CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9711190115 DOC.DATE: 97/11/11 NOTARIZED: YES DOCKET #
FACIL:50-244 Robert Emmet Ginna Nuclear Plant, Unit 1, Rochester G 05000244

AUTH.NAME AUTHOR AFFILIATION
MECREDY,R.C. Rochester Gas & Electric Corp.
RECIP.NAME RECIPIENT AFFILIATION
VISSING,G.S.

SUBJECT: Forwards responses to 970331 RAI re proposed mod of Ginna spent fuel storage pool.

DISTRIBUTION CODE: A001D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 20
TITLE: OR Submittal: General Distribution

NOTES:License Exp date in accordance with 10CFR2,2.109(9/19/72). 05000244

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD1-1 LA	1	1	PD1-1 PD	1	1
	VISSING,G.	1	1			
INTERNAL:	FILE CENTER 01	1	1	NRR/DE/ECGB/A	1	1
	NRR/DE/EMCB	1	1	NRR/DRCH/HICB	1	1
	NRR/DSSA/SPLB	1	1	NRR/DSSA/SRXB	1	1
	NUDOCS-ABSTRACT	1	1	OGC/HDS3	1	0
EXTERNAL:	NOAC	1	1	NRC PDR	1	1

C A T E G O R Y 1 D O C U M E N T

NOTE TO ALL "RIDS" RECIPIENTS:
PLEASE HELP US TO REDUCE WASTE. TO HAVE YOUR NAME OR ORGANIZATION REMOVED FROM DISTRIBUTION LISTS OR REDUCE THE NUMBER OF COPIES RECEIVED BY YOU OR YOUR ORGANIZATION, CONTACT THE DOCUMENT CONTROL DESK (DCD) ON EXTENSION 415-2083

TOTAL NUMBER OF COPIES REQUIRED: LTTR 13 ENCL 12

RG AND E

ROCHESTER GAS AND ELECTRIC CORPORATION • 89 EAST AVENUE, ROCHESTER, N.Y. 14649-0001 AREA CODE 716 546-2700

ROBERT C. MECREDY
Vice President
Nuclear Operations

November 11, 1997

U.S. Nuclear Regulatory Commission
Document Control Desk
Attn: Guy S. Vissing
Project Directorate I-1
Washington, D.C. 20555

Subject: Response to Request for Additional Information - Spent Fuel Pool (SFP) Modifications - SFP Cooling Concerns (TAC No. M95759)
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Ref.(1): Letter from G. S. Vissing (NRC) to R. C. Mecredy (RG&E), Subject: Request for Additional Information - Spent Fuel Pool (SFP) Modifications - SFP Cooling Concerns (TAC No. M95759), dated September 9, 1997.

Dear Mr. Vissing:

By Reference 1, the NRC staff requested additional information regarding the proposed Modification of the Ginna Spent Fuel Storage Pool dated March 31, 1997. Enclosed are responses to each of the questions submitted by the NRC staff.

Very truly yours,

Robert C. Mecredy

Robert C. Mecredy

JPO

Subscribed and sworn to before me
on this 11th day of November, 1997

Marie C. Villeneuve

Notary Public

MARIE C. VILLENEUVE
Notary Public, State of New York
Monroe County
Commission Expires October 31, 1998

A001
/ /

xc: Mr. Guy S. Vissing (Mail Stop 14B2)
Senior Project Manager
Project Directorate I-1
Washington, D.C. 20555

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Ginna Senior Resident Inspector

Mr. Paul D. Eddy
State of New York
Department of Public Service
3 Empire State Plaza, Tenth Floor
Albany, NY 12223-1350

U. S. NRC
G. S. Vissing

November 11, 1997

Question No. 1.:

With regard to the decay heat loads resulting from the proposed spent fuel pool (SFP) capacity expansion, Table 5.5-1 of the SFP Re-racking Licensing Report should be revised to include the decay heat generation rate for each batch of the spent fuel assemblies (SFAs) stored in the SFP.

Response:

See attached a revised Table 5.5-1, Ginna Spent Fuel Pool Inventory (Actual & Projected). A few minor changes have been made to update this information since the Licensing Report was submitted on March 31, 1997. These changes have no effect on the required capacity of the SFP cooling system.

Table 5.5-1 Ginna Spent Fuel Pool Inventory (Actual & Projected), REV. 1

Discharge Date	Average Burnup (MWD/MTU)	Number of Assemblies	Heat Load on 9/18/2029 (BTU/hr)	Days of Decay to 9/18/2029
10/1/72	19750	81[a]	3.69E+04	20806
1/1/74	25135	12	5.58E+03	20349
3/11/75	24054	24	1.14E+04	19915
1/29/76	25048	37	1.78E+04	19591
4/15/77	28831	41	2.02E+04	19149
3/25/78	28579	41	2.05E+04	18805
2/9/79	29429	40	2.03E+04	18484
3/29/80	30721	36	3.19E+04	18070
4/18/81	31258	15	1.35E+04	17685
1/26/82	32281	19	1.73E+04	17402
3/27/83	35200	21	1.95E+04	16977
3/3/84	36714	28	2.63E+04	16635
3/2/85	37342	29	2.77E+04	16271
2/7/86	39119	31	3.01E+04	15929
2/6/87	39421	32	3.15E+04	15565
2/10/88	40281	33	3.31E+04	15196
3/17/89	38118	36	3.67E+04	14795
3/23/90	36995	37	3.84E+04	14424
3/22/91	39473	29	3.06E+04	14060
3/27/92	40057	37	3.96E+04	13689
3/12/93	44705	29	3.16E+04	13339
3/4/94	42397	27	2.99E+04	12982
3/26/95	41518	37	4.17E+04	12595
4/1/96	40674	41	4.70E+04	12223
10/20/97	39060	41	6.77E+04	11656
3/7/99	Proj:55000	44	7.46E+04	11153

a) Of the original 81 fuel assemblies discharged in 1972, 70 remain as intact fuel assemblies, but the fuel rods from 11 intact fuel assemblies were extracted and stored in 8 consolidated rod canisters (the consolidated hardware was stored in two additional canisters).

