Southern California Edison Company

P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

M.O. MEDFORD
MANAGER, NUCLEAR LICENSING

TELEPHONE
(213) 572-1749

August 28, 1984

Director, Office of Nuclear Reactor Regulation
Attention: Mr. W. A. Paulson, Acting Chief
Operating Reactors Branch No. 5
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket No. 50-206
Return to Service Requirements Regarding
Transamerica Delaval Emergency Diesel Generators
San Onofre Nuclear Generating Station
Unit 1

References: (A) Letter M. O. Medford (SCE) to D. M. Crutchfield (NRC), June 29, 1984, Return to Service Requirements Regarding Transamerica Delaval Emergency Diesel Generators

(B) Letter D. M. Crutchfield (NRC) to K. P. Baskin (SCE), July 26, 1984, Transamerica Delaval Diesel Inspection Requirements for Restart of San Onofre Unit 1

By Reference A, in response to an NRC request, Southern California Edison Company submitted detailed information on the operating history, inspection results, and analyses results concerning the San Onofre Unit 1 emergency diesel generators. During a telephone conversation with the NRC staff on July 13, 1984, the NRC's evaluation of the Reference A information was discussed. In this discussion, the NRC staff identified additional inspections, maintenance and surveillances and pre-operational testing to be performed prior to San Onofre Unit 1 restart. Reference B formally transmitted this NRC position and requested that Southern California Edison Company provide a description of the program to implement the required actions, along the lines suggested in the NRC letter.

Enclosures I and II to this letter describe our program covering inspections, tests, and maintenance and surveillance activities between the present time and the next refueling outage.

A001
1/1

During the conversation of July 13th, the NRC staff also expressed interest in the basis for, and method used to determine, the ESF loads. This information is included as Enclosure III. Additionally, we agreed to provide the results of stress analyses performed by Failure Analysis Associates (FaAA) regarding pistons, blocks and liners, crankshafts, connecting rods and bearing shells, specific to the San Onofre Unit 1 diesel generators under the nameplate rating condition of 6000 kW. These reports are in the final stages of preparation, and upon review by the TDI diesel generator owners group and Southern California Edison Company, they will be forwarded to you.

If you have any questions, please call me.

Very truly yours,

M. O. Medford

cc: USNRC Document Control Desk, Washington, D.C. 20555
A. E. Chaffee (USNRC Resident Inspector Units 1, 2 and 3)
C. L. Ray (TDI Diesel Generator Owners Group)

ENCLOSURE I

A - INSPECTIONS

Southern California Edison Co. will implement the following diesel generator inspections, retorquing, and component replacement program prior to returning San Onofre Unit 1 to service:

1) Inspect Nos. 9 and 10 main bearing journals near the oil holes visually and with eddy current non-destructive examination.

2) Retorque all connecting rod bolts to current TDI recommended values. Augment retorquing with the ultrasonic technique being developed by FaAA to measure bolt stretch.

3) Retorque air start valve capscrews to the current TDI recommended values.

4) Replace cylinder heads known to have valve seat cracks with cylinder heads that meet TDI's current acceptance criteria.

B - TESTS

Prior to returning San Onofre Unit 1 to service, the following tests will be performed on one diesel generator:

a. Ten modified starts to 4500 kW load. A modified start includes turbocharger prelube and a three to five minute loading to 4500 kW with engine run for a minimum of one hour.

b. Two fast starts to 4500 kW. A fast start simulates an ESF signal with the engine in ready-standby status.

c. One 24-hour run at 4500 kW.

ENCLOSURE II

MAINTENANCE PROGRAM

Table A provides a listing of the periodic checks and inspections that currently comprise the preventative maintenance program for the San Onofre Unit 1 diesel generators. This program is based on the Technical Specification requirements, TDI recommendations, good engineering practices and general utility experience with emergency diesel generators in nuclear service. Those specific items where vendor recommendations have been modified are listed under "Footnote to Table A".

Table B is a list of additional features to augment the effectiveness of the existing maintenance program.

