LONG ISLAND LIGHTING COMPANY
SHOREHAM NUCLEAR POWER STATION
P.O. BOX 618, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

JOHN D. LEONARD, JR.
VICE PRESIDENT - NUCLEAR OPERATIONS

May 29, 1985

SNRC-1178

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Emergency Diesel Generator Maintenance Procedures
Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

References:
1. Letter from J. D. Leonard to Mr. H. R. Denton dated April 4, 1985, titled, "Emergency Diesel Generator Loading"
2. Letter from J. D. Leonard to Mr. H. R. Denton dated May 6, 1985, titled, "Emergency Diesel Generator Qualified Load Job/Task Analysis"

Dear Mr. Denton:

The Staff, in its December 18, 1984 Supplemental Safety Evaluation Report (SSER) pertaining to the SNPS TDI diesel generators concluded that these engines will provide a reliable source of onsite power in accordance with General Design Criteria 17. This conclusion was subject to the following Staff positions:

(1) Implementation of an enhanced maintenance/surveillance program

(2) Special requirements pertaining to any future adverse maintenance inspection findings for the crankshaft and engine blocks.

(3) The installation of a distinctive alarm to warn operators when EDG loading exceeds 3300KW and the completion of appropriate procedures to minimize the possibility of operator error.

(4) Implementation by LILCO of any additional actions which the Staff finds are necessary as a result of its final review of the Owners Group findings and the Shoreham DRQR program.

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In response to Staff position two (2), LILCO has developed in conjunction with the Staff, crankshaft and engine block inspection criteria. These criteria which have been approved by the Staff, have been forwarded to the ASLB in LILCO's April 4, 1985 Proposed Findings of Fact Concerning the Emergency Diesel Generator Contentions.

In response to Staff position three (3), LILCO has completed a job task analysis designed to resolve any concerns pertaining to procedures, training, and instrumentation and controls. This job task analysis concluded that the operators demonstrated a proficiency in managing emergency diesel generator load in a degraded plant condition. The evaluation found that there is reasonable assurance that (1) the procedures and training do not lead the operators to load the emergency diesel generators over 3300 KW, (2) the procedures and training provide the necessary guidance to have the emergency diesel generator load reduced to less than 3300 KW within one hour in the unlikely event loads exceed 3300 KW, and (3) that the training program adequately addresses the 3300 KW qualified load associated with the emergency diesel generators. As a result of the job task analysis, enhancements as described in the referenced May 6 letter have been evaluated and accepted by LILCO. Included among these recommendations is the need for a 3300KW alarm, as well as procedural and training lesson plan modifications.

Finally, in response to Staff position one (1), LILCO has completed development of a maintenance/surveillance program for the Shoreham TDI engines as shown in attachment one. This program is based primarily on the recommendations of the Shoreham specific DRQR program as well as the Staff's December 18 SSER. It should be noted that LILCO has modified the concept of inspection intervals to be coincident with planned refueling outages as opposed to the original TDI concept of one, five and ten year outages. In general, one year intervals were considered to be each refueling outage, five years to be every fourth refueling outage and ten years to be every eighth refueling outage. Maintenance and surveillance activities previously keyed to engine hours were likewise considered based on refueling outages with roughly 100 hours of engine operating time assigned for each refueling cycle; with an additional 175 hours included based on the conservative assumption of a LOOP/LOCA occurring at the end of the last cycle.

With this submittal, LILCO believes it has fully and appropriately responded to each of the Staff positions listed above. Should you or your Staff have additional questions concerning our response, please contact my office.

Very truly yours,

J. D. Leonard, Jr.
Vice President-Nuclear Operations

BEG/cf

cc: P. Eselgroth

ATTACHMENT 1

GENERAL MAINTENANCE

PROCEDURES

TABLE OF CONTENTS

Legends:

1/ Change to E&DCR F-46505

2/ Change to December SSER (items listed by NRC/PNL in addition to E&DCR F-46505.)

3/ Change required to agree with NRC/PNL information provided during the Perry hearings (Docket 50-440/50-441)

4/ Change required to agree with Shoreham ASLB commitments and settlement agreements

