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June 30, 1993

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Subject: **Docket No. 50-206, Amendment Application No. 211, Supplement 1, Fuel Storage Facility Thermal and Structural Analyses, Permanently Defueled Technical Specifications, San Onofre Nuclear Generating Station, Unit 1**

Reference: Letter, Harold B. Ray (SCE) to NRC Document Control Desk, "Docket No. 50-206, Amendment Application No. 211, Permanently Defueled Technical Specifications, San Onofre Nuclear Generating Station, Unit 1," May 12, 1993.

This letter describes the results of thermal and structural analyses for the San Onofre, Unit 1 (SONGS 1) fuel storage facility. Preliminary results and/or conclusions from these analyses were included in the referenced amendment application to support expeditious NRC review of the proposed SONGS 1 Permanently Defueled Technical Specifications (PDTS). The final analytical results confirm the validity of the PDTS significant hazards consideration analysis. Replacement pages for the proposed PDTS are provided to reflect completion of the analyses.

THERMAL ANALYSIS

Amendment Application No. 211 provided preliminary results for the following thermal characteristics of the SONGS 1 fuel storage facility during the permanently defueled condition: (1) spent fuel pool (SFP) heat load, (2) time for the SFP water temperature to reach 150°F after loss of forced cooling, and (3) the SFP water equilibrium temperature and the maximum SFP evaporation rate with no forced cooling in operation. Those calculated parameters were provided as a function of time during the permanently defueled condition in Figures 1, 2, and 3 of the amendment application.

Most of the final results of the thermal analysis are identical to the corresponding preliminary results submitted earlier. Specifically, the SFP heat load (Figure 1) and time to heat up to 150°F (Figure 2) results are unchanged. Therefore, by August 1, 1993, the SFP heat load will be less than

2.3 MBtu/hr and over 65 hours would be required for the SFP water temperature to reach 150°F if forced cooling were lost.

However, the final results for SFP equilibrium temperature and maximum evaporation rate during loss of cooling conditions differ slightly from the preliminary results included in Figure 3 of the amendment application. For example, the timing for an SFP equilibrium temperature of 180°F is projected for August 29, 1993, rather than the preliminary date of August 26, 1993. Additionally, the SFP maximum evaporation rate that could occur if forced cooling were lost after August 29, 1993, is 4.1 gpm rather than 4.5 gpm. The slight changes in the calculated parameters of Figure 3 are not significant. The conclusions of the PDTS significant hazards consideration analysis concerning the adequacy of SFP makeup water sources and the capability to passively cool the SFP are confirmed by the final analytical results.

The slight reduction in the calculated SFP maximum evaporation rate during loss of forced cooling conditions means the predicted rate for lowering of the SFP water level is less than previously indicated in Amendment Application No. 211. For example, the time stated in the Basis of proposed PDTS D3.2 for the SFP water level to drop within 10 feet of the stored fuel, assuming makeup remained unavailable, is conservatively calculated to be 24 days rather than 22 days. This result also supports the conclusions of the PDTS significant hazards analysis.

Final versions of Figures 1, 2, and 3 in the amendment application are included in Enclosure 1 to support the Commission's review of the proposed PDTS. Each figure is noted as being final rather than preliminary. Additionally, the calendar date axis in Figure 1 has been rescaled slightly to correct a plotting discrepancy that was contained in the preliminary version of that figure.

STRUCTURAL ANALYSIS

A new safety limit for the SONGS 1 fuel storage facility was proposed in Amendment Application No. 211 to maintain the SFP water level above plant elevation 16 feet. That limit was developed, in part, by re-confirming the structural adequacy of the SFP concrete walls. The confirmation included SFP stress analyses which conservatively assumed boiling can occur in the SFP. This assumption was made to maximize thermal stress effects even though SFP boiling is not credible during the permanently defueled condition. The final results of the analyses confirm stress levels in the liner/concrete are acceptable even if SFP boiling were postulated.

TECHNICAL SPECIFICATION REPLACEMENT PAGES

Replacement pages for the proposed PDTS are contained in Enclosure 2 to reflect completion of the fuel storage facility thermal and structural analyses. Change bars indicate the text revisions on each replacement page.

