

LILCO, March 21, 1984

RELATED CORRESPONDENCE

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USNRCUNITED STATES OF AMERICA⁸⁴ MAR 23 A10:36
NUCLEAR REGULATORY COMMISSIONOFFICE OF SECRETARY
DOCKETING & SERVICEBefore the Atomic Safety and Licensing Board

In the Matter of)

LONG ISLAND LIGHTING COMPANY)

Docket No. 50-322 (OL)

(Shoreham Nuclear Power Station,
Unit 1))LILCO'S RESPONSE TO
SUFFOLK COUNTY'S REQUEST FOR PRODUCTION OF DOCUMENTS

LILCO hereby responds to Suffolk County's Request for
Production of Documents.

In accordance with the Board's guidelines at the
February 17, 1984 prehearing conference, LILCO has not produced
all documents in existence that may be technically responsive
to each request. Rather, LILCO has conducted a search
reasonably calculated to identify documents which contain the
substantive information sought by the County. Thus, LILCO has
produced only representative documents or reports or
compilations of information that contain the information sought
by the request. To the extent the County maintains its request
for all documents, including drafts and copies, LILCO objects
to the requests as burdensome, oppressive and contrary to the
Board's direction. Because of the multitude and scope of

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documents requested by the County, LILCO's review of documents is not complete. These responses will be supplemented as necessary.

Many of the documents requested by the County are not in the possession or control of LILCO. Most of the documents in this category are TDI documents. At LILCO's request, TDI has agreed to cooperate in responding to Suffolk County's request. LILCO has been informed that the County has arranged to review TDI's documents in Oakland, California, beginning on March 22, 1984. Consequently, LILCO has not attempted to search for and produce TDI documents in LILCO's possession.

Many of the documents requested by the County relate to the Design Review Quality Revalidation (DRQR) program. LILCO has not produced all documents developed as part of the DRQR program. Such an effort would be unduly burdensome and oppressive given the scope of DRQR activities and its ongoing nature. The DRQR will develop a report on each component. Copies of the reports will be produced when they are complete. Reports on 16 diesel components (AE pistons, cylinder head studs, connecting rod bearings, rocker arm capscrews, air start valve capscrews, crankshaft, wiring and terminations, jacket water pump, turbocharger, cylinder block and liners, connecting rods, AN pistons, base and bridge caps, cylinder heads, main

and connector push rods and fuel oil injection tubing) are scheduled to be completed by March 30, 1984. The County has already received a number of these reports; additional reports will be produced when completed.

In this response, LILCO has not attempted to identify documents provided to the County prior to the February 29, 1984 request. Additionally, LILCO has not produced any documents protected by the attorney-client privilege and objects to the production of such documents. To date, LILCO has not withheld any otherwise responsive documents under a claim of work product privilege or trial preparation privilege, but LILCO reserves the right to make any such objection where appropriate and consistent with the Board's February 17 direction.

CONTENTION I

1. Documents identifying all TDI series R-4 and RV-4 diesel engines in nuclear and non-nuclear service, the name and address of the owner/operators of such engines, and in each case the B.M.E.P., horsepower rating, KW rating, operating speed, and fuel for such engine.

RESPONSE: The documents identified in this request are in the possession of TDI. LILCO is informed that TDI is making these documents available to the County for inspection and copying at TDI's offices in Oakland, California.

2. Documents identifying all TDI R-48 diesel engines in service at the time LILCO accepted the TDI bid for the Shoreham EDGs, the name and address of the owners/operators of such R-48 diesels, and in each case the B.M.E.P., horsepower rating, KW rating, operating speed, and fuel for such diesels.

RESPONSE: See response to Request No. 1 above.

3. Documents in the custody, control or possession of TDI, including correspondence between TDI and LILCO, that describe or address alleged defects or deficiencies with the Shoreham EDGs or their components.

RESPONSE: See response to Request No. 1 above.

4. Documents in the custody, control or possession of TDI, including correspondence between TDI and its customers, that describe or address alleged defects or deficiencies with TDI series R-4 and RV-4 diesel engines or their components.

RESPONSE: See response to Request No. 1 above.