TDI MAINTENANCE/SURVEILLANCE ITEM	Component #
INSPECTIONS REQUIRED FOR REPLACEMENT PARTS (Prior to Installation or 1st Operation)	
1. Perform x-ray examination of new connecting rod bearing shells	(03-340)
2. Perform L.P. or M.P. inspection of new replacement piston pins	(03-341)
3. Perform cylinder head inspection criteria of new replacement cylinder heads	(03-360)
4. Inspect new fuel oil injection tubes to ensure no I.D. flaws greater than 0.004 in.	(03-365)
5. Ensure 135° fuel oil spray tips, if replacement tips are required	(03-365)
6. Perform L.P. inspection to new replacement connecting rod bushing	(03-340)
7. Perform L.P/E.T inspection of stud boss area on piston	(03-341)
8. Perform destructive examination on sample lot of friction-welded pushrods	(03-390)
INSPECTIONS REQUIRED FOR REPLACEMENT PARTS - DELETED	
1. Visually inspect fuel oil tubing lengths for leaks at 1st operation following installation	(03-365)[1/]
MAINTENANCE BASED ON GAUGE READINGS	
1. Change fuel oil filter elements d/p greater than 20 psid	(03-455)
2. Shift/Clean or replace fuel oil strainer d/p greater than 2 psid	(03-455)
3. Clean or replace strainer screens in lube oil pressure strainer d/p greater than 15 psid	(04-000)
4. Clean or replace filter element in full flow lube oil filter d/p greater than 15 psid	(10-106)
5. Clean or replace filter element in oil prelube filter d/p greater than 10 psid	(10-117)

WEEKLY

1.	Perform barring procedure until completion of six month surveillance	(03-360)
2.	Turn on electrical fuel oil booster pump and circulate fuel through system; check strainers and filters for clean fuel	(10-108, (03-455)
3.	Record keepwarm oil filter d/p; if greater than 10 psi, clean/replace filter as required	(10-117)
4.	Check fuel oil booster pump and motor bearings for signs of overheating and/or roughness	(10-103)[1/]
5.	Check fuel oil booster pump mechanical seals for excessive leakage	(10-108)[1/]

EVERY 3 TO 6 MONTHS

1.	Perform spectrochemical engine oil analysis - every three months	(10-104) (MP-017)
2.	Clean and inspect "Y" strainers in starting air system - every 3 months until 1st outage	(03-441)[2/]
3.	Perform L.P. and TSI depth gauge inspection to Nos. 2 and 8 cam gallery saddles of DG 101 and 102 - every 3 months until 1st outage	(03-315)
4.	Check and record crankshaft web deflection and thrust ring clearance - every six months	(03-310)
5.	Inspect air intake filter - every 3 to 6 months	(10-114)
6.	Clean fuel oil strainer - every 3 months	(03-455)

OTHER AND CONDITIONAL FREQUENCIES

1. Perform LP and UT of cylinder liner landing at any time liner is removed (03-315)

2. If piston is disassembled, perform visual and LP inspection on piston pin assembly (03-341)

3. Inspect main bearing journals and oil holes between crankpin journals Nos. 5, 6 and 7, LP and eddy current (every 3rd refueling outage and review) (03-310)

4. Measure and record dimensions of cylinder liner at each disassembly (03-315)

OTHER AND CONDITIONAL FREQUENCIES - DELETED

1. Disassemble and clean lube oil pressure regulating valve after initial start-up after a major lube oil reassembly (00-420)[1/]

2. Test lube oil actuator and switchover logic after maintenance (03-717)[1/]

3. Verify calibration and operation of fuel injection pumps - every 3rd outage (03-365)[2/]

DAILY

1.	Check engine and auxiliary equipment for oil, water and fuel oil leaks; visually inspect J.W. and lube oil heat exchangers for signs of leakage	(Gen;, 03-717)
2.	Drain all low point water collectors, barring device air filter, compressor air trap, air receiver tank drain taps, monitor moisture, if moisture is found in air start system drain and inspect "Y" strainers, starting air distributor air filter, air compressor filter felts on unloader system	(03-525)[1/] (10-111)
3.	Verify all controls in proper position for standby (refer to Station Log Sheets)	
4.	Check fuel oil day tank level	(General)
5.	Verify intercooler inlet plenum drain connection is open and clean; open valve or remove cap and rod out	(F-068)
6.	Record jacket water temperature in/out - visual every 8 hours, log 24 hours	(00-700) (03-800A)
7.	Check turbocharger bearing lubricating system sight glass for oil flow	(03-CFR)
8.	Check fuel oil pump rack for freedom of movement; check for loose parts on governor linkage assembly	(03-371)
9.	Drain water from crankcase vent piping drip legs	(03-387)
10.	Check level of lubricating oil in governor; add oil as required	(03-415)
11.	Check all governor knob settings	(03-415)
12.	Record room temperature - visually every 8 hours, log 24 hours	(03-500)
13.	Test annunciator - test every 8 hours, log 24 hours	(03-500)
14.	Check level of lubricating oil in sump tank	(03-540)
15.	Check Lube oil temperature - in/out visually every 8 hours, log 24 hours	(03-540) (03-800B)
16.	Check level of lube oil in pedestal bearing	(03-650)
17.	Check for proper operation of generator space heaters	(03-650)[1/]

DAILY (Cont'd.)