U. S. NRC
G. S. Vissing

November 11, 1997

Table 5.5-1 Ginna Spent Fuel Pool Inventory (Actual & Projected), REV. 1 Continued

Discharge Date	Average Burnup (MWD/MTU)	Number of Assemblies	Heat Load on 9/18/2029 (BTU/hr)	Days of Decay to 9/18/2029
9/15/00	Proj:55000	44	7.68E+04	10595
3/17/02	Proj:55000	44	7.90E+04	10047
9/16/03	Proj:55000	44	8.13E+04	9499
3/15/05	Proj:55000	44	8.37E+04	8953
9/21/06	Proj:55000	44	8.63E+04	8398
3/19/08	Proj:55000	44	8.90E+04	7853
9/18/09	Proj:55000	44	9.18E+04	7305
3/15/11	Proj:55000	44	9.48E+04	6762
9/15/12	Proj:55000	44	9.81E+04	6212
3/15/14	Proj:55000	44	1.02E+05	5666
9/15/15	Proj:55000	44	1.06E+05	5117
3/15/17	Proj:55000	44	1.11E+05	4570
9/15/18	Proj:55000	44	1.17E+05	4021
3/15/20	Proj:55000	44	1.24E+05	3474
9/15/21	Proj:55000	44	1.36E+05	2925
3/15/23	Proj:55000	44	1.54E+05	2379
9/15/24	Proj:55000	44	1.87E+05	1829
3/15/26	Proj:55000	44	2.60E+05	1283
9/15/27	Proj:55000	44	4.53E+05	734
3/15/29	Proj:55000	44	1.27E+06	187
9/18/29	---------	---------		---------
TBD		121		
Total		1879		

U. S. NRC
G. S. Vissing

November 11, 1997

Question No. 2.:

In Section 5.7 of the SFP Re-racking Licensing Report, Ginna states that the technical specification (TS) limit for the SFP water is 150°F which is achieved with the present SFP cooling system. The heat removal capability of the SFP cooling system heat exchangers varies as the temperature of Lake Ontario water varies. Therefore, the duration of reactor shutdown required prior to any SFAs discharged to ensure that the SFP water temperature does not exceed its 150°F limit is a function of Lake Ontario water temperature. For a full core off-load scenario, the following summarizes the reactor shutdown times required prior to the discharge of any SFA for three lake temperatures (40°F, 60°F, and 80°F) to prevent the SFP water from exceeding the 150°F limit:

Lake Water Temperature, °F	SFAs In Reactor Decay Time Required, Hrs.
40	100
60	132
80	280

Have these restrictions required for SFAs to decay in the reactor prior to the discharge of any SFA been incorporated in the Ginna TS? If not, provide detailed justifications for not having these restrictions imposed in the TS.

Also, provide the decay heat loads in the SFP and the corresponding calculated SFP water temperatures as a function of reactor shutdown time for each of the above cases.

Response:

Section 5 of the SFP Re-racking Licensing Report is in error when it states that the technical specification limit for the SFP water is 150°F. This limit is actually in the technical requirements manual (TRM), which is a document formatted similar to the Ginna Station Improved Technical Specifications, but is actually an extension of the UFSAR (i.e., changes to the TRM are performed under 10CFR50.59). The SFP water limit is specified in the TRM, since 10CFR50.36 does not require this to be specified within the technical specifications (see also NUREG-1431, Improved Standard Technical Specifications for Westinghouse Plants).

The in-reactor decay time has been misinterpreted. This is not the time required before the first SFA can be placed in the SFP but a time used for calculational purposes that represents the heat load associated with all the SFAs being instantaneously placed in the SFP. SFAs may be placed in the SFP before this time but the total reload or off-load cannot be placed in the SFP until this time has elapsed.

The heat removal evaluations of the SFP cooling system are based on two primary parameters.

The first is the lake temperature, since this provides the ultimate heat sink for the SFP, and the second is the reactor decay time, since this provides the heat load within the pool. RG&E proposes to add these two parameters to the TRM similar to the 150°F SFP water temperature. Placement of these parameters within the TRM provides a very clear and concise operating limit that is evident to all plant personnel, including operations. Changes to these two parameters can still be made by RG&E based on fuel cycle inputs, but only using 10CFR50.59. The NRC would be notified of these changes via 10CFR50.71 (i.e., UFSAR update process).

The decay heat load vs. time used for the full core off-load for each of the Lake Ontario water temperatures is shown in Figures 2-1, 2-2, and 2-3. The increase in SFP heat load above the background value in the figures corresponds to the placement of the full core off-load in the SFP after the required in-reactor decay time.