The PDTS significant hazards consideration analysis, as presented in Amendment Application No. 211, is confirmed by the final results described above and demonstrates the adequacy of the proposed PDTS.

Please let me know if you have any questions on this matter.

Sincerely,

Walter C. Marsh
Manager of Nuclear Regulatory Affairs

Enclosures

cc: B. H. Faulkenberry, Regional Administrator, NRC Region V
S. W. Brown, NRC Project Manager, San Onofre Unit 1
C. W. Caldwell, NRC Senior Resident Inspector, San Onofre Units 1, 2&3
R. F. Dudley, Jr., Section Chief, Non-Power, Decommissioning, and Environmental Project, Directorate of Reactor Projects - 3, 4 and 5

ENCLOSURE 1

FINAL ANALYTICAL RESULTS

SONGS 1 FUEL STORAGE FACILITY THERMAL ANALYSIS

FIGURES 1, 2, AND 3 OF AMENDMENT APPLICATION NO. 211

PROPOSED PERMANENTLY DEFUELED TECHNICAL SPECIFICATIONS

Final

Figure 1. Spent Fuel Pool Heat Load During Permanently Defueled Condition

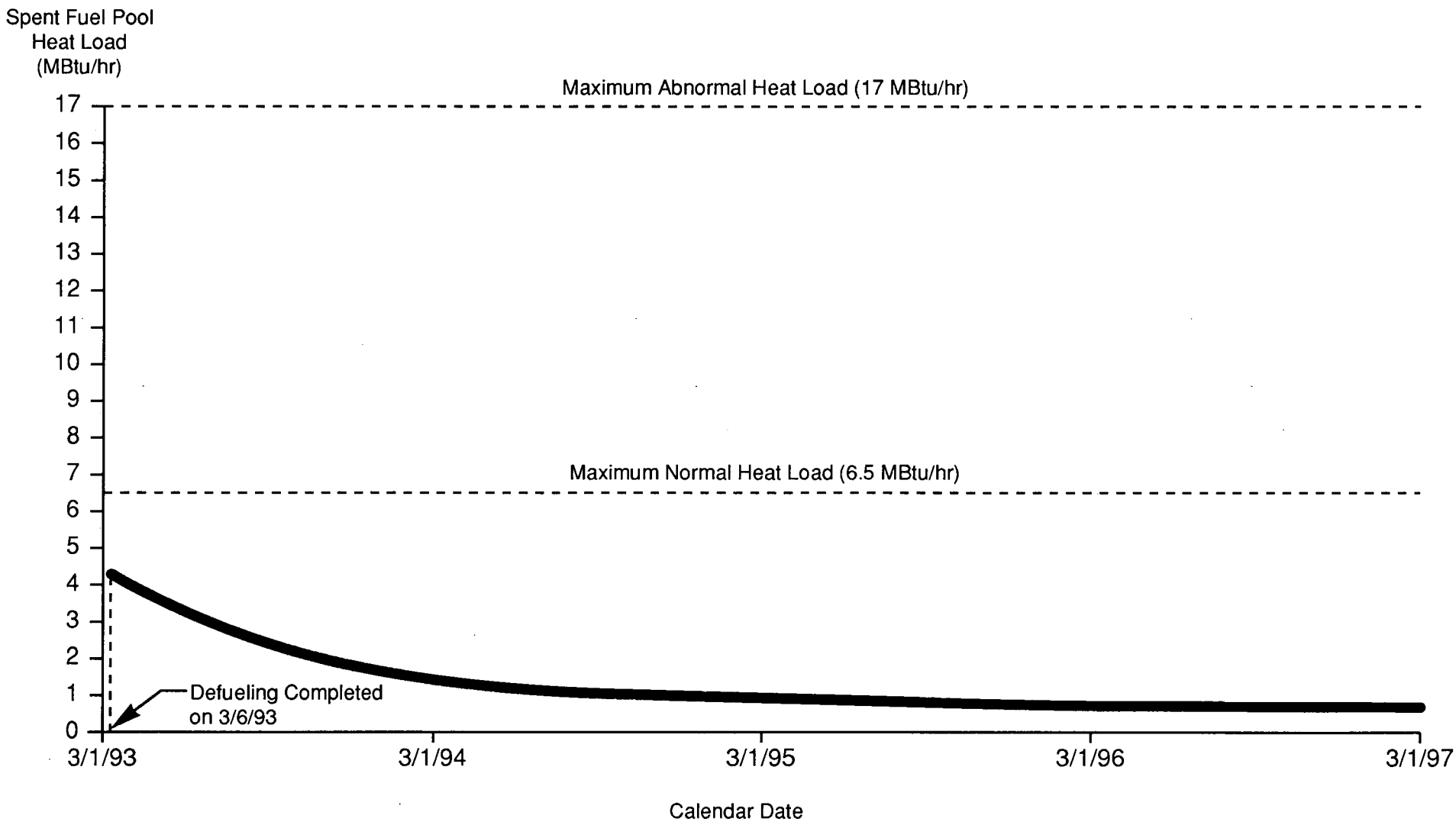


Figure 2. Time for Spent Fuel Pool Temperature to Reach 150°F After a Loss of Spent Fuel Pool Cooling (no heat loss from spent fuel pool)

