Southern California Edison Company

P. O. BOX 800

2244 WALNUT GROVE AVENUE

ROSEMEAD, CALIFORNIA 91770

M. O. MEDFORD
MANAGER OF NUCLEAR ENGINEERING
AND LICENSING

TELEPHONE
(818) 302-1749

July 19, 1988

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

Gentlemen:

Subject: Supplement to Amendment Application No. 153
Docket No. 50-206
San Onofre Nuclear Generating Station
Unit 1

By letter dated July 15, 1988 we provided additional information in support of the NRC's review of Amendment Application No. 153. That letter indicated an evaluation of motors operating in an overload condition would be provided on July 19, 1988.

This evaluation is provided as an enclosure to this letter. If you have any questions, please contact me.

Very truly yours,

M. O. Medford

Enclosure

cc: J. B. Martin, Regional Administrator, NRC Region V
F. R. Huey, NRC Senior Resident Inspector, San Onofre Units 1, 2 and 3



A001
1/1

# OVERLOAD OPERATION OF THE

# FEEDWATER AND CHARGING PUMP MOTORS

## OVERVIEW

During the review of the diesel generator loading calculation, the NRC noted that the horsepower required for the feedwater and charging pumps was greater than the motors' rated horsepower. The motors for these pumps have been evaluated for this limited operation as discussed below.

## ANALYSIS

The purpose of this evaluation is to address the operability of these motors at overload conditions and the effect on motor input KW. The feedwater and charging pump motors normally operate at or below the design rating of 3500 HP and 600 HP, respectively. During an emergency condition, these pump motors could be required to operate at an overload condition during the accident event. The feedwater pump motors could be run at a value of 117% of their rated value (3500 HP rated, 4100 HP overload). The charging pump motors could be run at a maximum value of 133% of their rated horsepower (600 HP rated, 796 HP overload).

Both of these motors are designed with a service factor of 1.15. This service factor, multiplied by the rated horsepower, indicates a continuous horsepower that the motor may deliver. At the service factor load, the motor may have efficiency, power factor and speed different from those at rated horsepower, but the locked-rotor torque and locked-rotor current and breakdown torque will remain unchanged.

It is assumed that the feedwater pump will be run at this 2% over the motors' service factor for approximately one hour during the event. Operating the motor at 117% for one hour would not result in any appreciable loss of motor life based on the resulting motor temperature rise. Using the actual motor efficiency curves, the effects on efficiency curves, power factor and speed are less than 1/2% lower than at 100% rated horsepower. For added conservatism, the DG loading calculation assumed no reduction in speed (i.e., maximum pump horsepower). This small efficiency value change will be incorporated into the DG loading calculation. Operating the motor at 2% over the service factor is acceptable because of the limited overload duration for this type of motor as confirmed by the Westinghouse evaluation on the charging pump motors below.

The mechanical design calculation for charging pump flow requirements was revised and established that the charging pump motors could run at the following values:

121% overload during Injection Phase for 25 minutes

122% overload during Transition Phase for 5 minutes

133% overload during Recirculation Phase for 5 hours

116% overload during Recirculation Phase for 30 days

The maximum overload condition occurs during the recirculation mode for approximately five hours. Westinghouse Electric Corporation has performed a detailed engineering evaluation and has determined that the charging pump motors will operate satisfactorily under these overload conditions

without exceeding mechanical or thermal design limitations on any part of the motor. The resulting motor temperature rise during these overload periods was evaluated, and there is no appreciable effect on motor life. Based on Westinghouse charging pump motor data, the power factor and motor efficiency values at maximum overload were increased by approximately 0.9% and 0.3%, respectively. The motor speed will decrease by approximately 0.2%. To provide additional conservatism, the overload values were determined by assuming no reduction in speed. Also, since there is an increase in power factor and efficiency, the lower values at 100% rated load will be incorporated into the DG loading calculation for conservatism.

Since both the feedwater and charging pump motors are 4160V, overcurrent protection relays are provided. However, the time overcurrent relays for the feedwater pump motors are defeated on a SIS/SISLOP condition. To ensure that these motors continue to operate and perform their safety function, the minimum pickup setting for the charging pump motor overcurrent relay is 167%, and the feedwater pump motor relay is defeated.

CONCLUSION

The limited overload operation of the feedwater pump motors and the charging pump motors described above is acceptable. These loading conditions are slightly different than the loading assumptions in the calculation provided in our letter of July 15, 1988. These changes will be incorporated into a revision of the DG loading calculation prior to return to service.

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