The SFP temperature vs. time for a full core off-load scenario at each of the lake water temperatures is provided in Figures 2-4, 2-5, and 2-6. These SFP bulk temperatures were calculated for an instantaneous placement of the full core in the SFP, neglecting the thermal inertia of the SFP and using design conditions for fouling and tube plugging for the SFP heat exchangers.

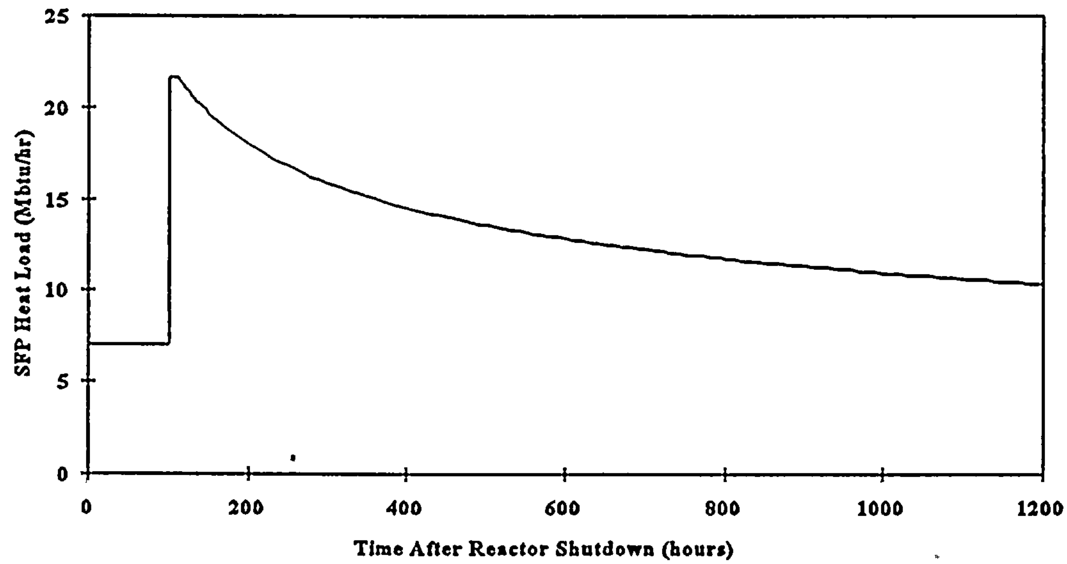

FIGURE 2-1 SFP HEAT LOAD - FULL CORE DISCHARGE
40°F LAKE WATER TEMPERATURE

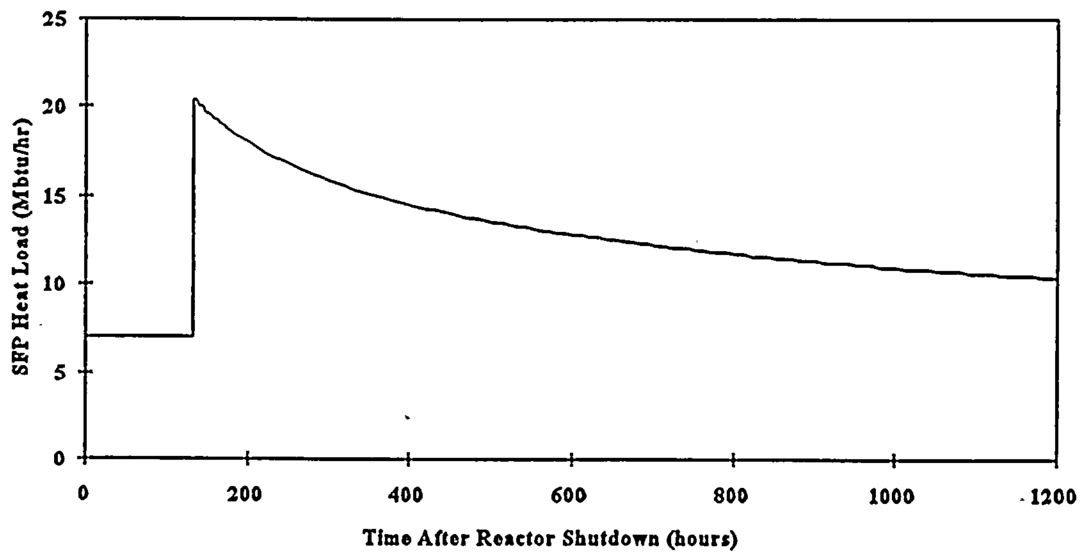

FIGURE 2-2 SFP HEAT LOAD - FULL CORE DISCHARGE
60°F LAKE WATER TEMPERATURE

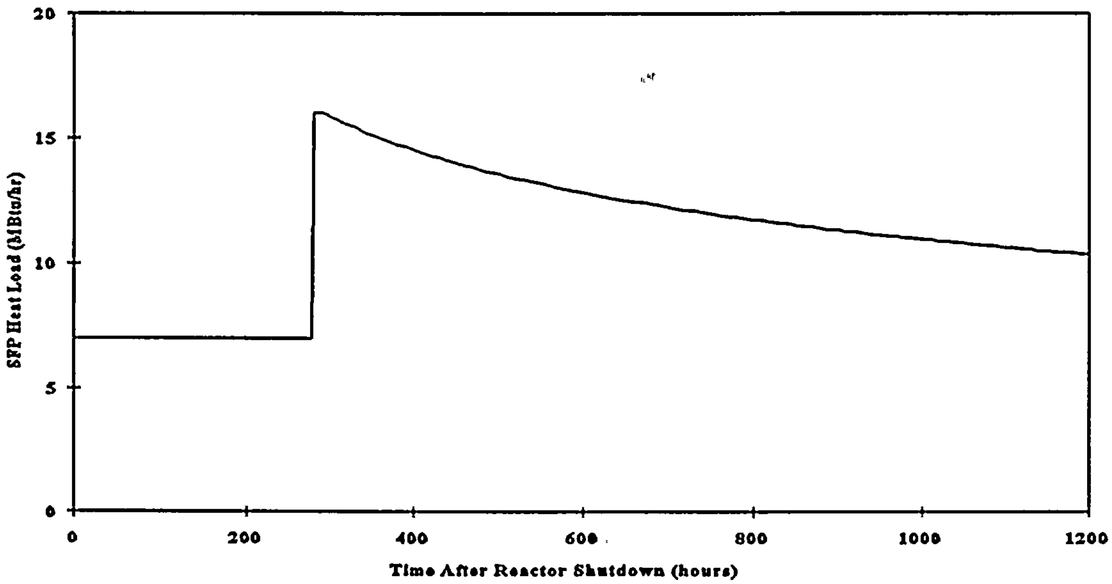

FIGURE 2-3 SFP HEAT LOAD - FULL CORE DISCHARGE
80°F LAKE WATER TEMPERATURE

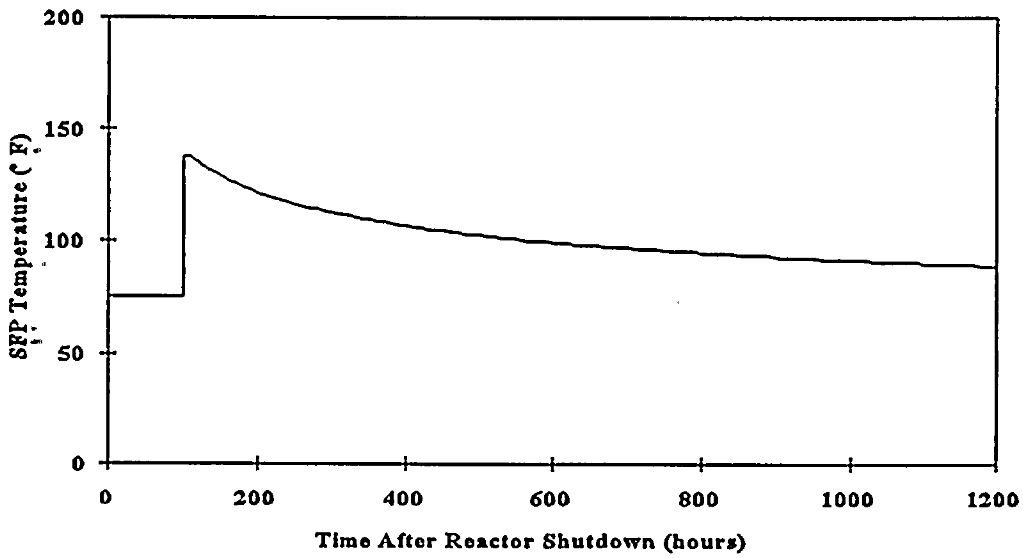

FIGURE 2-4 SFP HEAT LOAD - FULL CORE OFFLOAD
40°F LAKE WATER TEMPERATURE

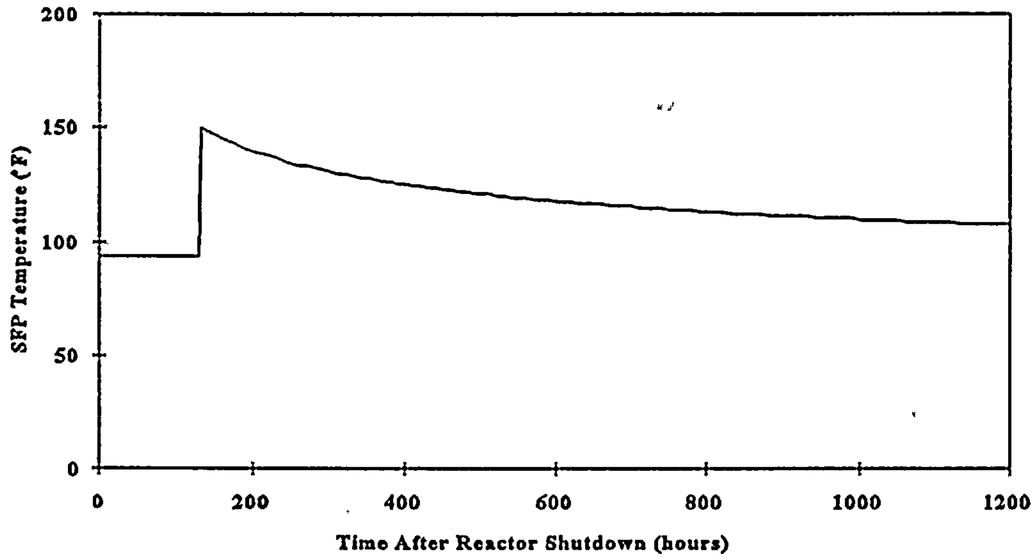

FIGURE 2-5 SFP TEMPERATURE - FULL CORE OFFLOAD
60°F LAKE WATER TEMPERATURE

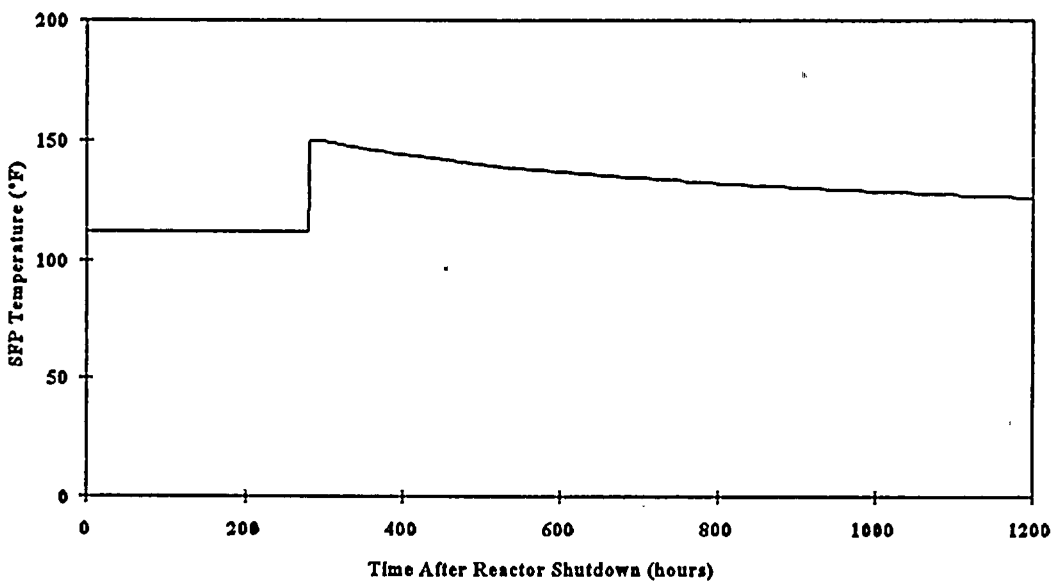

FIGURE 2-6 SFP TEMPERATURE - FULL CORE OFFLOAD
80°F LAKE WATER TEMPERATURE

U. S. NRC
G. S. Vissing

November 11, 1997

Question No. 3.:

For the normal (routine refueling with 1/3 core discharged) discharge scenario as discussed in Section 5.5.2.1 of the SFP Re-racking Licensing Report, provide the decay heat loads in the SFP and the corresponding calculated SFP water temperatures as a function of reactor shutdown time. Also, indicate the lake water temperature which was used in the analysis.