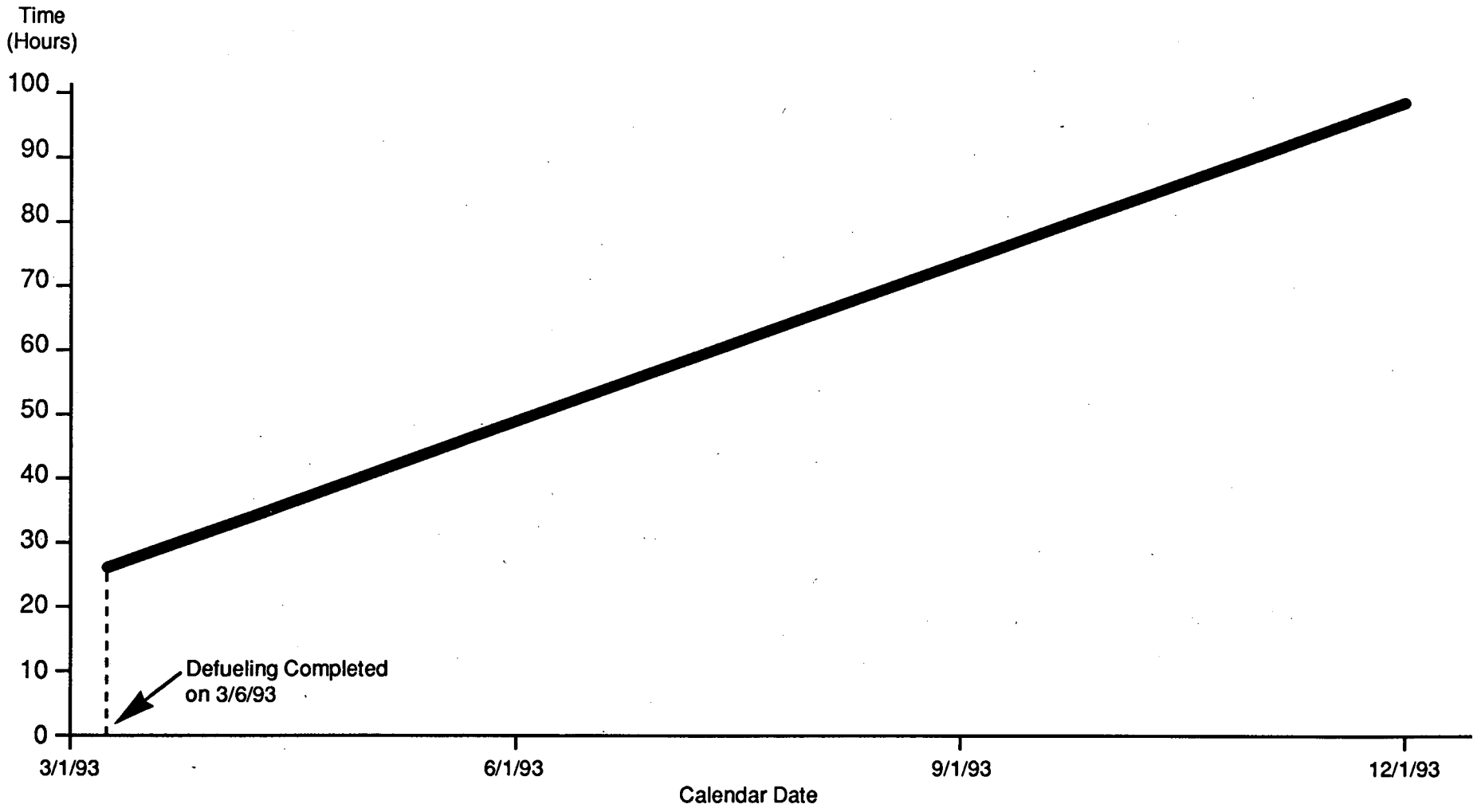
