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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 132 TO PROVISIONAL OPERATING LICENSE NO. DPR-13

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT NO. 1

DOCKET NO. 50-206

1.0 INTRODUCTION

By letter dated May 16, 1990, as supplemented by letter dated June 4, 1990, Southern California Edison Company (SCE or the licensee) requested an amendment to Provisional Operating License No. DPR-13 for operation of San Onofre Nuclear Generating Station, Unit No. 1, located in San Diego County, California. The purpose of the amendment request was to obtain NRC approval of a proposed revision to the spent fuel pool (SFP) cooling system decay heat removal requirements described in Section 9.1.3 of the Updated Final Safety Analysis Report (UFSAR). Based on its analysis under Title 10 of the Code of Federal Regulations, Article 10 CFR 50.59, the licensee concluded that the proposed revision involved an unreviewed safety question and that NRC review and approval was therefore required.

2.0 DISCUSSION

2.1 Background

The licensee plans to remove the fuel from the core of Unit 1 in order to examine the reactor vessel thermal shielding. In order to perform this examination, the fuel from the core will be stored in the SFP together with some fuel previously off-loaded, i.e., 59 assemblies already stored in the SFP. The licensee noted that, in preparing for off-loading the core during the Cycle 11 outage, an error was discovered in the previous decay heat calculations used to establish spent fuel pool coolant temperatures. This occurred because of use of the plant electrical rating in lieu of the thermal rating. The licensee made the appropriate corrections and repeated the calculations with the correct decay heat calculations. The results of those recalculations are discussed below, together with the licensee's plan for modifications of the spent fuel pool (SFP) cooling system. It is noted that this safety evaluation concerns only the SFP heat loads and the capability of the SFP cooling system to maintain the temperature of the spent fuel pool coolant under those conditions.

The licensee provided the information relating to the plans for the SFP cooling system modifications, for off-loading the core during the Cycle 11 reload period and new calculations regarding heat loads and concomitant SFP coolant temperatures in submittals dated May 16 and June 4, 1990.

2.2 Description of Spent Fuel Pool (SFP) and SFP Cooling

2.2.1 Spent Fuel Pool

The Spent Fuel Pool for SONGS Unit 1 (SONGS 1), has space for storage of 216 spent fuel assemblies, sufficient for 1-1/3 cores, in a rectangular array of 24 x 9 assemblies. In order to maintain space for a full core off-load, Unit 1 spent fuel assemblies may be transferred to the Unit 2 or Unit 3 spent fuel pools, as necessary. Storage of spent fuel in the Unit 1 SFP was found to be acceptable by the staff in a previous evaluation dated December 7, 1982.

2.2.2 Spent Fuel Pool Cooling System

The present SFP cooling system consists of a pump and a heat exchanger, together with a spare pump. The spare pump is partially installed, ready for connection to the SFP cooling system, as required. The licensee estimated that the time required, at present to place the spare pump in service may be as great as 16 hours. The SFP cooling pump may also be used to pump pool water to the ion exchanger, as required to maintain pool water chemistry.

The licensee states that the only accident previously evaluated involving the SFP cooling system is loss of SFP cooling; this evaluation postulates the single active failure to be loss of the primary SFP cooling system pump. The issues of heat loads and concomitant SFP coolant temperatures together with planned SFP cooling system modifications are discussed below. The spent fuel pool cooling system was found to be acceptable by the staff in a previous evaluation dated December 7, 1982.

3.0 EVALUATION

3.1 SFP Cooling System Modifications

The licensee reported that modifications to the SFP cooling system are presently being completed to place the spare pump in service within 30 minutes, as follows:

(1) The spare pump is being permanently connected to the SFP cooling system. All system additions will be Seismic Category I and safety-related quality class.

(2) The spare pump motor will be powered, initially, from a non-safety related construction power source, either from the San Diego Gas and Electric Power Grid or other construction power source. This power supply will be connected to the spare pump prior to the Cycle 11 outage. The spare pump, however, will not be installed completely

into the SFP cooling system until sometime prior to off-loading the full core so as to be able to place it in service in approximately 30 minutes. The power supply will be upgraded to comply with its safety-related classification only prior to the Cycle 12 outage.

