



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO.104 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 June 22, 1988, as supplemented July 15, 19, 21, and 22, 1988, Southern California Edison Company (SCE or the licensee) requested a change to the Technical Specifications appended to Provisional Operating License No. DPR-13 for operation of San Onofre Nuclear Generating Station, Unit No. 1 in San Diego County, California. The proposed change would revise the surveillance requirements for the emergency diesel-generators (EDGs) and increase the load limit during testing from 4500 KW to 5250 KW.

2.0 DISCUSSION

SONGS 1 utilizes two Delaval Model DSRV-20 diesel generators for on-site emergency power. These diesel generators have a nameplate rating of 6000 KW and operate at 450 rpm. In 1984, the NRC imposed a loading limit on the diesel generators of 4500 KW \pm 5%. This loading limit was imposed in consideration of certain design issues associated with Delaval diesel generators (see NUREG-1216, "Safety Evaluation Report Related to Operation and Reliability of Diesel Generators Manufactured by Transamerica Delaval, Inc.")

As a result of previous commitments, the licensee has installed a third Auxiliary Feedwater (AFW) pump, which will be integrated in the existing system during the upcoming refueling cycle. In reviewing the existing EDG loads and the additional AFW pump motor load, SCE found that errors had been made in the previous calculations: some loads were erroneously not included, the main feedwater pump load calculation was based on maximum safety injection flow instead of full flow, (at full flow, the load is higher) and non-conservative assumptions were used for some loads. After correcting these errors, the total present load was determined to be in the range of 5200 KW for each diesel generator.

The existing technical specifications include a diesel generator loading limit of 4500 KW \pm 5%. In order to start up from the current plant outage, SCE was required to demonstrate that revision of the existing TS load limit

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to accommodate the new calculated emergency service requirements is acceptable. SCE proposed a revised loading limit of 5250 KW \pm 5%. Also, as part of the diesel generator load testing, it is necessary to reject the largest single load. That load, previously calculated to be 2611 KW, has been recalculated to be 3220 KW. A revision to the surveillance testing and corresponding technical specification is also necessary.

3.0 EVALUATION

The NRC staff has evaluated the licensee's proposed change and finds it acceptable with certain limitations that are described below. The staff evaluation is based on SCE letters of June 22, July 15, July 19, July 21, and July 22, 1988, an SCE letter dated June 27, 1988 which transmitted Licensee Event Report (LER) No. 88-009 related to the potential diesel generator loads in excess of technical specification requirements, and meetings and telephone discussions with SCE representatives.

The proposed EDG loading limit of 5250 kW \pm 5% is acceptable to the staff as an interim limit until the next refueling outage which is scheduled to begin approximately three months from restart. The staff acceptance of this temporary load limit is based on the fact that the excess load would occur during the early stages of a design basis accident, with a maximum time duration of about 30 minutes. During this time, the brake mean effective pressure (BMEP) in the current type AF piston skirts will increase from 116 psi to 135 psi. Based on calculations performed by Failure Analysis Associates (see Enclosure 2 to the licensee's July 15, 1988 letter), the staff concludes that the increased loading would have a negligible impact on the propensity for cracks in the piston skirts of the diesel engine to initiate or propagate. For this reason, a temporary increase in the load limit to 5250 KW \pm 5% is acceptable.

In addition to the above change in the technical specifications, in its July 15, 1988 letter, the licensee proposed to replace the Type AF piston skirts at SONGS-1 with Type AE piston skirts at the next refueling outage, as a long-term solution to the potential problem of cracking of the TDI piston skirts. The staff finds this consistent with the recommendations of NUREG-1216, and therefore, acceptable. The SONGS-1 operating license is modified to include this as a license condition.

In addition to the above change, changes are being made in TS 4.4 to require that the number of fast starts be minimized, as was proposed in the licensee's July 15, 1988 letter. These changes are acceptable because they reduce the likelihood of piston skirt cracking and are consistent with the intent of Generic Letter 84-15. Also, the licensee proposed the following definitions of slow and fast starts, which the staff has reviewed and found to be consistent with current practice, and therefore acceptable.

A DG SLOW START is specified for the monthly surveillance and is defined as a start in which the steady state voltage and frequency is achieved in not less than 24 seconds. A DG FAST START is defined as an automatic or manual start of the EDG in which the steady state voltage and frequency is achieved within 10 seconds. This fast start is to be performed every

18 months or on a signal generated by coincident loss of offsite power and demand of safety injection. In addition to the above, in section 4.4.B.1.C of the Technical Specifications, the "brief load" is expected to last approximately three to five minutes. The loading 5250 KW \pm 5% is necessary to demonstrate the ability of the EDG to function at this load, but the brief loading is specified to minimize the increased stresses on the unit.