18.	J.W. heat exchanger and associated piping to be flushed	(10-103)
19.	Observe J.W. standby pump running	(10-107)
20.	Record starting air pressure - visually every 8 hours, log 24 hours	(10-111)
21.	Observe B&A lube oil pump running	(10-113)
22.	Check B&A lube oil pump and motor bearings on pump for signs of overheating and/or roughness	(10-113)[1/]
23.	Check B&A lube oil pump mechanical seals for excessive leakage	(10-113)[1/]

DAILY - DELETED

1.	Check alarm clear	[2/]

CONTROL BUILDING/OUTSIDE (Cont'd)

	0000 to 0800	0800 to 1600	1600 to 2400	REMARKS
Emergency Diesel Generator - TDI				
EDG-101				
Fuel Day Tk. Level				
Starting Air Press				
Verify All 7 Control Switches on 1R43*PNL-DG1 in AUTO				
Annunciator Test				
Verify Air Block Valves OPEN 1R43-03V* (0210A, 0211A)				
Lube Oil Sump Level				
Lube Oil Temp				
Cooling Water Level Check	xxxxxx	xxxxxx		
Cooling Pump Operating	xxxxxx	xxxxxx		
Cooling Water Temp				
Governor Oil Level Check	xxxxxx	xxxxxx		
Pedestal Brg Oil Level Check	xxxxxx	xxxxxx		
Check Fuel Oil Pump Rack for Freedom of Movement Through Full Travel Limit	xxxxxx xxxxxx	xxxxxx xxxxxx		
Verify Oil Flow in Turbo-Charger Bearing Lube Oil Sight Glass	xxxxxx xxxxxx	xxxxxx xxxxxx		
Drain Crankcase Vent Pipe Drip Legs	xxxxxx	xxxxxx		
Check Governor Knob Settings: LOAD - Maximum DROOP - Zero SPEED - 14.09	xxxxxx xxxxxx xxxxxx xxxxxx	xxxxxx xxxxxx xxxxxx xxxxxx		
Drain Starting Air Low Point Water Collectors Y-Strainers, and Air Receivers	xxxxxx xxxxxx xxxxxx	xxxxxx xxxxxx xxxxxx		If moisture is present generate an MWR
Visual Inspection for Air, Water, Oil Leaks				
EDG-103				
Fuel Day Tk. Level				
Starting Air Press				
Verify All 7 Control Switches on 1R43*PNL-DG3 in AUTO				
Annunciator Test				
Verify Air Block Valves OPEN 1R43-03V* (0210C, 0211C)				
Lube Oil Sump Level				
Lube Oil Temp				
Cooling Water Level Check	xxxxxx	xxxxxx		
Cooling Pump Operating	xxxxxx	xxxxxx		
Cooling Water Temp				
Governor Oil Level Check	xxxxxx	xxxxxx		
Pedestal Brg Oil Level Check	xxxxxx	xxxxxx		
Check Fuel Oil Pump Rack for Freedom of Movement Through Full Travel Limit	xxxxxx xxxxxx	xxxxxx xxxxxx		

CONTROL BUILDING/OUTSIDE (Cont'd)

	0000 to 0800	0800 to 1600	1600 to 2400	REMARKS
Verify Oil Flow in Turbo-Charger Bearing Lube Oil Sight Glass	xxxxxx xxxxxx xxxxxx	xxxxxx xxxxxx xxxxxx		
Drain Crankcase Vent Pipe Drip Legs	xxxxxx	xxxxxx		
Check Governor Knob Settings: LOAD - Maximum DROOP - Zero SPEED - 12.00	xxxxxx xxxxxx xxxxxx xxxxxx	xxxxxx xxxxxx xxxxxx xxxxxx		
Drain Starting Air Low Point Water Collectors Y-Strainers, and Air Receivers	xxxxxx xxxxxx xxxxxx	xxxxxx xxxxxx xxxxxx		If moisture is present generate an MWR
Visual Inspections for Water, Air and Oil Leaks				
EDG-102				
Fuel Day Tk. Level				
Starting Air Press				
Verify All 7 Control Switches on 1R43*PNL-DG2 in AUTO				
Annunciator Test				
Verify Air Block Valves OPEN 1R43-03V* (0210B, 0211B)				
Lube Oil Sump Level				
Lube Oil Temp				
Cooling Water Level Check	xxxxxx	xxxxxx		
Cooling Pump Operating	xxxxxx	xxxxxx		
Cooling Water Temp				
Governor Oil Level Check	xxxxxx	xxxxxx		
Pedestal Brg Oil Level Check	xxxxxx	xxxxxx		
Check Fuel Oil Pump Rack for Freedom of Movement Through Full Travel Limit	xxxxxx	xxxxxx		
Verify Oil Flow in Turbo-Charger Bearing Lube Oil Sight Glass	xxxxxx xxxxxx	xxxxx xxxxxx		
Drain Crankcase Vent Pipe Drip Legs	xxxxxx	xxxxxx		
Check Governor Knob Settings: LOAD - Maximum DROOP - Zero SPEED - (14.02)	xxxxxx xxxxxx xxxxxx xxxxxx	xxxxxx xxxxxx xxxxxx xxxxxx		
Drain Starting Air Low Point Water Collectors Y-Strainers, and Air Receivers	xxxxxx xxxxxx xxxxxx	xxxxxx xxxxxx xxxxxx		If moisture is present generate an MWR
Visual Inspection for Air, Water and Oil Leaks				
Aux. Boiler Oil Sounding Tubes Capped & Locked				
Diesel Fuel Oil Sounding Tubes Capped & Locked				