(3) The licensee intends to provide "appropriate controls that are consistent with existing system requirements" for the spare pump. However, during the Cycle 11 refueling non-safety-related manual controls will be used. They will be upgraded to safety-related prior to the Cycle 12 refueling.

(4) The licensee's present plan, as noted above, is to install operating controls for initiation of spare pump operation at or near the spare pump. However, the licensee intends to review operation of the spare pump with a view toward determining whether to provide remote manual operation in the control room.

The power supply for the primary SFP cooling system pump will have to be changed from 480 Volt bus no. 2 (its normal power supply) to 480 Volt bus no. 1 because of the extensive reconfiguration of the 480 Volt system requiring that bus no. 2 be taken out of service for approximately one month. This switchover will take place before the full core off-load, when the heat generation in the SFP is low (0.5 MBTU/HR). Once bus no. 2 has been declared operable, the primary pump's power supply will be switched back to bus no. 2; this will occur after the core has been off-loaded and only after the spare SFP cooling pump has been installed so as to be operable within 30 minutes.

The licensee stated that this switchback will not require more than 72 hours. During this time, the spare SFP cooling system pump will be used for cooling the water in the SFP.

The staff finds the licensee's plan for the SFP cooling system modifications to be acceptable.

3.2 Thermal - Hydraulic Concerns

The licensee provided a series of calculations (Table 1, below) which showed the expected spent fuel pool coolant temperatures under various decay heat loads.

TABLE 1

SFP COOLING SYSTEM DECAY HEAT REMOVAL CAPABILITY
COMPARED TO CURRENT UFSAR MAX. ABNORMAL HEAT LOAD*

Plant Condition	Max. SPF Heat Load (MBtu/h)	Max. SFP Temp (°F)	Time to Boil Upon Loss of Cooling (hr)
Current UFSAR Max. Abnormal Heat Load	6.8*	116*	47*
Fuel Cycle 10 (current SFP fuel inventory)	0.5	<90	No Boiling (By Observation)
Cycle 11 Outage	8.6	138	21
Fuel Cycle 11 (with postulated emergency defueling)	14.7	179	6
Corrected UFSAR Max. Abnormal Heat Load	17.0	193	3

* In error because of use of plant electrical capacity in lieu of thermal capacity

All of these calculations assumed that only one pump was utilized in cooling the spent fuel pool.

The temperature of 193°F for the maximum abnormal heat load case is lower than 212°F and, thus is found to be acceptable. The licensee did not provide a recalculation of the maximum normal heat load. However, the heat generated in the Cycle 11 outage (8.6 MBTU/HR), in which the full core is unloaded, may be used as an upper bound for the case of a normal maximum heat load; the results show a SFP coolant temperature of 138°F.

Therefore, it is anticipated that a maximum normal heat load would result in a SFP temperature less than 138°F. The staff finds this to be acceptable.

3.3 Sources of Makeup Water

The sources of makeup water for the spent fuel pool are unchanged. The sources are:

(1) From the boric acid (BA) tank through the BA pumps to the SFP through the SFP return line. Each BA pump has a capacity of 45 gpm. The BA tank contains 7000 gal of borated water.

(2) From the primary makeup water to the SFP return line, by means of two makeup pumps at a rate of 100 gpm for each pump. The primary plant makeup tank contains a volume of 150,000 gal.

(3) From the refueling water storage tank (RWST) to the SFP via the RWST filter pump to the SFP return line at a rate of 80 gal/min. with a total capacity of 240,000 gal. in the RWST.

(4) The fire protection water system may also be used to provide water from the service water reservoir (3,000,000 gal) at a rate of 1000 gal/min. An emergency hose connection on the spent fuel pool cooling system return line would be used to admit water from the reservoir to the SFP.