The licensee's revised load calculations determined that the largest single load is now 3220 kW, rather than the previous value of 2611. The proposed revision of TS 4.4.F.3 to verify the generator capability to reject a load of 3220 kW without tripping is consistent with the recommendations of Regulatory Guide 1.108, and is acceptable, since this load is the largest single connected load, and the increase constitutes a more severe test condition.

In addition to the above load testing SCE proposed to conduct confirmatory in-place load testing of the major EDG loads such as the main feedwater, safety injection, charging, auxiliary feedwater, component cooling water salt water pumps. The purpose of these tests is to confirm the adequacy of the calculated values for the onsite power system loads. The staff finds this additional testing to be an acceptable method of verifying the accuracy of the calculated loads, and is including this commitment as a condition of the SONGS-1 license.

SCE proposed that the power (kW) of the pump motors will be measured at flows as close as possible to the worst-case flows assumed in the EDG loading calculations. If the assumed flow is not obtainable, additional data points will be taken to enable extrapolation of pump power to the required flow rate. Also, instrumentation will be used to obtain pump flow, discharge and suction pressures and fluid temperature. If the instrumentation is not within its calibration range, it will be calibrated prior to the test. The pump motor volts, amps, power (kW) and power factor at specific flow will be measured, and pre and post calibration will be performed on these instruments prior to each test. Further, the observed kW values obtained from the tests will be corrected to account for the accuracy of the measuring instruments. The results of the tests and the values corrected for instrument error will be presented and compared to the estimated calculated values. A final EDG loading calculation to include the test results and other load requirements will be prepared to confirm the calculated required loads on each EDG. The staff has reviewed the above proposal for confirming the calculated loads and finds it acceptable.

The staff noticed, in reviewing the tabulations and calculations of the EDG loads submitted as attachment 1 to SCE letter of July 15, 1988 that the rating of the feedwater pump motor is 3500 HP and of the charging pump motor is 600 HP while the required loads are 4100 HP and 670 HP, respectively. Thus, these two electric motors will be overloaded under accident conditions. SCE submitted an evaluation of the overload conditions by letter dated July 19, 1988, in which an analysis is presented to show that the motors can withstand the overload conditions. The staff reviewed SEC justification and concludes that overloading the main feedwater pump

motor to 117% of its rating is acceptable because the pump service factor is 1.15, and the overload condition exists for less than one hour. Under these conditions, there would not be any appreciable loss of motor life due to overtemperature.

However, for the charging pump, the calculated overloads are 133% for five hours and 116% for 30 days. By letters dated July 21 and July 22, 1988, the licensee provided an analysis by the pump manufacturer (Westinghouse) that indicated that the pump had sufficient design margin to withstand the 133% overload condition. The staff has reviewed the analysis and concludes that it constitutes an acceptable justification for continued operation in the short term. As a long-term solution, the licensee proposed, in its July 22, 1988 letter, to either recertify the charging pump motors to a higher power level, so that the overload condition would not exceed the service factor, or to rewind the motors or purchase new motors that are NEMA-rated for the maximum worst-case accident loads. The staff has reviewed this commitment, and finds it acceptable as a long-term solution to the issue. The licensee's commitment in this regard has been incorporated into the SONGS-1 license as a condition.

On startup and coast down, the SONGS-1 EDG crankshaft is subjected to high torsional stresses at three closely spaced resonant frequencies. These stresses can initiate and cause propagation of cracks around certain main journal oil holes. The steady state loading of the units will also contribute to crack propagation after the crack reaches a certain depth, i.e., 18 mils for this type of EDG. The use of slow starts rather than fast starts mitigates but does not entirely resolve the problem of crankshaft cracking at SONGS-1 EDG.

Due to the number of fast starts of the EDG that have occurred to date, in discussions with SCE representatives in a meeting on July 11, 1988 the staff concluded that inspections of the crankshaft are necessary to verify that no cracks have developed since the last inspections. SCE agreed that prior to restart, it will inspect journals 8 and 9 of EDG No. 1 and journals 9 and 10 of EDG No. 2. Furthermore, the staff requested and the licensee agreed, in its letter of July 15, 1988, that at the next refueling outage and each refueling outage thereafter, main bearing journals 8-12 for both EDG units will be inspected until the issue of crankshaft cracking is resolved. These commitments are being included as conditions of the license.

In summary, based on the above discussion, and subject to the above additional requirements proposed by the licensee and incorporated herewith into the SONGS-1 operating license, the NRC staff finds the proposed technical specification changes to be acceptable.

