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September 21, 1983

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BY FEDERAL EXPRESS

Lawrence Brenner, Esq.
Administrative Judge
U.S. Nuclear Regulatory
Commission
Washington, D.C. 20555

Long Island Lighting Company
Docket No. 50-322 (OL)

Dear Judge Brenner:

Enclosed is LILCO's Diesel Generator Status Report dated September 21, 1983. This Status Report, which LILCO committed to provide in its Response to Suffolk County's Motion to Compel dated September 12, 1983, is the first of a series of periodic status reports on the progress of the diesel generator effort that will be provided to the Board and parties.

Sincerely yours,

Anthony F. Earley, Jr.
Anthony F. Earley, Jr.

AFE/403

Enclosure

cc: Dr. Peter A. Morris
Dr. George A. Ferguson
All Parties

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DIESEL GENERATOR STATUS REPORT

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I. DIESEL GENERATOR 102

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Diesel generator 102 was disconnected from its auxiliary equipment and moved to the turbine building where it was disassembled. The disassembly has been completed. The crankshaft was inspected in place and was then removed from the bed plate and taken to another location where the fractured surfaces were inspected and photographed by FAA, TDI and other personnel as well as by representatives of Suffolk County. The failure of the diesel generator 102 crankshaft occurred at the no. 7 cylinder connecting rod journal. Nondestructive examination of portions of this crankshaft in the area of the fracture disclosed no other cracks or indications. The crankshaft was then cut in such a manner as to permit shipment of the fractured surfaces. These fractured surfaces were shipped to FAA's metallurgical laboratories in Palo Alto, California. Separate shipments were used as a precaution. Metallurgical analysis of the fractured surfaces is underway by FAA. FAA's metallurgical analysis includes scanning electron microscopy, cellulose acetate replication of fracture and fillet radius surfaces, gold shadow replicas, chemical and physical property verification, hardness measurements, macroetching, metalographic sectioning and x-ray diffraction indications of residual stress. A written report of the results of the metallurgical tests is expected on or before September 30. Copies of this report will be made available to the Board and parties.

In addition to the inspection of the crankshaft, the remaining portions of diesel generator 102 have been inspected in the course of and after disassembly. This inspection included measurement of critical internal components. This inspection has been completed. In the early stages of disassembly, examination disclosed damage to the bed plate in the area of the no. 8 main journal bearing, one of the two journal bearings adjacent to the no. 7 cylinder in the region where the crankshaft failure occurred. The damage observed was caused by the crankshaft failure and consisted of some fretting of the main journal bearing surface at the no. 8 bearing. In addition, other magnetic particle indications were observed on the bed plate and were investigated. The base plate has been returned to TDI for repair. The repair will involve machining to ensure that there is a solid seating surface for the main bearings and a new, oversized bearing will be put in place.

At present, it is anticipated that diesel generator 102 will be released for reassembly as early as September 22 and reassembly efforts will then commence with one of the new 13 X 12" crankshafts described elsewhere in this Status Report.

II. DIESEL GENERATOR 103

Diesel generator 103 was disconnected from its auxiliary equipment and moved to the turbine building where it has been

fully disassembled. Nondestructive examination of the crankshaft of diesel generator 103 has been completed and the results are as follows. NDE identified a long linear indication approximately 2" in length on the no. 6 cylinder connecting rod pin. The penetrant indication was confirmed using a surface wave transducer and a depth of approximately 1/2" was found where it could be measured. No other indications were identified.

The remaining portions of diesel generator 103 have been inspected and as a result of this inspection, cracks were noted in the base plate emanating radially from the bolt holes for the main bearing hold down bolts. Some of the cracks turn down into the bolt holes and there are cracks in all but three of the eleven locations. Nondestructive examination has been performed on all cracks. In addition, crack propagation analyses have been performed taking into account stress levels during operation. These analyses show there are no operating mechanisms which cause these cracks to be of concern. FAA and TDI are investigating the cause of these cracks.

During examination of diesel generator 103, a piece of a bearing insert was noted to have cracked off the top half of the no. 5 cylinder connecting rod bearing. Further investigation of this condition is underway and the matter will be resolved prior to final assembly of these components in the

engine.* At present, it is anticipated that the 103 engine will be released for reassembly on or soon after September 20, 1983. Reassembly will be performed using one of the new 13 X 12" crankshafts described below.