TABLE A

San Onofre Unit 1 Existing Maintenance & Surveillance Program

Maintenance Action	Frequency		Procedure
The following temperatures and pressures are recorded and trended. A. Jacket water temperature B. Lube oil temperature C. Lube oil pressure D. Crank case vacuum E. Air manifold pressure F. Fuel oil pressure G. Turbo charger oil pressure H. Lube oil consumption	Monthly	*	SOI-12.3-10
Exercise test of intake air strangulation valves	Monthly	*	SOI-12.3-10
Inspect level of lube oil in sump tank, governor and pedestal bearing.	Monthly	*	SOI-12.3-10
Inspect fuel oil pump rack and linkage	Monthly		SOI-12.3-10
Clean and inspect starting air "Y" strainers	Quarterly	*	SOI-I-6.47
Clean and inspect fuel oil strainers	Quarterly		SOI-I-6.47
Drain water and sludge from lube oil filter	Quarterly	*	SOI-I-6.47
Lubricate air strangulation valves	Quarterly	*	SOI-I-6.47
Lubricate fuel pump control shaft and linkage	Quarterly	*	SOI-I-6.47
Oil rack assembly	Quarterly	*	SOI-I-6.47
Lubricate radiator fan vibration switch	Quarterly		SOI-I-6.47
Obtain fuel oil sample for analysis	Quarterly		Maintenance Order
Obtain lube oil sample for analysis	Quarterly	*	SO123-III-3.13
Inspect generator brushes	Quarterly		SOI-I-5.46
Inspect and adjust V-belts on instrument and air start compressor	Quarterly		Maintenance Order

*Items recommended by vendor

Maintenance Action	Frequency		Procedure
Check compressor head and base bolts for tightness	Quarterly		Maintenance Order
Check level in air line lubricators	Quarterly		SOI-I-6.48
Clean or replace air compressor air filters	Semi Annually		Maintenance Order
Clean compressor externally	Semi Annually		Maintenance Order
Change compressor crankcase lube oil	Semi Annually		Maintenance Order
Lubricate compressor after cooler motor	Annually		Maintenance Order
Clean and inspect engine intake air filters	Annually	*	SOI-I-6.48
Change governor oil	Annually	*	SOI-I-6.48
Clean and inspect oil separator	Annually		SOI-I-6.48
Megger crankcase vent fan motor	Annually		SOI-I-6.48
Inspect and clean filter in starting air distributor	Quarterly		SOI-I-6.47
Measure the insulation resistance of each of the following pumps and motors: A. Standby lube oil pump motor B. Fuel oil transfer pump motor C. Fuel oil standby pump motor circuit D. Lube oil heater E. Jacket water heater F. Radiator fan motors	At Refueling	*	SOI-I-5.37
Inspect the shaft seals, casings, piping flanges and oil seals of the following pumps for leakage: A. Standby lube oil pump B. Jacket water pump C. Fuel oil transfer pump D. Fuel oil standby pump E. Main fuel oil pump F. Main lube oil pump G. Jacket water keep warm pump	At Refueling		SOI-I-5.37

*Items recommended by vendor

Maintenance Action	Frequency		Procedure
Lubricate pump and motor bearings	At Refueling		SOl-I-5.4
Change oil in standby lube oil pump motor	At Refueling		SOl-I-5.4
Lubricate radiator fan motors	At Refueling		SOl-I-5.4
Inspect fuel oil standby pump motor commutator and brushes	At Refueling		SOl-I-5.42
Inspect engine foundation and bolts, check torque	At Refueling	*	SOl-I-2.2
Inspect crank case, including bump test on connecting rods	At Refueling	*	SOl-I-2.2
Measure crankshaft web deflection	At Refueling	*	SOl-I-2.2
Inspect cam shafts tappets, rollers, rocker arms, push rods and valve springs	At Refueling	*	SO-I-2.2
Adjust hydraulic valve lifters	At Refueling	*	SOl-I-2.2
Inspect cam and idler gears	At Refueling	*	SOl-I-2.2
Remove fuel injectors and pop test	At Refueling	*	Maintenance Order
Inspect governor drive coupling for wear	At Refueling		SOl-I-2.2
Record firing and exhaust temperatures Adjust temperature per Delaval Instruction Manual	At Refueling	*	SOl-I-2.2
Inspect intake air filters	Annually	*	SOl-I-6.48
Clean and inspect generator winding brushes and slip rings	At Refueling		SOl-I-5.46
Measure insulation resistance of rotor and stator windings	At Refueling		SOl-I-5.46
Change pedestal bearing oil	At Refueling		SOl-I-5.46
Clean and inspect A.C. outlet box	At Refueling		SOl-I-5.46
Check generator foundation bolt torque	At Refueling		SOl-I-5.46
Inspect and lube auxiliary skid valves and piping	At Refueling	*	SOl-I-6.49