Response:

The SFP temperature limit is the same for the normal discharge and the full core off-load, 180°F. Since the heat load associated with the full core off-load is significantly greater than the normal discharge, calculations have only been provided for the bounding case: the full core off-load. See the response to Question No. 5 for the values used in the bounding analysis.

The single batch core off-load can be performed after the minimum 100-hour shutdown time limit associated with the radiological requirement (postulated fuel-handling accident). The limiting design SFP decay heat load at 100 hours for the single batch off-load and the design heat removal capability of the "B" SFP cooling loop with design conditions for fouling and tube plugging is summarized below for lake water temperatures of 40°F, 60°F, and 80°F:

Lake Water Temperature (°F)	SFP "B" Heat Exch. Capacity (MBtu/hr)	Decay Heat Load (MBtu/hr)	Delay Time Required for the Radiological Requirement (hours)
40	24.6	11.3	100
60	20.4	11.3	100
80	16.0	11.3	100

This limiting case was very conservatively calculated assuming the removal of 44 fuel assemblies being operated at 1.35 times the core average, in addition to a background heat load of 3.7 MBtu/hr of previously discharged fuel.

This limiting design decay heat load vs. time used for a 1/3 core off-load is shown in Figure 3-1. The increase in SFP heat load above the background value 100 hours after reactor shutdown in the figure corresponds to the placement of the 1/3 core off-load into the spent fuel pool.

The corresponding SFP temperature vs. time for a 1/3 core off-load at each of the Lake Ontario water temperatures are provided in Figures 3-2, 3-3, and 3-4. These SFP bulk temperatures were calculated for an instantaneous placement of the 1/3 core in the SFP after the minimum required 100-hour decay time. The thermal inertia of the SFP was neglected and design conditions for fouling and tube plugging were used for the SFP heat exchangers.

The actual decay heat associated with a normal 1/3 core off-load is significantly less than the limiting case analyzed. The decay heat is calculated using a methodology similar to the full core off-load methodology with more realistic assumptions concerning burnup of the off-loaded assemblies, background decay heat load, and number of discharged assemblies to ensure 100% cooling system backup is available prior to placing the spent fuel into the spent fuel pool. Because the decay heat load from the 1/3 core is so much less than the design limiting case analyzed, the spent fuel pool temperature will never approach the 150°F limit, using any single one of the three spent fuel pool cooling subsystems.

