47807830

* All fuel is assumed to have 4 years of reactor operating operating time and 12 month fuel cycles.