*Items recommended by vendor

Maintenance Action	Frequency		Procedure
Disassemble and repair jacket water keep warm and main pump discharge check valves	At every other Refueling		Maintenance Order
Remove fuel injection pump send pumps to shop for rebuild and calibration	At every other Refueling	*	Maintenance Order
Disassemble, repair and repack auxiliary skid valves	At every other Refueling		Maintenance Order
Disassemble and repair jacket water keep warm pump	Every 5 years		SOI-I-5.64
Disassemble and repair lube oil keep warm pump	Every 5 years		SOI-I-5.64
Change lube oil in sump, clean strainers and change lube oil and keep warm filters	At every other Refueling (or earlier, based on lube oil analysis)	*	SOI-I-6.53
Disassemble, inspect and repair fuel oil standby pump	Every 10 years		SOI-I-5.63
Disassemble, inspect and repair turbo charger	Every 10 years	*	SOI-I-5.71
Disassemble, inspect and repair heat exchangers and intercoolers. Trending of temperature and pressure	Every 10 years	*	Maintenance Order
Check gear train backlash	Every 10 years	*	SOI-I-5.70

*Items recommended by vendor

Footnote to Table A

The following vendor's recommendations have been modified, as explained below:

Vendor's Recommendations	SCE's Alternative Checks and and Inspections
Check main bearing thickness during every other refueling	Due to low operating hours, 1. Use vibration analysis to evaluate bearing (annually). 2. Review crankshaft web deflection data (annually). 3. Document whether or not bearing temperature alarms have occurred as part of trending (annually). 4. Check lube oil analysis (annually).
Check idler gear bushing every other refueling	Due to low operating hours, check gear lash and idler bushing every ten years.
Check rod bearings every other refueling	At refueling, the connecting rods are bump tested which indicates bearing wear.
Replace governor drive coupling during refueling	At refueling, the governor drive coupling is checked for wear. Also based on low operating hours.
Check gear case lube oil jets during refueling	The gear case must be removed in order to check oil jets, as gear case has no inspection covers. This check will be done during 10 year gear case inspection.

TABLE B

San Onofre Unit 1 Augmented Maintenance & Surveillance Program

	Action	Frequency
a)	Record engine operating parameters: 1. engine inlet lube oil pressure 2. turbo lube oil pressure 3. fuel oil pressure 4. fuel oil filter differential pressure 5. air manifold pressure L.B. 6. air manifold pressure R.B. 7. lube oil filter differential pressure 8. jacket water pressure (inlet and outlet) 9. crankcase vacuum 10. all cylinders exhaust temperatures 11. exhaust manifold temperatures at turbine inlet 12. lube oil temperature (inlet and outlet) 13. jacket water temperature (inlet and outlet) 14. tachometer 15. hourmeter 16. generator load	Once per hour, during surveillance testing.
b)	Air roll engine	At 4 hours and 24 hours following engine shutdown and prior to planned start.
c)	Visually inspect external engine block and base for oil and water leakage	Monthly or after every 24 hours of engine operation, whichever comes first.
d)	Perform laboratory analysis of lube oil samples taken from the following locations: 1. Lube oil supply tank 2. Bottom of sump (includes check for presence of water)	Quarterly.
e)	Clean and inspect "Y" strainer in starting air system	Quarterly.
f)	Visually inspect all connecting rods and check for preload relaxation	Refueling outage.

g)	Check preload relaxation on 25% of cylinder head studs, 25% of rocker arm bolts, and 50% of air start valve capscrews	Refueling outage.
h)	Visually check cams, tappets, and push rods	Refueling outage.
i)	Check hot and cold crankshaft deflections	Refueling outage.
j)	Check rotor float and inspect stationary nozzle ring bolts for one turbo-charger	Refueling outage.
k)	Flush jacket water system	Alternate refueling outages.

IAA:2148F

ENCLOSURE III

ESF LOADS

Reference: A) Letter M. O. Medford (SCE) to D. M. Crutchfield (NRC), June 29, 1984, Return to Service Requirements Regarding Transamerica Delaval Emergency Diesel Generators

A copy of the procurement specification for the San Onofre Unit 1 diesel generators was transmitted to the NRC as Enclosure No. 24 to Reference A. Table 4-III in this specification lists all the time-sequenced loads connected to the emergency diesel generators after actuation of the safety injection signal. These loads are based on the motor size rating of the connected equipment (pumps, valves, compressors, fans, etc.), or in the case of the battery chargers, on the electrical rating.

A comparison between the present actual diesel generator loading and the loads originally included in the procurement specification was transmitted to the NRC in response to Question No. 9 in Enclosure No. 2 to Reference A. As explained in this response, the maximum postulated ESF loads presently associated with safety injection are:

4350 kW (Train 1)
4443 kW (Train 2)

The diesel generators have margins of 27.5% and 26% based on the qualified continuous generator rating of 6000 kW. For the monthly surveillance test, the diesel generators are typically loaded to 4500-5000 kW.