MONTHLY AT EACH EXERCISE TEST

1.	Check pH factor of jacket water	(00-700)
2.	Cycle indicator cocks open and shut	(03-361)
3.	Check lube oil cups and fill as necessary on fuel pump control shaft	(03-371)
4.	Check air butterfly valve for freedom of movement; lubricate as necessary	(03-475)
5.	Verify that associated locking devices are tight on air butterfly valve	(03-475)
6.	Check lube oil with a viscosimeter for fuel oil dilution (lube oil filter inlet)	(03-540)
7.	Take lube oil sample from bottom of sump (check for water)	(03-540)
8.	Manually cycle lube oil filter and strainer switchover valves through full throw and return to automatic	(03-717)
9.	Visual inspection of air compressor; check oil level and pressure	(10-112)
10.	Drain sediment bowls on air dryer moisture traps	(10-116)
11.	Verify fuel level in day tank	
12.	Verify fuel level in fuel storage tank	
13.	Verify pressure in air start receivers is greater than, or equal to 205 psig	(10-111)
14.	Perform "standby mode status check" (refer to Station Log)	
15.	Open cylinder indicator cocks	(03-361)
16.	Bar engine over slowly and check cylinder indicator cocks for liquids	
17.	Disengage and lock barring device	(03-525)
18.	Prelube turbocharger bearing two minutes prior to engine start	(MP-017)

Monthly During Run

1. Record all operating parameters, compare with baseline data (General)

2. Conduct a visual and audible inspection for leakage during engine operation of: (General)

   a) All fuel, air, oil and water piping and valves
   b) J.W. standpipe drain valve
   c) J.W. discharge manifold piping, Dresser couplings and seals
   d) J.W. and lube oil thermostatic control valves
   e) All valves, and repack as necessary
   f) Fuel injection ports on cylinder heads
   g) Fuel oil tubing at compression fittings

3. Perform visual inspection of block top between cylinder heads during operation with an intense light (03-315)

4. Verify the diesel starts from standby condition

5. Verify diesel generator is synchronized

6. Raise or lower speed control switch to control engine speed during loading

7. Rotate thermocouple selector switch and observe temperature readings

8. Log hourly all cylinders exhaust temperatures (03-360)

9. Log hourly exhaust temperature at turbine outlet (MP-017)

10. Log hourly air manifold temperature

11. Log hourly air manifold pressure

12. Log hourly crankcase vacuum (03-387)

13. Check starting air pressure hourly (10-111)

14. Log hourly service water pressure (10-103)

15. Log service water to jacket water cooler temperature (inlet and outlet) (10-103)

16. Log hourly jacket water temperature inlet (00-700)

17. Log hourly jacket water pressure

18. Log jacket water levels (00-700)

Monthly During Run Cont'd.

19.	Log hourly lube oil strainers d/p - if greater than, or equal to 15 psid - clean/replace	(04-000)
20.	Log hourly lube oil filter d/p - if greater than, or equal to 15 psid - clean/replace	(10-106)
21.	Log hourly lube oil temperature (inlet and outlet)	
22.	Log hourly lube oil inlet pressure	
23.	Log hourly lube oil to turbocharger pressure	(MP-017)
24.	Check lube oil with a viscosimeter for fuel oil dilution every 24 hours of continuous engine operation	
25.	Log lube oil sump tank level	(03-540)
26.	Log lube oil sump tank pressure	(03-540)
27.	Log governor lube oil level	(03-415)
28.	Check fuel oil day tank level hourly	
29.	Verify fuel transfer pump starts and transfers fuel to day tank	
30.	Record fuel oil strainer d/p - if greater than, or equal to 2 psid; shift/clean element	(03-455)
31.	Log hourly fuel oil to engine pressure	(03-455)
32.	Calculate fuel oil filter differential pressure	(03-455)
33.	Log fuel oil pump discharge pressure	(03-455)
34.	Log fuel rack position at cylinder #1	(03-455)
35.	Check generator pedestal bearing ring oilers for proper operation	(03-650)
36.	Check generator brushes and slip rings for proper operation	(03-650)
37.	Log hourly generator load KW/KVAR	(03-650)
38.	Log generator pedestal bearing temperature	(03-650)

Monthly During Run Cont'd.