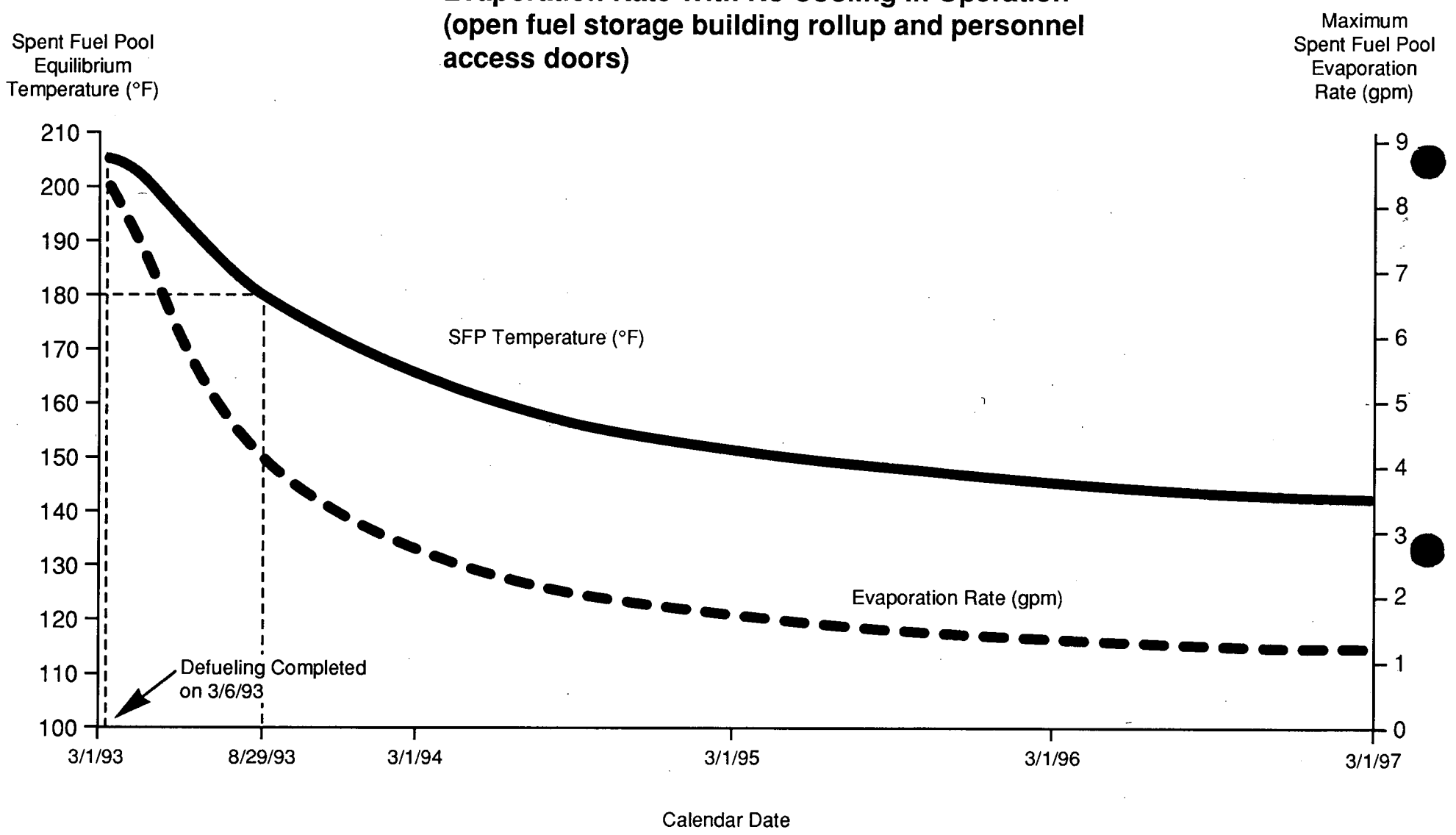


