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March 8, 1985

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

Gentlemen:

Subject: Docket No. 50-206
Transamerica Delaval Inc. Emergency Diesel Generators
Revised Maintenance and Surveillance Program
San Onofre Nuclear Generating Station
Unit 1

References: (A) Letter M. O. Medford (SCE) to W. A. Paulson (NRC), August 28, 1984, Return to Service Requirements Regarding TDI Emergency Diesel Generators

(B) Letter D. M. Crutchfield (NRC) to K. P. Baskin (SCE), November 19, 1984, TDI Diesel Engine Reliability and Operability

(C) Letter M. O. Medford (SCE) to J. A. Zwolinski (NRC), December 19, 1984, TDI Diesel Engine Reliability and Operability

By Reference A, Southern California Edison (SCE) submitted a description of our program covering maintenance and surveillance activities for the San Onofre Unit 1 emergency diesel generators during the period between the recent plant restart and the next refueling outage. By Reference B, the NRC advised us that a revision to this program was necessary in light of recommendations contained in Pacific Northwest Laboratory Report PNL-5304, dated November 1984, and that such a revision should be submitted for NRC review. By Reference C, SCE agreed to submit a revision that considers Section 4.0 of PNL-5304.

Enclosed Table A to this letter constitutes our revised maintenance and surveillance program description, which incorporates the results of our review of Section 4.0 of PNL-5304. In some instances we have deviated from the PNL-5304 recommendations because of the lack of feasibility of the recommendation or because a clear advantage in terms of enhanced diesel engine reliability was not seen in adopting the recommendation.

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Revised plant procedures to implement Table A will take effect as soon as practicable, but no later than the end of the next refueling outage.

If you have any questions, please call me.

Very truly yours,

M. O. Medford

cc: USNRC Document Control Desk, Washington, D.C. 20555
F. R. Huey (USNRC Senior Resident Inspector Units 1, 2 and 3)
D. E. Broeils (TDI Diesel Generator Owners Group)

TABLE A
Description of Revised Maintenance & Surveillance Program

Section I

Action	Frequency
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
Exercise test of intake air strangulation valves	Monthly
Inspect level of lube oil in sump tank, governor and pedestal bearing.	Monthly
Inspect fuel oil pump rack and linkage	Monthly
Clean and inspect starting air "Y" strainers	Quarterly
Clean and inspect fuel oil filter and strainers	Quarterly Also at pressure drop of 20 psi
Drain water and sludge from lube oil filter	Quarterly
Change lube oil filter	At Refueling. Also at pressure drop of 20 psi.
Lubricate air strangulation valves	Quarterly
Lubricate fuel pump control shaft and linkage	Quarterly
Oil rack assembly	Quarterly
Lubricate radiator fan vibration switch	Quarterly
Obtain fuel oil sample for analysis	Quarterly

Action	Frequency
Obtain and analyze lube oil sample from lube oil filter inlet with engine running, immediately prior to engine shutdown	Quarterly or after 24 hours of continuous operation, whichever comes first
Inspect generator brushes	Quarterly
Inspect and adjust V-belts on instrument and air start compressor	Quarterly
Check compressor head and base bolts for tightness	Quarterly
Check level in air line lubricators	Annually
Clean or replace air compressor air filters	Semi Annually
Clean compressor externally	Semi Annually
Change compressor crankcase lube oil	Semi Annually
Lubricate compressor after cooler motor	Annually
Clean and inspect engine intake air filters	At Refueling
Change governor oil	At Refueling
Clean and inspect oil separator	Annually
Megger crankcase vent fan motor	Annually
Inspect and clean filter in starting air distributor	Quarterly
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

Action	Frequency
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
Lubricate pump and motor bearings	At Refueling
Change oil in standby lube oil pump motor	At Refueling
Lubricate radiator fan motors	At Refueling
Inspect fuel oil standby pump motor commutator and brushes	At Refueling
Inspect engine foundation and bolts, check torque	At Refueling
Inspect crank case, including bump test on connecting rods	At Refueling
Measure crankshaft web deflection	At Refueling
Inspect cam shafts tappets, rollers, rocker arms, push rods and valve springs	At Refueling
Adjust hydraulic valve lifters	At Refueling
Visually inspect cam and idler gears	At Refueling
Remove fuel injectors and pop test Also verify spray pattern of injector	At Refueling
Inspect governor drive coupling for wear	At Refueling
Record firing and exhaust temperatures and firing peak pressures Adjust temperature per Delaval Instruction Manual	At Refueling
Clean and inspect generator winding brushes and slip rings	At Refueling

Action	Frequency
Measure insulation resistance of rotor and stator windings	At Refueling
Change pedestal bearing oil	At Refueling
Clean and inspect A.C. outlet box	At Refueling
Check generator foundation bolt torque	At Refueling
Inspect and lube auxiliary skid valves and piping	At Refueling
Disassemble and repair jacket water keep warm and main pump discharge check valves	At every other Refueling
Disassemble, repair and repack auxiliary skid valves	At every other Refueling
Disassemble and repair jacket water keep warm pump	Every 5 years
Disassemble and repair lube oil keep warm pump	Every 5 years
Change lube oil in sump	Based on results of quarterly lube oil analysis
Clean lube oil strainers	At Refueling
Change lube oil keep warm filter	At Refueling or at 20 psi pressure drop
Disassemble, inspect and repair fuel oil standby pump	Every 10 years
Disassemble, inspect and repair turbo charger	Every 10 years
Disassemble, inspect and repair heat exchangers and intercoolers. Trending of temperature and pressure	Every 10 years, or as required by temp, pressure trending
Check gear train backlash	Every 10 years (An inspection of backlash and thrust will be performed at next refueling).