The realistic calculation for the 1997 reload is summarized below:

Lake Water Temperature (°F)	**SFP "A" Heat Exch. Capacity (MBtu/hr)**	**Decay Heat Load (MBtu/hr)**	**Delay time Required for the Radiological Requirement (hours)**
40	14.5	9.2	100
60	12.0	9.2	100
80	9.3	9.2	100

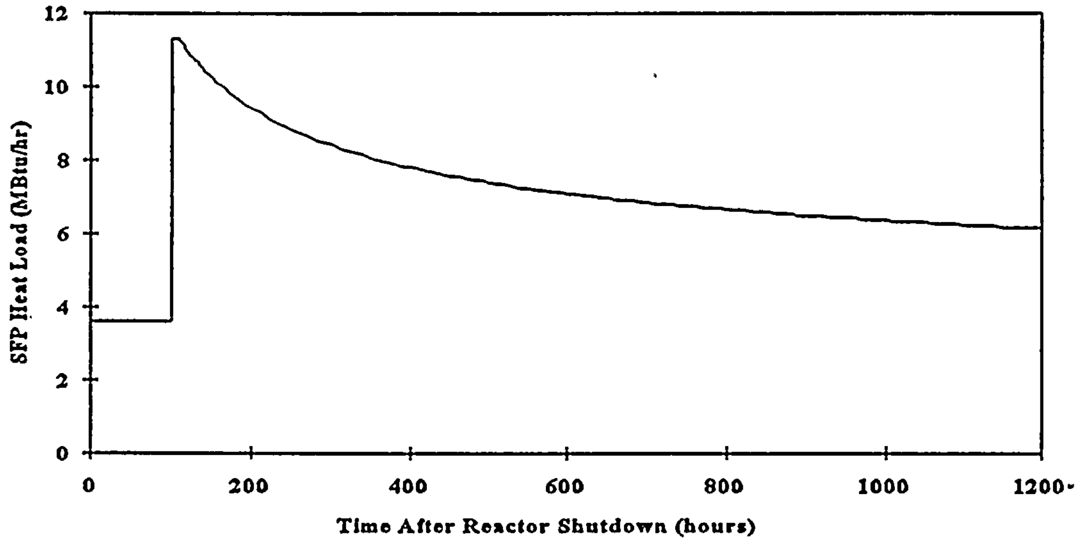

FIGURE 3-1 SPF HEAT LOAD -
NORMAL BATCH OFFLOAD
(40°F, 60°F & 80°F LAKE WATER TEMPERATURES)