4.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission may make a final determination, pursuant to the procedures in 10 CFR 50.91, that a proposed amendment to an operating license for a

facility licensed under paragraph 50.21(b) or paragraph 50.22 or a testing facility involves no significant hazards consideration, if operation of the facility in accordance with the proposed amendment would not:

- (1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or
- (2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or
- (3) Involve a significant reduction in a margin of safety.

SCE has provided the following evaluation:

This change does not involve a significant increase in the probability or consequences of an accident. The changes proposed relate to an increase in the calculated diesel generator loading. The diesel generators are utilized in events following a loss of offsite power to provide electrical power for emergency equipment to achieve a safe shutdown condition. In relation to the probability of a Station Blackout event, it is noted that Station Blackouts result from failure of the diesel generators to start. Because the proposed changes do not impact the method or ability to start the diesel generator, and the the diesel generators have been analyzed for operation at greater than the limit proposed, this change does not impact the probability of a Station Blackout. Therefore, a revision of the generator load has no impact on the accident probabilities. The proposed changes potentially impact only the consequences of previously analyzed accidents. The analyses performed by FaAA assumed diesel generator loading at or greater than the nameplate rating for the SONGS 1 diesel generators (6000 kW). Although the proposed changes increase the administrative load limit imposed by the NRC, the increased value is still well within the analyzed value which indicated the diesel generators are acceptable. In addition, the recommended maintenance and inspections are not affected by this change. Thus, the potential impact on the consequences of the accidents remain bounded by these previous analyses and the existing programmatic recommendations. Accordingly, operation of the facility in accordance with the proposed changes will not significantly increase the probability or consequences of an accident previously evaluated.

This change does not create the possibility of a new or different kind of accident. The diesel generators provide a mitigation function in response to an accident. They will not initiate or create an accident. The changes proposed relate to the maximum load that can be placed on the diesel generator for surveillance and emergency applications. This maximum load remains within the bounds of previous analyses. Therefore, operation of the facility in accordance with this proposed change will not create the possibility of a new or different kind of accident from an accident previously evaluated.

This change does not involve a significant reduction in a margin of safety. The margin of safety associated with diesel generator loading is established by the analyses performed by FaAA. This margin has been increased by the NRC through the imposition of an administrative load limit. The administrative limit was based on the required emergency service loads which were previously calculated to be less than 4500 kW. In addition, previous surveillance testing was (1) consistent with current surveillance testing, (2) accounted for emergency service requirements, and (3) minimized the stresses placed on diesel generator components. This administrative limit was not considered in the context of future diesel generator load changes.

The proposed changes increase the diesel generator administrative load limit from 4500 kW \pm 5% to 5250 kW \pm 5%, thus decreasing the conservatism associated with the existing limit. However, as discussed previously, the diesel generators have been analyzed to their nameplate rating of 6000 kW, (or greater than 6000 kW for some components). Therefore, the proposed changes do not impact the margin of safety assumed in the previous analyses. The licensee concludes, with concurrence from FaAA, that the analytical impact on component stresses and their propensity for failure is completely negligible and that the resulting configuration will be within the analyzed margin of safety. Thus, it is concluded that operation of the facility in accordance with this proposed change will not significantly reduce the margin of safety as defined by the previous analyses.

The NRC staff has reviewed the licensee's analyses presented above and finds that it acceptably addresses the three criteria, and the Staff agrees with the analysis. The State of California was consulted in this matter and had no comments. Therefore, the NRC staff has made a final determination that the amendment involves no significant hazards consideration.

5.0 BASIS FOR EMERGENCY TREATMENT

Under the Commission's regulations in 10 CFR 50.91, an emergency situation is deemed to exist when, as here, failure to act in a timely way would result in derating or shutdown or a delay in startup of a nuclear power plant. Licensees are also required to explain why the situation occurred and why it could not be avoided.

In its submittal of June 22, 1988, the licensee explains that errors made in the diesel generator loading calculation were discovered on or about June 7, 1988 as a result of revising the calculation to add additional loads in upcoming Cycle 10 this fall. In addition, the licensee attempted, unsuccessfully, to reduce the loads and could not avert the need for the emergency Technical Specification change. The staff has reviewed the submittal and concludes that it is necessary to revise the existing load limit to accommodate the new calculated emergency service requirements and failure to act in a timely manner would result in an unnecessary delay of plant startup.

We conclude that SCE has satisfied the requirements for emergency consideration of its request.

6.0 ENVIRONMENTAL CONSIDERATION

This amendment involves changes in surveillance requirements. 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 staff has also determined that the amendment involves no significant hazards consideration. Accordingly, the 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 issuance of this amendment.

7.0 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 22, 1988