39.	Log generator winding temperature	(03-650)
40.	Log generator field current	(03-650)
41.	Log generator field voltage	(03-650)
42.	Log generator stator current	(03-650)
43.	Log generator voltage	(03-650)
44.	Log hourly tachometer	
45.	Log hourly hourmeter	
46.	Verify air flow on continuous vent from air manifold	(03-375)
47.	Log Group 1 shutdown pressure	(03-695)
48.	Log room temperature	

Monthly After Run

1.	Manual prelube of turbo thrust bearing following engine run to cool down bearing	(MP-017)
2.	Visual inspection of cylinder block and eddy current inspection between stud holes of adjacent cylinders after each engine run greater than 1800 KW load on DG 101 and DG 102. Inspection of DG 103 in accordance with settlement agreement requirements.	(03-315) 2/ 4/
3.	Perform barring procedure 4 to 8 hours and 24 hours after engine run	(03-360)
4.	Inspect temperature sensitive labels on diodes of bridge rectifier assembly	(03-650)
5.	Inspect GLYPTOL on side of lugs for relative movement on bridge rectifier assembly	(03-650)
6.	Inspect GLYPTOL on adjustment screws on printed circuit board of voltage regulator	(03-650)

Monthly After Run (Contd'.)

7.	Check printed circuit boards for cleanliness	(03-650)
8.	Evaluate intercooler performance based on engine operating parameters	(F-068)
9.	Evaluate performance of J.W. heat exchanger based on engine operating parameters	(10-103)
10.	Evaluate performance of lube oil heat exchanger based on engine operating parameters	(10-104)
11.	Drain water and/or sludge from lube oil flow filter	(10-106)
12.	Once a month or after each operation - approximately one hour - check and remove accumulated water from day tank	
13.	Check and remove accumulated water from the fuel storage tank every 31 days	
14.	Verify diesel generator is aligned to provide standby power	

MONTHLY (Each Exercise Test) - DELETED

1.	Measure rotor end play	(MP-017) 2/
2.	Test lube oil actuator and switchover logic	(03-717) 1/
3.	Log fuel oil transfer pump strainer d/p unless auto/duplexed and alarmed	2/

OUTAGE

1.	Remove alternate left side doors and examine inside of engine for any abnormal condition; check with a good light for evidence of babbit flakes; if excessive water or sludge is present, drain crankcase	(General)
2.	Check cold compression pressures and maximum firing pressures; if so indicated, remove cylinder heads, grind valves and reseat; check rings and liners	(03-341) (General)
3.	Inspect gears for general condition; crankshaft and turning gear, cam gear, idler gear, crankshaft to J.W. pump gear, governor drive, etc.	(General)[1/]
4.	Check calibration of engine, skid and control panel pressure gauges	(General)
5.	Record firing peak pressures and exhaust temperature and adjust	(General)
6.	Measure rotor end play of thrust bearing in turbocharger	(MP-017)
7.	Measure turbocharger vibration and compare with baseline data	(MP-017)
8.	Remove turbocharger, disassemble, clean, inspect and reassemble	(MP-017)[1/]
9.	Inspect nozzle ring of turbocharger (perform LP examination of inlet nozzle ring vanes)	(MP-017)
10.	Pull turbocharger rotor and inspect radial and thrust bearings	(MP-017)[1,2/]
11.	Clean impellor and diffusor of turbocharger	(MP-017)
12.	Check flange and piping alignment upon reassembly of turbocharger	(MP-017)
13.	Disassemble and clean one lube oil pressure regulating valve. Based on evaluation of valve, lube oil analysis and lube oil pressure determine need to inspect others	(00-420)[1/]
14.	Check calibration of J.W. standpipe level and temperature switches	(00-700)
15.	Check lube oil jets for plugged or broken lines on lube oil line internal to engine	(03-307)

OUTAGE (Cont'd.)