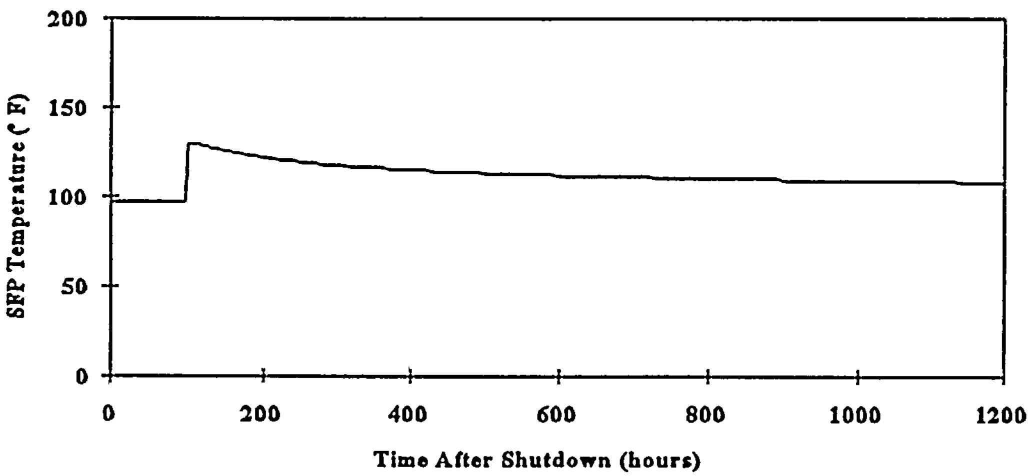

FIGURE 3-2 SPF TEMPERATURE NORMAL BATCH OFFLOAD
80° F LAKE WATER TEMPERATURE

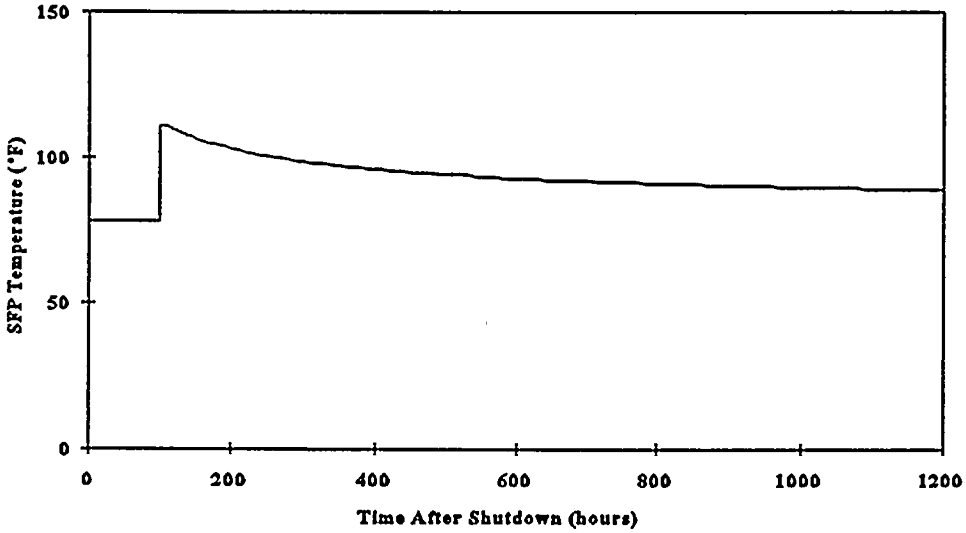

FIGURE 3-3 SPF TEMPERATURE NORMAL BATCH OFFLOAD
60°F LAKE WATER TEMPERATURE

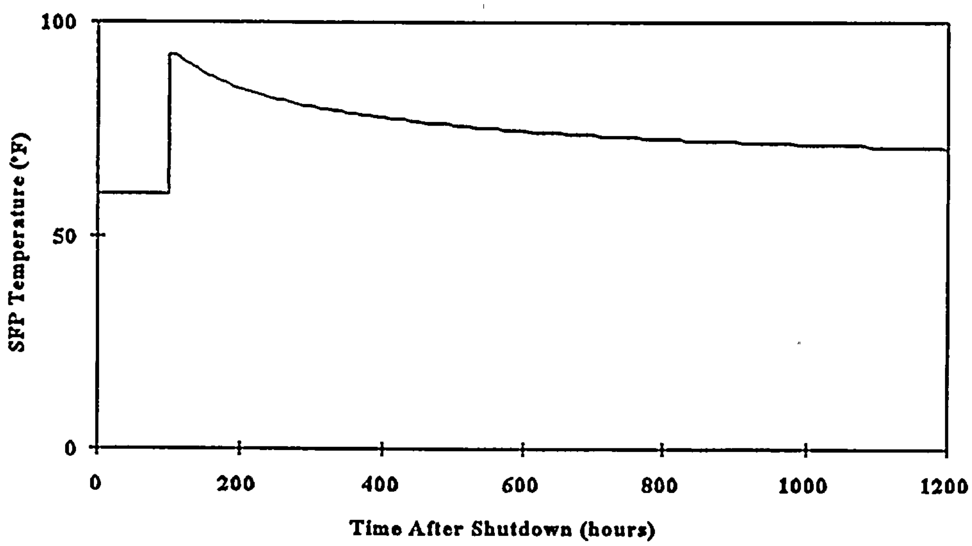

FIGURE 3-4 SPF TEMPERATURE NORMAL BATCH OFFLOAD
40°F LAKE WATER TEMPERATURE

<u>Question No. 4.</u>:

In an event of a complete loss of the SFP cooling system (i.e., resulting from a station blackout event, a seismic event, etc.), with the assumption that 1879 (a full core off-load scenario with a full inventory of SFAs) SFAs are stored in the pool and the pool temperature is 150°F, provide an analysis to show the time required for the SFP to boil. Information to be provided should include: input parameters (i.e., the reactor shutdown time required prior to the SFA discharge, etc.) used to calculate the decay heat load; SFP boiling off rate; methods to replenish the SFP water; and sources of makeup water.

<u>Response</u>:

SRP 9.1.3, Section III.1.d, requires evaluation of the abnormal maximum heat load (i.e., full core off-load) to ensure the SFP water remains below boiling and the liquid level is maintained without consideration of a single active failure. For Ginna Station, the SFP seismic design has only been evaluated up to a SFP temperature of 180°F. Therefore, the maximum temperature under abnormal conditions is 180°F and not boiling (212°F).

The analysis presented in Section 5.10 of the SFP Re-Racking Report lists the time it takes for the SFP to heat up from 150°F to 180°F. The worst case scenario listed is 2.5 hours. Since no single active failure must be considered, SFP Cooling Train B can be used. Even though not required by the SRP, the use of SFP Cooling Train A (original system) and the skid-mounted system are a second alternative. Both the preferred and alternative method can be accomplished by loading the specified SFP cooling system on the emergency diesel generators within the 2.5 hours. Therefore, the SRP requirement is met. Also, since the SFP remains below 180°F (and below boiling), there is no assumed SFP boil-off rate and no required makeup capability. The normal makeup methods can accommodate the evaporative losses.

However, for the purpose of answering this hypothetical question, the increase in the SFP bulk temperature with time (the heat up rate) has been determined, assuming a complete loss of the heat removal system. The analysis conservatively does not take credit for conduction in the pool walls or floor, evaporative cooling or convective cooling to the ambient air. The thermal inertia of the SFP is calculated by summing the individual (pool water, rack steel, and fuel assembly materials) heat capacities.

In the case of a complete failure of the SFP heat removal system, the heat up rate, the time to reach 212°F, and the rate of evaporation have been calculated based on the heat load for the full core off-load scenario and Lake Ontario water temperatures of 40°F, 60°F, and 80°F. The values determined are summarized below:

SFP Configuration: Full Core Off-Load, 1879 SFAs

Lake Water Temperature (°F)	Heat Load (MBtu/hr)	Delay Time Required for the 150°F Tech. Spec. Limit Temp. (hours)	Time to Boil 150°F→212°F (hours)	Evaporation Rate (gpm)
40	21.7	100	5.7	47.0
60	20.4	132	6.1	44.0
80	16.0	280	7.7	35.0

Makeup System:
The normal makeup water source is the Refueling Water Storage Tank. It contains in excess of 70,000 gallons of borated water, once the refueling cavity is filled. The maximum makeup rate of 60 gpm can be made available in less than 15 minutes.

As an alternative, the CVCS hold-up tanks provide an alternate source of water at 50 gpm, which could be made available in approximately 15 minutes.

Other makeup sources are the reactor makeup water tank or monitor tanks, which could supply water at 40 gpm and could be available within 3 hours.

The makeup rate from the primary source and one of the alternate sources exceeds the boil-off rate of 47 gpm (40°F lake water temperature) and 44 gpm (60°F lake water temperature). The makeup water rate from all sources exceeds the 35 gpm boil-off rate for the 80°F lake water temperature.