5. Documents showing the results of failure analyses prepared by or for TDI with respect to components of TDI series R-4 and RV-4 diesel engines; documents showing the results of failure analyses with respect to components of the TDI EDGs at Shoreham.

RESPONSE: With respect to documents showing the results of failure analyses prepared by or for TDI, LILCO is informed that TDI is making these documents available to the County for inspection and copying at TDI's offices in Oakland, California. With respect to documents showing the results of failure analyses with respect to components of the TDI EDGs at Shoreham, LILCO will produce all final TDI failure analyses in its possession.

6. Documents, including blueprints, specification sheets, operating histories, quality documentation and test records, provided by TDI to the TDI Owners' Group. See page 63 (Matthews) of the transcript of the January 26, 1984 meeting between the NRC Staff and the TDI Owners' Group.

RESPONSE: See response to Request No. 1 above.

7. Documents showing experience data in the possession, custody or control of TDI, including records of failures, operating losses and design changes, concerning TDI series R-4 and RV-4 diesel engines or their components at (a) Shoreham, (b) other nuclear plants, (c) marine applications and (d) non-nuclear installations.

RESPONSE: See response to Request No. 1 above.

8. All TDI-specific documents regarding series R diesel engines or their components constituting (a) Significant Operating Experience Reports ("SOERs"); (b) Significant Event Reports ("SERs"); (c) Operating and Maintenance Reports ("O&MRs"); and (d) Licensee Event Reports ("LERs").

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress.

9. Blueprints, design drawings, and material and manufacturing specifications and tolerances, with surface finish details and codes if available, and all modification detail drawings, for (i) every component of the TDI EDGs at Shoreham, and (ii) every component of each model of the TDI series R diesel engines that was changed to cause, or was changed as a result of, an increase in the horsepower of such model, including:

- (a) air, oil and jacket water coolings drawings;
- (b) crankshaft drawings;
- (c) piston and liner drawings;

- (d) piston pin and bush detail drawings;
- (e) main bearing, bottom end bearing drawings and detail of bearing bolting arrangements;
- (f) bedplate and cylinder block drawings;
- (g) tie bolt drawings;
- (h) cylinder cover drawings;
- (i) turbocharger drawings;
- (j) camshaft drawings including material details and heat treatments for cams and rollers;
- (k) air start, fuel and relief valve drawings;
- (l) connecting rod drawings;
- (m) lubricating, jacket water, starting air, fuel and other system piping drawings and line diagrams;
- (n) piston cooling arrangement drawings;
- (o) jacket water cooling arrangement drawings;
- (p) camshaft drive assembly drawings;
- (q) governor and governor drive arrangement drawings;
- (r) fuel pump drawings;
- (s) drawings of all engine safety devices including overspeed trips, safety valves, bursting discs, crankcase pressure relief devices, overload protection and shutdown circuitry drawings;
- (t) pressure and temperature charts of all other engine running parameters for reduced, continuous and overload conditions; and
- (u) control and instrumentation drawings.

RESPONSE: See response to Request 1 above.

10. Drawings and documents for the components of the TDI EDGs listed in request number I.9., to the extent that they are not included in documents requested in number I.9., above, showing:

(a) all pump capacities and flow rates through engine piping systems;

RESPONSE: See response to Request No. 1 above.

(b) operational recommendations;

RESPONSE: See response to Request No. 1 above.

(c) service interval charts;

RESPONSE: See response to Request No. 1 above.

(d) instruction manuals and service manuals;

RESPONSE: See response to Request No. 1 above.

(e) overhaul and maintenance procedures;

RESPONSE: See response to Request No. 1 above.

(f) test bed results for each engine, including such results for ten percent overload conditions;

RESPONSE: See response to Request No. 1 above.

(g) detailed design calculations for each engine component, including design changes, documents showing the reasons for the engine uprating, details and drawing of such modifications, and material selection details and specifications lists of manufacturing process and QA/QC controls involved;

RESPONSE: See response to Request No. 1 above.

(h) design calculations for the replacement crankshft, including crankshaft balance data;

RESPONSE: See response to Request No. 1 above.