16.	Hot and cold check and record crankshaft web deflection and thrust ring clearance	(03-310)
17.	Select 2 of 3 (Nos. 5, 6 and 7); inspect crankpin journal and oil holes, LP and eddy current*	(03-310)
18.	Perform visual (borescopic) inspection of cylinder liners for wear	(03-341) (03-315)
19.	Perform LP and ET of block top after removal of two adjacent cylinder heads on EDG 101 and EDG 102. Whereupon, after 4 refueling outages the entire block top has been examined**	(03-315)
20.	Perform LP and TSI depth gauge at Nos. 2 and 8 cam gallery saddles on DG 101 and DG 102	(03-315)
21.	Check preload on 25% of head studs	(03-315)
22.	Replace flywheel bolts on DG 101 and DG 102 or perform fluorescent magnet particle inspection on DG 101 and DG 102 flywheel bolts and sim 64H	(03-330)[1/]
23.	Check connecting rod bearing clearances (includes Bump Test)	(03-340)
24.	Visually inspect 2 sets of connecting rod bearing (in conjunction with Item 17 for crankshaft)	(03-340)[2/]
25.	Inspect cams, tappets and rollers, where accessible	(03-345)[1,2/]
26.	Inspect camshaft, where accessible	(03-350)[1,2/]
27.	Visually inspect cam lobe surfaces, where accessible	(03-350)[1,2/]
28.	Remove, clean and inspect air start valves	(03-359)
29.	Inspect the piston cap, guide housing sliding surfaces for wear	(03-359)
30.	Inspect subcover for soot and other evidence of valve guide blowby	(03-360)[1/]
31.	Remove cylinder head covers to inspect valve springs	(03-360)
32.	Remove fuel injector nozzles, clean, reset and reinstall (pop test and spray pattern)	(03-365)

*For 1st outage only; these inspection requirements superceded by those delineated in item 1 on page 18.

**Based on evaluation of the cylinder block top inspection after 4 outages, a determination shall be made whether or not to continue these outage inspections.

OUTAGE (Cont'd.)

33.	Remove pressure screw from one fuel injection pump on each engine and check for erosion; evaluate need to check others	(03-365)[1/]
34.	Check fuel rack shutdown cylinder for proper extension and air leakage	(03-371)
35.	Inspect crankcase relief valves and clean flame arrestors	(03-385)
36.	Clean crankcase fan oil mist separator	(03-387)
37.	Inspect crankcase manometer; clean tube and replace fluid as required	(03-387)
38.	Check valve lash	(03-390)
39.	Perform leak down test, reinstall and adjust hydraulic valve lifters; use sample lot of 2 per engine and evaluate need to test others	(03-390)[1/]
40.	Inspect rocker arms and pushrods	(03-390)
41.	Inspect governor drive for wear and replace elastomeric element	(03-402)
42.	Check that governor drive coupling hubs are tight on shaft	(03-402)
43.	Check overspeed trip setpoint	(03-410)
44.	Inspect overspeed trip couplings and replace elastomeric element	(03-410)
45.	Verify that overspeed trip coupling hubs are tight on shaft	(03-410)
46.	Drain governor oil, clean, flush and refill with new oil	(03-415)
47.	Check and adjust governor panel knob settings	(03-415)
48.	Evaluate governor settings to verify overshoot of the 450 rpm set speed is no more than 11.2% or a max. speed of 500 rpm during start or when unloaded by 1000 KW	(03-415)
49.	Test governor response for same as above	(03-415)

OUTAGE (Cont'd.)

50. Disassemble, clean and inspect "Y" strainers in starting air system (03-441)

51. Clean and refurbish air start block valve; replace "O" ring and clean screened fittings; test for leak tightness after reassembly (03-441)

52. Replace filter element in starting air distributor filter (03-441)

53. Inspect fuel oil booster pump coupling for wear of flex element (03-445)

54. Change fuel oil filter elements (03-455)

55. Check calibration of fuel oil strainer d/p gauges/switches (03-455)

56. Lube air butterfly valve shaft (03-475)

57. Clean interior on control panel (03-500)

58. Check cabinet heater and calibration of thermostat (03-500)

59. Inspect wiring for damaged insulation (03-500)

60. Check pressure switch calibration and inspect tubing for leaks (03-500)

61. Clean and inspect relay contact blocks (03-500)

62. Check tachometer, pyrometer and hour meter calibration (03-500)

63. Inspect and test control CKT breakers (03-500)

64. Clean element in air filter to barring device (03-525)

65. Drain lubricating oil system, refill with new oil, depending on results of lube oil analysis. When replacing engine oil, use HD oil that meets or exceeds series 3 standards. A recommended engine oil is Mobilguard 412, or an equivalent, to ensure improved lubrication. (03-540)

66. Inspect lube oil sump tank level switch floats; check switch setpoints (03-540)

67. Check foundation bolts for correct torque; check and record crankshaft web deflection (03-550)

OUTAGE (Cont'd.)