Question No. 5.:

In Section 5.10 of the SFP Re-racking Licensing Report, Ginna states that in the event of a complete loss of the SFP cooling system, the original (loop 1) SFP cooling system can be made operational in 45 minutes and that an additional 5.3 hours would be available for repair or to place the skid-mounted unit (loop 3) into operation before the pool temperature reaches 180°F.

Provide the following information:

- *detailed discussion to show how the above-cited 45 minutes were derived,*
- *detailed justifications (including equipment availability, readiness, etc.) to show that 5.3 hours will be adequate for repair or to place the skid-mounted unit into operation, and*
- *detailed discussion to show how long it will take to make the original SFP cooling system operational during an event of a complete loss of the SFP cooling system, resulting from a station blackout event, a seismic event, etc.*

Response:

The SER for the Ginna SFP cooling system (Ref. 1) required a 100% backup cooling capability. For a normal reload, 1/3 core, 100% backup cooling is provided by the original (loop 1) SFP cooling system. For a full core unload, 100% backup cooling is provided by the original and the skid-mounted units operating in parallel. The single active failure is assumed to be a component in the SFP cooling system.

The following steps are necessary to activate the original system:

1. Close one manual 4" valve isolating the lower suction from the SFP to the "B" (loop 2) SFP cooling system. (5 min)

2. Open one manual 6" suction valve upstream of the pump. (5 min)

3. Open one manual 4" valve to allow SFP water to be discharged from the heat exchanger back to the SFP. (5 min)

5. Close one 6" valve at the discharge of the "B" pump. (5 min)

6. Open one 2" valve in the purification line. (2 min)

7. Close one 2" valve isolating the "B" system purification line. (2 min)

8. Operate several small instrumentation valves. (2 min)

9. Start the SFP pump from a local on/off switch.

Since service water is continually supplied to the loop 1 heat exchanger, no valve manipulations are required.

The accident analysis of a loss of offsite power assumes that power is restored to the vital buses within 12.75 sec. Since the SFP pump is powered off a vital bus, there is almost no additional time to add to the above times following the loss of offsite power.

As shown above, the operations necessary to place the original SFP cooling system in service is less than 45 minutes.

The skid-mounted system is only necessary during a full core unload. Prior to a full core unload, the skid-mounted system is placed in position, hoses connected, and leak checked. The following operations would be necessary to activate the skid-mounted system:

1. Open one manual 6" valve to admit service water to the heat exchanger.

2. Open one manual 6" valve to allow service water to be discharged from the heat exchanger.

3. Open one manual 6" suction valve upstream of the pump.

4. Open one manual 4" valve to allow SFP water to be discharged from the heat exchanger back to the SFP.

5. Open one 4" lower suction valve.

6. Start the skid-mounted pump using local on/off switch.

As discussed earlier, the accident analysis of a loss of offsite power assumes that power is restored to the vital buses within 12.75 sec. Since the skid-mounted pump is powered off a vital bus, there is almost no additional time to add to the above times following the loss of offsite power.

The operations described above can be accomplished well within the additional 5.3 hr. required to heat up to 180°F.

The original analysis assumed the heat exchanger and pump was staged and connected prior to starting the system. Considerable time can be saved by having the equipment pre-positioned and connected.

As described above in the response to Question 4., the SRP does not require assumption of a single active failure. Therefore, SFP Cooling Train B would be available. Re-initiating SFP Cooling Train B following a loss of offsite power is accomplished by locally operating the on/off switch, since the pump is supplied from a vital bus.

The vital bus would be re-powered following a loss of offsite power by the time the operator actuated the on/off switch.

This case is bounded by the case presented in Section 5.10 of the SFP Re-rack Licensing Report.

The TRM will be modified to ensure 100% backup for all SFP cooling scenarios, along with lake water temperature, in-reactor decay times, and associated SFP heat loads.

References:

1. Letter from D. M. Crutchfield (NRC) to J. E. Meier (RG&E), dated November 3, 1981; SUBJECT: SPENT FUEL POOL COOLING SYSTEM MODIFICATIONS (GINNA).

<u>Question No. 6.</u>:

Discuss the procedures to be utilized by the Ginna staff to monitor and control the SFP water temperature and decay heat load so as to remain within the design basis limiting values for routine refueling and planned or unplanned full core off-load events. Include discussion of the location of needed instrumentation, means of monitoring it, and integration of operation staff activities with engineering staff activities in order to implement the procedure(s).

<u>Response</u>:

As described in Section 2.0, RG&E proposes to add requirements to the TRM with respect to lake water temperatures and reactor decay time. These limits, in combination with a maximum SFP temperature of 150°F, will ensure that all assumptions of the SFP heat load analyses remain bounding. Included with these two new requirements will be appropriate surveillances (i.e., verification of minimum reactor decay time prior to moving fuel to the SFP and periodic verification of the lake water temperature). The verification of minimum reactor decay time is an administrative function based on time since MODE 2 was exited. Periodic verification of lake water temperature will be accomplished consistent with current technical specification Surveillance Requirement SR 3.7.8.1 (verification of screenhouse water temperature to SW suction every 24 hours). Verification that the SFP water temperature is < 150°F will continue to be once every 24 hours at all times, per TRM Surveillance Requirement TSR 3.9.2.3. Since the TRM is controlled by Engineering but implemented by Operations, necessary integration is maintained.