(i) the procurement specifications (SHI-89) for the Shoreham EDGs as issued by LILCO in December 1973, all addenda showing changes thereto, and all E&DCRs referred to therein; documents showing exceptions and clarifications made by TDI to the specification and addenda, and documents showing LILCO comments thereon; the performance specifications and documents showing the results of inspections performed upon receipt of the EDGs to ensure that the procurement specifications were met;

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress.

(j) indicator diagrams on cylinder pressure and crank angle details over the for cycles;

RESPONSE: See response to Request No. 1 above.

(k) balance data, including details of the balance weights, for the replacement crankshafts on the TDI EDGs at Shoreham and for the identical design crankshafts at other installations;

RESPONSE: See response to Request No. 1 above.

(l) temperature distribution (shown by lines of constant temperature through the various parts, if available) through cylinder heads, the piston crown and upper parts of the cylinder liner (including valve seals and pockets, flame deck of cylinder head, piston crown and sides, and cylinder liner flange);

RESPONSE: See response to Request No. 1 above.

(m) turboblower characteristics (including the weight of gas going through the blower, surge boundaries and RPMs), valve timing diagrams covering air inlets and exhaust valves of fuel injectors, and fuel pump characteristics.

RESPONSE: See response to Request No. 1 above.

11. Documents showing the changes in each model TDI series R diesel engine that were intended to increase its per cylinder horsepower.

RESPONSE: See response to Request No. 1 above.

12. Documents showing the results of the Initial Diesel Generator Recovery Program, including:

(a) checkout and initial operation testing of individual EDG components;

RESPONSE: LILCO has produced documents in this category.

(b) functional testing of EDG systems;

RESPONSE: LILCO has produced results of the portions of the diesel generator recovery program that have been completed. Additional results of the diesel generator recovery program will be produced as they are completed.

(c) preoperational testing (including starting tests, design load and overload tests, load acceptance and rejection tests, reliability qualification tests, 72-hour endurance run, electrical tests, and 100 total hours of operation at full load);

RESPONSE: LILCO has produced results of the portions of the preoperational tests that have been completed. Additional preoperational test results will be produced as they are completed.

(d) detailed vibration and balance tests;

RESPONSE: The information sought by this request will be obtained by LILCO as part of the Design Review and Quality

Revalidation Program (DRQR) which has not been completed at this time. As soon as the DRQR reports are finalized for each component, a copy of the report will be produced.

(e) crankshaft and other components inspection following preoperational testing;

above. RESPONSE: See response to Request No. 12(d)

(f) torsional crankshaft tests.

above. RESPONSE: See response to Request No. 12(d)

13. Documents showing the results of the Expanded Diesel Generator Recovery Program, including:

(a) results of the seven-day continuous run;

RESPONSE: No completed documents exist at this time that show results of the seven-day continuous run. When the documents are completed, they will be produced.

(b) results of post-testing inspections.

RESPONSE: No completed documents exist at this time that show results of post-testing inspections. As soon as the documents are completed, they will be produced.

14. Documents with respect to the Diesel Generator Recovery Program showing component selection and the bases therefor, task descriptions for quality and for design review, results of inspections of the EDGs and their components, the results of investigations of manufacturing and design processes for EDG components, and analyses of EDG components.

RESPONSE: LILCO has previously provided the County with the Diesel Generator Recovery Program Summary and the associated appendices. These documents contain descriptions of all phases of the DRQR and the procedures to be used to conduct the program. The procedures include, inter alia, those used in the component selection process. The results of the DRQR program will be contained in reports, copies of which will be produced when completed.

15. All deficiency or non-conformance reports (LDRs, CARs, etc.) concerning the EDGs or their components, and documents showing all dispositions thereof, since January 1980.

RESPONSE: LILCO has produced documents responsive to this Request, including all completed LDRs.

16. All documents prepared by or for TDI identifying nonconformances of the EDGs and their components affecting form, fit, or function which were dispositioned "repair" or "use-as-is," all documents which set forth the technical justification for the acceptability of such "use-as-is" or "repair" decisions.

RESPONSE: See response to Request No. 1 above.