68.	Measure generator vibration and compare with baseline data	(03-650)
69.	Megger rotor and stator	(03-650)
70.	Clean and inspect generator unit	(03-650)
71.	Clean and inspect generator panel	(03-650)
72.	Check condition of wire insulation for degradation	(03-650)
73.	Clean and inspect relay contact blocks	(03-650)
74.	Check meter calibrations	(03-650)
75.	Drain, flush and refill generator pedestal bearing	(03-650)
76.	Disassemble and inspect generator pedestal bearing	(03-650)[1/]
77.	Check bearing insulation resistance	(03-650)
78.	Replace elastomeric parts in the pressure regulator	(03-695)
79.	Inspect and clean the 200 mesh screen of shutdown check valve P/N F-573-127	(03-695)
80.	Check calibration of engine shutdown trip switches	(03-695)
81.	Visually inspect foundation for breaks in bond between sole plates and grout	(03-715)
82.	Check differential valve setpoints on lube oil filter and strainer switchover panels	(03-717)
83.	Check temperature switch calibration of J.W. heater	(03-800A)
84.	Measure J.W. heater insulation resistance	(03-800A)
85.	Check temperature switch calibration of lube oil heater	(03-800B)
86.	Measure lube oil heater insulation resistance	(03-800B)
87.	Clean lube oil strainer elements	(04-000)
88.	Remove end plates of J.W. heat exchanger; examine and clean	(10-103)

OUTAGE (Cont'd.)

89.	Inspect and clean lantern ring; verify leak-off holes are not plugged	(10-103)
90.	Replace packing rings on J.W. heat exchanger	(10-103)
91.	Map plugged tubes on J.W. heat exchanger	(10-103)[1/]
92.	Remove end plates of lube oil heat exchanger; examine and clean	(10-104)
93.	Replace packing rings at floating tube sheet on lube oil heat exchanger	(10-104)
94.	Replace elements in lube oil filter; visually inspect material in filter	(10-106)
95.	Check vibration and megger motor of J.W. keepwarm pump	(10-107)
96.	Clean, inspect and megger motor on fuel oil booster pump (electrical)	(10-108)
97.	Check brushes and commutator on motor for fuel oil booster pump	(10-108)
98.	Check pump/motor vibration levels on fuel oil booster pump	(10-108)
99.	Lube motor bearings on fuel oil booster pump	(10-108)
100.	Replace filter felts on unloader system of starting air compressor; replace hydraulic unloader	(10-112)
101.	Clean cooling surfaces of intercooler and aftercooler of starting air compressor	(10-112)
102.	Check operation of safety valves on starting air compressor	(10-112)
103.	Clean or replace intake filter elements, as required on starting air compressor	(10-112)
104.	Change starting air compressor oil	(10-112)
105.	Check belt tension of starting air compressor	(10-112)
106.	Check pulley clamp bolts and set screws are tight on starting air compressor	(10-112)
107.	Inspect valve assemblies for leaks and looseness on starting air compressor	(10-112)

OUTAGE (Cont'd.)

108.	Inspect cushion chamber and discharge line on starting air compressor	(10-112)
109.	Inspect contact points in motor starter on starting air compressor	(10-112)
110.	Clean, inspect and megger motor of B&A lube oil pump	(10-113)
111.	Check coupling alignment of B&A pump	(10-113)
112.	Check pump/motor vibration levels	(10-113)
113.	Clean B&A pump suction strainers	(10-113)
114.	Inspect and replace intake air filter elements and service, as required	(10-114)
115.	Clean and inspect magnetic starter for D.C. fuel oil booster pump	(10-115)
116.	Clean condensing units on air start air dryers	(10-116)
117.	Refurbish air dryer moisture traps	(10-116)
118.	Change oil prelube filter elements	(10-117)

1st Outage

1.	Inspect DG 101 and 102 crankpin journals and oil holes Nos. 5, 6 and 7; L.P. and eddy current	(03-310)
2.	Inspect main bearing crank journals and oil holes between crank pin journals #5, 6 and 7; L.P. and eddy current removal and assembly in accordance with TDI Maintenance Procedures	(03-310)
3.	Perform L.P. and eddy current inspection on all 24 pistons in the boss area. Visual inspection of liners and reassembly in accordance with TDI Maintenance Procedures	(03-341)[1,2,4/]
4.	Replace lower connecting rod bearing shell Nos. 4, 5 and 6 on DG 101	(03-340)[1/]
5.	Perform M.P. examination to 25% of circumferential pipe welds and corresponding heat affected zone on exhaust manifold piping; inspection for service induced cracks in heat affected zone	(03-380)[1/]
6.	Perform visual and L.P. examination of all clow check valves in lube oil and jacket water systems	(03-717)[1,2/]