III. DIESEL GENERATOR 101

Diesel generator 101 has not been moved or disassembled; it remains mounted in the diesel generator room. Visual and nondestructive examination of the diesel generator 101 crankshaft was performed and the following indications were found. Florescent penetrant examination on the connecting rod journal of the no. 7 cylinder disclosed a crack 1 1/2 - 2" long and approximately 360 mils deep extending from the journal into the web fillet radius. Florescent penetrant testing also identified three tightly grouped linear indications on the crankshaft journal of the no. 3 cylinder. These were found to be 3 to 5 mils deep. Three linear indications were also noted in the crankshaft web fillet radius adjacent to the journal on

* The connecting rod bearing failure found at the no. 5 connecting rod of diesel generator 103 led to similar inspections of the connecting rod bearings on diesel generators 101 and 102. Though no failures were observed, evidence was seen of early stages of a similar condition at one location with regard to diesel generator 101 and two locations with regard to diesel generator 102 and this matter is under investigation by FAA. The bearing insert may not have been properly supported by the connecting rod which forms the load bearing surface for the insert. The new 12" pin connecting rods to be installed have been inspected to ensure that a proper machine fit of the insert into the connecting rods exists such that there is firm and uniform backing for the insert over its total length.

the no. 5 cylinder. These indications were approximately 1" long with depths ranging from 7 mils to 320 mils.

The significance of these indications was evaluated and it was determined that the engine could be safely operated for a sufficient period of time to permit performance of a test to acquire torsional stress data. Four cracks in the diesel generator 101 crankshaft, one at the no. 7 cylinder and three at the no. 5 cylinder, were ground out to prevent propagation during operation. A linear elastic fracture mechanics analysis of the three cracks was performed to determine the probability of crack propagation and this analysis confirmed that the engine could be safely operated to permit the generation of data. Instrumentation was applied to the engine to obtain stress levels in the crankshaft fillets and on the crankshaft web at the no. 5 and no. 7 cylinders. Torsional measurement devices were also placed on the engine to measure overall torsional response of the engine generator set. Initial efforts to conduct the test confirm that the engine operates satisfactorily, but the strain gauge instrumentation was found to need improvement. These improvements are underway and it is anticipated that the test will be performed September 25, 1983 or soon thereafter. Once the torsional stress test has been completed, diesel generator 101 will be moved to the turbine building where it will be disassembled, inspected and reassembled with installation of a new crankshaft.

IV. NEW CRANKSHAFTS

LILCO has obtained two replacement crankshafts from Krupp Co. in Germany. A third crankshaft may also be obtained from this source. These replacement crankshafts are substantial improvements over the existing crankshafts in the following respects:

- (1) the replacement crankshafts have been shot peened in the web fillet areas to enhance stress response in these areas;
- (2) the replacement crankshafts incorporate a larger connecting rod journal diameter of 12" vs. 11" and therefore distribute stress levels over a larger area and diameter;
- (3) the web relief fillet contour has been changed to improve stress response;
- (4) the mass of the shaft has been redistributed to improve inertial response and to move critical operating points further away from the normal operating area.

The two new crankshafts are on site and have been subjected to nondestructive examination (ultrasonic testing and magnetic particle testing). No indications were found.

V. SCHEDULE

The investigation of the cause or causes of the crankshaft failure is still underway. As noted, a report of the metallurgical findings is expected to be available on September 30. Thereafter, FAA anticipates that a report should be available by October 15, 1983 setting forth FAA's conclusions concerning the cause or causes of the diesel generator 102

crankshaft failure. The schedule for completion of this report could be affected by the results of analyses that are in progress. Copies of this report will be made available to the Board and parties. It is also anticipated that FAA will subsequently issue a comprehensive report on the disassembly of the diesel generator, the crankshaft inspections on all three diesel generators, the detailed results of analyses (e.g., torsional stress analysis, finite element analysis) and a review of the design of the new crankshafts. A date for the publication of this report has not yet been established.

Although definitive conclusions about the cause of the crankshaft failure have not been reached, schedule considerations dictate commencement of reassembly efforts on diesel generators 102 and 103. Reassembly will begin approximately September 22 and 21, respectively. Reassembly efforts should take approximately three weeks and the reassembly efforts on the two engines will take place simultaneously. After reassembly, diesel generators 102 and 103 will be moved back to their respective cubicles and connected to their auxiliary systems. These operations collectively will take approximately two weeks. At that point, the diesel generators will undergo flushes, initial C&IO testing of components and then preoperational tests. Substantial testing will not be performed until the cause of the failure is known and appropriate corrective actions have been taken. All three diesel generators will undergo the complete preoperational test program once they are reassembled.

Though difficult to predict with precision, LILCO now anticipates that all three diesel generators will be repaired, reassembled and reinstalled in the diesel generator room on or before December 18, 1983. The preoperational test program for the three diesel generators is anticipated to be completed by January 30, 1984.

In addition to the repair of the existing TDI diesel generator sets and to provide added assurance of emergency power or as an alternative to the existing diesel generators, LILCO has made arrangements to purchase three new diesel generator sets from Colt Industries, with a higher capacity than the existing diesel generators. Delivery of these engines is contemplated to occur in the next 10 months. Engineering has commenced on the interfacing of these engines with the existing plant electrical and service systems.