17. All dispositions and corrective action documents, including appropriate reports to management, prepared by or for LILCO, S&W, or TDI regarding the Shoreham EDGs or their components which set forth the identification, cause or corrective action initiated for nonconformances.

RESPONSE: LILCO has produced all completed LDRs in response to Request No. 15.

18. Documents identifying and showing the results of all procurement requirements, inspections, tests and QA/AC reviews and inspections of the following replacement parts installed in the Shoreham EDGs:

- (a) crankshafts;
- (b) model "AE" pistons;
- (c) cylinder heads;
- (d) connecting rods;
- (e) connecting rod bearings;
- (f) turbocharger thrust bearings;
- (g) cylinder liners.

RESPONSE: Certain inspections, tests and quality control reviews of replacement parts are contained in the DRQR Program. As soon as reports concerning these categories are finalized, LILCO will provide the County with a copy. In addition, LILCO's review for any documents responsive to this request is still in progress.

19. All management reports and other documents prepared by or for LILCO, S&W, or TDI management which set forth the status and adequacy of the design and manufacture of the Shoreham EDGs.

RESPONSE: In response to other requests, LILCO has agreed to produce DRQR reports which will assess the adequacy of the design and manufacture of the Shoreham diesels. To the extent the request seeks other documents, LILCO objects. The terms "all management reports and other documents prepared by

or for . . ." and "status and adequacy" are ill-defined. The request would entail a burdensome search, particularly in light of LILCO's commitment to produce the completed DRQR reports which will contain information on the adequacy of the design and manufacture of the diesels.

20. Design verifications provided by the performance of design reviews, the use of alternate calculations, or the performance of qualification tests relied upon to verify the adequacy of the design and design changes of the Shoreham EDGs.

RESPONSE: LILCO will produce completed DRQR reports when they are available.

21. All documents developed by LILCO, S&W, or its subcontractors as part of the DRQR review of the design and quality attributes of the components of the Shoreham EDGs. (See "LILCO's Response to Suffolk County's Motion To Admit Supplemental Diesel Generator Contentions," February 7, 1984, at p. 10.) Included should be at least the following categories of documents:

(a) documents regarding the review of every component of the EDGs conducted to determine its function and potential contribution to engine reliability;

RESPONSE: The County has received a copy of the DRQR program component tracking list that contains information concerning each component to be reviewed as part of the DRQR. LILCO will also produce all final reports as they become available. Beyond this, LILCO objects to producing all documents developed as part of the DRQR Program, on the grounds that such production would be burdensome and oppressive.

(b) documents regarding the assessment of the nuclear and non-nuclear experience with the components set forth in (a);

RESPONSE: See response to Request No. 21(a) above.

(c) documents providing the basis for the selection of 171 out of the total of 218 component types for further evaluation;

RESPONSE: LILCO has produced the DRQR component selection procedure.

(d) documents concerning the adequacy of each component's design and quality such as design analyses, calculations, inspections, nondestructive examinations, and other necessary, destructive examinations.

RESPONSE: See response to Request No. 21(a) above.

22. Documents showing the results of inspections, reports, examinations, tests and analyses of the cracking of the cylinder blocks; documents showing the inspection procedures used with respect to the cracks; documents showing the bases for the conclusion that the cracks are non-propagating, and documents relied upon in reaching this conclusion; photographs and drawings depicting the location of the cracks; documents identifying other engines on which "these type cracks . . . had been observed." See NRC Morning Report dated February 14, 1984.

RESPONSE: LILCO will produce the DRQR final report concerning cracking of the cylinder block, which will contain the information sought in this request, when the report is completed.

23. Documents showing the procedures used for and the results of comprehensive performance tests conducted by TDI on the Shoreham EDGs prior to their shipment to LILCO, including sequential load tests.

RESPONSE: See response to Request No. 1 above.

CONTENTION I.A.

I.A.1 Crankshafts

1. To the extent not included in request number I.9., supra, detailed engineering drawings, including dimensions for the original and replacement crankshafts.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing calculations performed for sizing the replacement crankshafts, including assumptions.

RESPONSE: See response to Contention I, Request No.