These makeup sources are sufficient to replace water boiled off from the SFP at a rate of approximately 40 gpm under the worst conditions. These makeup sources were found to be acceptable in a previous SER, dated December 7, 1982.

3.4 Special Provisions, Cycle 11 Outage

The licensee proposes to maintain the temperature alarm for the spent fuel pool coolant at 125°F during the Cycle 11 outage. If the 125°F alarm point is reached, the licensee intends either to reset the alarm setpoint to 150°F or to assign an individual to monitor the performance of the SFP cooling system. In the event the 150°F temperature level is exceeded, the licensee proposes to dedicate an individual to monitor the SFP cooling system operation continuously so that the spare pump can be placed in service within 30 minutes in the event of failure of the primary SFP cooling system pump. At temperatures below 150°F, the system performance will be monitored once per shift. The licensee notes that, upon loss of pumping capability, the time to reach a pool boiling condition from 150°F would be approximately 15 hours. Once the planned modifications are completed, the spare pump could be put into operation within 30 minutes, in sufficient time to avert SFP boiling.

Normally, a single SFP cooling train will be operating during Cycle 11. This will consist of the SFP cooling system pump and heat exchanger, and one train each of the component cooling water system (used to cool the SFP cooling system heat exchanger) and saltwater cooling water system (used to cool the component cooling water heat exchanger). In addition, a second component cooling water system pump and a second saltwater cooling system pump will be functional during the Cycle 11 outage. It is anticipated that both SFP cooling system pump trains will be operable during the Cycle 11 refueling period once the spare pump is installed with the exception of the approximate 72 hour period in which the primary pump will not be available as noted above in Section 3.1.

The staff finds these added safety features during the Cycle 11 outage to be acceptable.

3.5 Loss of SFP Heat Exchanger

The licensee noted that the loss of the SFP heat exchanger would be a highly unlikely event. Nevertheless, the licensee considered such an event and concluded that a component cooling water (CCW) system heat exchanger could be used, on a temporary basis, as a replacement for a failed SFP heat exchanger. The CCW system heat exchanger would have to be connected to the SFP cooling system, in that case, by use of existing emergency cooling connections, flexible hoses and piping.

The licensee noted that sufficient time would be available to make the necessary connections before the SFP coolant started to boil except in the case of a full core off-load where boiling would be attained (in 3 hours) before completing the connections. It must be noted, further, that a postulated full core off-load is considered to be an event in which the licensee is not required to assume any further independent failures under present staff guidelines. Therefore, the licensee's consideration herein exceeds those guidelines. The staff, therefore, considers the licensee's request to delete the paragraph in Section 9.1.3.4 of the UFSAR, entitled "Safety Evaluation," which discusses this capability, to be acceptable.

3.6 Proposed UFSAR Revisions

The licensee proposed the following revisions in the UFSAR and requested that the staff approve them:

(1) SFP temperature will be no greater than 150°F for the SFP maximum normal heat load case (including assumption of failure of one cooling pump).

(2) No pool boiling will occur for the SFP maximum abnormal heat load case (including assumption of failure of one cooling pump).

(3) Pumps, piping, valves, electrical power sources, and connections will satisfy the existing system quality requirements.

(4) The SFP cooling pumps will be powered and controlled from separate electrical trains.

The use of an upper bound of 150°F for the SFP coolant temperature for the maximum normal heat load case is consistent with the original design basis for the plant, as reported by the licensee. Thus, items 1 through 4 are found to be acceptable.

3.7 STAFF POSITION

The licensee has corrected previous calculations regarding SFP coolant temperatures under conditions of maximum normal and maximum abnormal heat loads. The licensee is going to add another SFP pump in order to restore cooling capability within 30 minutes of losing the installed SFP cooling pump. Therefore, the staff considers the SFP modification, heat loads and coolant temperatures to be acceptable.

4.0 ENVIRONMENTAL CONSIDERATION

This amendment involves changes in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

5.0 CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations and (3) the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Dated: July 16, 1990