OUTAGE - DELETED

1.	Check generator/engine coupling	(03-330)[1/]
2.	Check preload on 25% of connecting rod bolts at 1st outage	(03-340)[2/3/]
3.	Check preload on 100% of air start valve capscrews	(03-359)[2/3/]
4.	Inspect for tightening of fittings; apply locking compound on starting air manifold piping	(03-441)[1/]
5.	Clean intake plenum	(03-375)[1/]
6.	Check preload on 25% of rocker arm bolts	(03-390)[2/3/]
7.	Replace Y-strainer filter element	(03-441)[2/]
8.	Inspect and clean shutdown equipment (check valves, 200 mesh screen, tubing)	(03-500)[1/]
9.	Check all terminals are tight	(03-500)[1/]
10.	Check that thermocouples indicate ambient engine temperature when engine is cold	(03-630)[1/]
11.	Check terminal boards for loose wiring	(03-650)[1/]
12.	Inspect and clean engine shutdown equipment	(03-695)[1/]
13.	Test shutdown logic system	(03-695)[1/]
14.	Inspect, clean and, as applicable, lube manual valves on skid	(03-717)[1/]
15.	Clean and inspect J.W. heater elements	(03-800A)[1/]
16.	Inspect and clean lube oil heater elements	(03-800B)[1/]
17.	Record lube oil heat exchanger performance data for trending	(10-104)[1/]
18.	Record fuel oil booster pump discharge pressure for trend data	(10-108)[1/]
19.	Conduct operating pressure test of starting air receivers	(10-111)[1/]
20.	Record B&A pump discharge pressure for trend data	(10-113)[1/]

ALTERNATE OUTAGE

1.	Drain intercooler; examine and clean, as necessary	(F-068)[1/]
2.	Check preload on main bearing studs	(03-305)
3.	Perform fluorescent dye L.P. examination on bearing saddles; EDG 103, saddle Nos. 5, 6, 7; EDG 102 saddle No. 8. Removal and assembly in accordance with TDI Maintenance Procedures	(03-303)[1,2/]
4.	Check main bearing shell thickness	(03-310)
5.	Visually inspect main bearing crank journals	(03-310)
6.	Visually inspect poppet valve spool end and timing cam of starting air distributor	(03-442)[1/]
7.	Visually inspect all cam lobe surfaces, cams, tappets, rollers and camshaft	(03-350)[1/]
8.	Check camshaft bearings	(03-350)
9.	Check idler gear bushings	(03-355)
10.	Disassemble and inspect one fuel injection pump; based on results and engine operating parameters, determine need to inspect others. Bendix representative should perform disassembly of fuel injection pump	(03-365)[2/]
11.	Perform M.P. examination to sample of circumferential pipe welds of exhaust manifold	(03-380)
12.	Clean and inspect crankcase vacuum fan	(03-389)
13.	Clean and inspect cylinder exhaust thermocouples and thermocouple shields	(03-630)
14.	Flush jacket water system	(03-717)
15.	Disassemble, inspect and refurbish jacket water keepwarm pump	(10-107)
16.	Check coupling alignment D.C. fuel oil booster pump	(10-108)

4th OUTAGE

1.	Replace elastomeric parts in engine mounted pressure switches (engine control pneumatic trip switches) PS 801A-C, PS 802 A-C, PS 804 A-C	(General)[1/]
2.	Inspect and measure connecting rod bearing shells	(03-340)[1/]
3.	Visually inspect piston pin assembly for chromeplate damage and L.P. examination	(03-341)[1/]
4.	Check piston pin oil plugs to insure they are tight	(03-341)[1/]
5.	Inspect and measure piston skirt and piston pin	(03-341)[1/]
6.	Perform L.P. examination on cylinder head subcover pedestals	(03-362)[1/]
7.	Perform L.P. inspection of pushrods	(03-390)[1/]
8.	Disassemble and replace "O" rings in overspeed vent valve	(03-410)[1/]
9.	Refurbish governor actuator and booster servo motor	(03-415)[1/]
10.	Clean governor heat exchanger	(03-415)[1/]
11.	Replace thermal power elements in thermostatic valve	(03-515)[1/]
12.	Replace elastomeric parts of barring device pressure regulator	(03-525)[1/]
13.	Check lift pressure for lube oil relief valves	(03-717)[1/]
14.	Disassemble d/p valves, replace "O" rings, lube mainshaft	(03-717)[1/]
15.	Disassemble and inspect lube oil pressure control valve	(03-717)[1/]
16.	Disassemble and inspect fuel oil pressure control valves	(03-717)[1/]
17.	Pop test air start storage tank safety valves	(10-111)[1/]

4th OUTAGE - DELETED

1.	Visual inspection of cylinder heads	(03-360)[2/]

8th OUTAGE

1. Visually inspect and measure intermediate rocker arm bushings (03-390)[1/]
2. Visually inspect and measure exhaust rocker arm bushings (03-390)[1/]
3. Visually inspect and measure intake rocker arm bushings (03-390)[1/]
4. Disassemble, inspect and refurbish engine driven fuel oil booster pump (03-445)[1/]
5. Visually inspect welds on starting air receivers (10-111)[1/]