Figure 3. Spent Fuel Pool Equilibrium Temperature and Maximum Evaporation Rate With No Cooling in Operation (open fuel storage building rollup and personnel access doors)



ENCLOSURE 2

REPLACEMENT PAGES D2.1-1, D3.1-2, D3.2-1, AND D3.2-2

FOR

PROPOSED PERMANENTLY DEFUELED TECHNICAL SPECIFICATIONS

AMENDMENT APPLICATION NO. 211

D2 SAFETY LIMITS

D2.1 FUEL STORAGE FACILITY

APPLICABILITY: Whenever fuel assemblies are in the spent fuel pool (SFP).

OBJECTIVE: To protect the integrity of physical barriers which guard against uncontrolled release of radioactivity from spent fuel assemblies stored in the SFP.

SPECIFICATION: The water level in the SFP shall be maintained above plant elevation 16 feet.

BASIS: The fuel cladding must be protected to guard against the uncontrolled release of radioactivity. This is achieved by ensuring the stored fuel is covered with water at all times. In this condition, the SFP water temperature is thermodynamically limited since the fuel storage building is maintained near standard atmospheric conditions and critical heat flux conditions cannot occur. A SFP water level safety limit of plant elevation 16 feet ensures that water completely covers the stored fuel. This safety limit provides acceptable margin to fuel uncovery since the top of the stored fuel assemblies is at approximately plant elevation 15 feet 1 inch (Reference 1). Reference elevation is sea level, mean lower low water. The thermodynamic limit on SFP water temperature also ensures that the stresses in the SFP liner and concrete are acceptable (References 2 and 3).

REFERENCES:

1. SCE Design Calculation No. DC-3321, "Spent Fuel Pool Connections Evaluation," August 28, 1991.
2. SCE Design Calculation No. DC-3775, "Fuel Storage Building - Spent Fuel Pool Wall Thermal Analysis," April 21, 1993.
3. SCE Design Calculation No. DC-3777, "Fuel Storage Building - Spent Fuel Pool Liner Plate Thermal Analysis," May 21, 1993.

The impact of losing SFPC during the PERMANENTLY DEFUELED MODE has also been evaluated (Reference 4). The SFP heat load is sufficiently low during the PERMANENTLY DEFUELED MODE so that a minimum of 65 hours would be required for the SFP temperature to reach 150°F if cooling were lost after August, 1993. This is sufficient time to place a SFPC TRAIN in service. A non-powered means of determining SFP water temperature is provided so that water temperature can be surveilled even if electrical power is unavailable.

If cooling were interrupted without restoration, the SFP could be cooled through passive means by opening the fuel storage building rollup and personnel access doors. The temperature of the SFP would not exceed 180°F if such action became necessary after August, 1993. Since the stored spent fuel could be cooled by passive means, the use of commercial grade spare parts to maintain the portions of the SFPC TRAINS which are not part of the SFP pressure boundary is permissible. The SFPC TRAIN components and structures which are part of the SFP pressure boundary are classified as quality class safety-related and seismic category A to ensure that the required SFP water inventory is reliably maintained.