Section II

	Action	Frequency
1) (A)	Record engine operating parameters: a. engine inlet lube oil pressure b. turbo lube oil pressure c. fuel oil pressure d. fuel oil filter and strainers differential pressure e. left bank air manifold pressure f. right bank air manifold pressure g. lube oil filter differential pressure h. jacket water pressure (inlet and outlet) i. crankcase vacuum j. all cylinder exhaust temperatures k. exhaust manifold temperatures at turbine inlet l. lube oil temperature (inlet and outlet) m. jacket water temperature (inlet and outlet) n. tachometer o. hourmeter p. generator load q. fuel oil transfer pump filter differential pressure	Once per hour, during surveillance testing.
(B)	Check following operating parameters: a. starting air pressure b. fuel oil day-tank level	
2)	Air roll engine	At 4 hours and at 24 hours following engine shutdown. Also prior to a planned start, unless the engine has run and/or been air rolled in the 24 hours immediately preceding the start.
3)	Visually inspect external engine block and base for oil and water leakage (engine running)	Monthly or after every 24 hours of engine operation, whichever comes first.
4)	Perform laboratory analysis of lube oil sample taken from the bottom of sump to check for presence of water.	Quarterly
5)	Visually inspect all connecting rod boxes and check for bolt preload relaxation	At refueling or after every 285 hours of operation, whichever comes first.
6)	Check preload relaxation on 25% of cylinder head studs, 25% of rocker arm bolts, and 50% of air start valve capscrews	At refueling.

	Action	Frequency
7)	Visually check cams, tappets, and push rods	At refueling.
8)	Check hot and cold crankshaft deflections. Measurements to be done once each refueling cycle. Hot to start immediately after engine shutdown.	At refueling.
9)	Check rotor float and inspect stationary nozzle ring bolts for one turbo-charger	At refueling. (One turbocharger will be disassembled and inspected at next refueling).
10)	Flush jacket water system*	At ten (10) year intervals, or earlier if required by coolant analysis.
11)	Inspect DG #1 crankshaft oil holes for cracks. Also conduct visual and thickness checks of two highly loaded bearings on a sampling basis.	At next refueling. At every second refueling thereafter.
12)	Conduct magnetic particle examination of top surface of cylinder blocks for cracks between the No. 4 and No. 7 heads, with the cylinder heads removed.	At next refueling. If negative, then no other.
13)	Disassemble two sets of pistons (four pistons) and inspect for cracks per Owners Group recommended procedures.	At refueling.
14)	(a) Visually inspect cylinder liners for scuffing or metal deposition.	(a) At refueling.
	(b) Measure/record dimensions of cylinder liners for wear and trend analysis.	(b) At each disassembly.
15)	Disassemble air start valves to check proper seat contact.	At refueling.
16)	Check fuel oil drip tank. Clean as required.	Quarterly

* This is a closed system in which chemical additives are maintained within specified limits. During a jacket water system inspection in 1984, no corrosion or scaling due to 7 years of operation could be found.

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Section III

Item		Surveillance
1.	Starting air pressure	Visual checks every 8 hours
2.	Lube oil temperature in/out	"
3.	Jacket water temperature in/out	"
4.	Lube oil sump level	"
5.	Fuel oil day-tank level	"
6.	Annunciator	Test every 8 hours.
7.	Compressor air trap operation	Check daily
8.	Fuel rack and linkage operation	Inspect and lube monthly
9.	Governor oil level	Check daily
10.	Visually inspect engine assembly for oil and water leakage	Monthly
11.	Keepwarm oil filter differential pressure	Check weekly
12.	Test jacket water for pH, conductivity, corrosion inhibitor	After makeup or monthly
13.	Air start admission valve strainer	Clean and inspect quarterly

Section IV

The following vendor's recommendations, as modified below, are also included in the revised maintenance and surveillance program.

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. (A visual inspection of cam and idler gears and bushing will be done at the next refueling).
Check connecting rod bearings every other refueling	At refueling, the connecting rods are bump tested which indicates bearing wear. In addition, inspection and radiograph of four half bearing shells will be performed at next refueling.
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 normally be done during 10 year gear case inspection. However, a visual inspection of oil jets will be done at the next refueling.
Remove fuel injection pumps and send to shop for rebuild and calibration	At every third refueling, have pumps checked for proper operation and calibration at a qualified diesel service center

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