REFERENCES:

1. Letter, W. Paulson (NRC) to R. Dietch (SCE), "Systematic Evaluation Program Topic IX-1, Fuel Storage - San Onofre Nuclear Generating Station, Unit 1," December 7, 1982.

2. Letter, T. M. Novack (NRC) to K. P. Baskin (SCE), "San Onofre Nuclear Generating Station, Unit 1, Long Term Service Seismic Reevaluation Program," July 11, 1986.

3. Letter, J. E. Tatum (NRC) to Harold B. Ray (SCE), "Issuance of Amendment No. 132 to Provisional Operating License, San Onofre Nuclear Generating Station, Unit No. 1 (TAC No. 76808)," July 16, 1990.

4. SCE Design Calculation No. DC-3769, Revision 1, "Natural Cooling of the Unit 1 Spent Fuel Pool," May 24, 1993.

D3.2 AUXILIARY FEEDWATER STORAGE TANK

APPLICABILITY: PERMANENTLY DEFUELED MODE

OBJECTIVE: To ensure the availability of water in the auxiliary feedwater storage tank (AFWST) so that the spent fuel pool (SFP) level requirements in Specification D3.1.2 can be satisfied during periods of fuel handling and storage as well as during accident conditions.

SPECIFICATION: The AFWST shall be OPERABLE with a minimum required water level of plant elevation 50 feet 9 inches.

ACTION: With the AFWST inoperable, restore the tank to OPERABLE status within 14 days, or initiate action within one hour to place an equivalent seismically qualified source of water in OPERABLE status.

BASIS: The purpose of the AFWST during the PERMANENTLY DEFUELED MODE is to serve as a seismically qualified source of makeup water for the SFP. The thermal conditions in the SFP during the PERMANENTLY DEFUELED MODE have been conservatively calculated (Reference 1) in accordance with the recommendations of Standard Review Plan, Section 9.1.3, "Spent Fuel Pool Cooling and Cleanup System," and Branch Technical Position ASB 9-2, "Residual Decay Energy for Light-Water Reactors for Long-Term Cooling." The analysis demonstrates that the heat load in the SFP is sufficiently low during the PERMANENTLY DEFUELED MODE so as to preclude pool boiling even if SFP cooling were discontinued.

Maintaining the AFWST water level above plant elevation 50 feet 9 inches ensures that at least 50,000 gallons of water can be gravity fed to the SFP at a flow rate of at least 12 gpm (Reference 2). The SFP evaporation rate would be less than 4.1 gpm if SFP cooling were interrupted after August, 1993. Therefore, the 50,000 gallons of usable water in the AFWST represents over a five day supply of makeup water for the SFP. Five days is sufficient time to either restore cooling or connect another water source to the SFP to ensure the SFP minimum water level required by Specification D3.1.2 is maintained. Reference elevation is sea level, mean lower low water. Surveillance of the AFWST water level is performed locally, using non-powered means, if control room indication is unavailable.

The 14 day allowed outage time for the AFWST allows for maintenance activities on the tank. Also, this period is sufficiently brief so as to minimize the probability of a seismic event from damaging the two alternate sources of makeup water (the primary plant makeup water tank and the service water reservoir) when the AFWST is out of service. Neither of the alternate water sources are seismically qualified.

By August, 1993, even if SFP cooling and makeup remained unavailable, over 24 days would be required for the SFP water level to drop within 10 feet of the top of the stored fuel. Ten feet of water above the fuel provides adequate shielding for periods of fuel storage (fuel handling operations are prohibited unless the stored fuel is covered by at least 23 feet of water). Therefore, sufficient time is available to perform corrective actions and return the SFP water level to plant elevation 40 feet 3 inches as required by Specification D3.1.2.

REFERENCES:

1. SCE Design Calculation No. DC-3769, Revision 1, "Natural Cooling of the Unit 1 Spent Fuel Pool," May 24, 1993.

2. SCE Design Calculation No. DC-3783, "Makeup Water for Unit 1 Spent Fuel Pool," March 13, 1993.