1. In addition, LILCO will produce the DRQR final report on the crankshafts when it is completed.

3. Documents showing calculations used for meeting DEMA, ABS, Det Norske Veritas and Lloyd's standards for the size of the crankshafts and documents concerning any meetings or discussions with DEMA, ABS, Det Norske Veritas and Lloyd's and correspondence with the foregoing, concerning the replacement crankshafts.

RESPONSE: See response to Request No. 2 above. In addition, LILCO does not concede that any of the above standards, except DEMA, are applicable to the Shoreham TDI diesels.

4. Documents showing the results of any crankshaft failure analyses performed by TDI.

RESPONSE: See response to Contention I, Request No.

1.

5. Documents showing the results of torsional analyses and torsional stress tests on the original and replacement crankshafts; documents showing the results of inspections, examinations and analyses of the two automatic shutdowns and one manual load reduction experienced during the torsional vibration testing. See NRC Inspection Report No. 50-322/83-38 at pages 15-17.

RESPONSE: LILCO has produced documents responsive to this request. The DRQR final report on the crankshafts will be produced when it is completed.

6. Documents showing manufacturing specifications for forging (e.g., gash or grain flow), machining and shot peening of the replacement crankshafts.

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress.

7. Documents showing testing and inspection criteria for replacement crankshaft attributes (such as dimensions, hardness and tensile strength), and the results thereof for the three replacement crankshafts.

RESPONSE: See response to Contention I, Request No.

1.

8. With respect to Franklin Research Center's Interim Technical Evaluation Report dated 11/18/83, provide all

(a) documents showing the detailed methods by which TDI calculated the equivalent inertia and torsional spring constant for each crank assembly in the mass-elastic model employed by TDI to represent the dynamic natural frequencies and mode shapes of the engine;

(b) all documents showing the results of the "manufacturer's operational tests . . . performed on the engines in addition to the nuclear qualification program" (prior to delivery of the EDGs to Shoreham) which indicated that the test data confirmed "to within 1%" the critical speeds calculated during design; all documents showing that these tests confirmed the amplification factors of each significant order of vibration. Id. at 14.

RESPONSE: See response to Contention I., Request No. 1.

9. With respect to FaAA's preliminary and final metallurgical evaluations of the failed crankshaft on EDG 102, all photographs reproduced in those reports, and all other photographs documenting the appearance of fracture surfaces.

RESPONSE: LILCO will make the requested photographs available for inspection at the Shoreham Nuclear Power Station in Wading River, New York.

10. Documents concerning the procurement of the replacement crankshafts, including all specifications thereof.

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress. .

I.A.2 Main Bearings

1. To the extent not included in request number I.9., supra, detailed drawings of the main bearing between cylinders no. 4 and 5, including both bearing and crankshaft tolerances and clearances.

RESPONSE: See response to Contention I., Request No.

1.

2. Documents showing all analyses conducted with respect to the main bearing oil film pressure or oil film thickness on the bearing between cylinders 4 and 5.

RESPONSE: LILCO will produce the final DRQR report on this subject when the report is completed. See also response to Contention I., Request No. 1.

3. Documents showing or calculating the wear anticipated on the main bearings by the replacement crankshafts.

RESPONSE: See response to Request No. 2 above.

I.A.3 Pistons

1. To the extent not included in request number I.9., supra, detailed design drawings of the model AE and AF pistons showing dimensions and tolerances.

RESPONSE: See response to Contention I., Request No.

1.

2. To the extent not included in request number I.9., supra, detailed drawings of the model AE and AF piston crown to skirt connecting bolts (including length and diameter) and bearing surfaces.

RESPONSE: See response to Contention I., Request No.

1.

3. Documents showing engineering analyses of forces on model AE and AF piston bolts, crowns and skirts.

RESPONSE: The DRQR report on AE pistons will be produced as soon as possible. In addition, LILCO has produced an FaAA report on AE and AF pistons.

4. Documents showing the operational test programs for the model AE and AF pistons and documents showing the results thereof. This shall include:

(a) documents showing the results of "experimental test programs" which reveal the patterns of stress and temperature existing in the piston assembly (including studies of thermal distortion, effects of combustion pressure and inertia forces, and the results of finite element analysis on piston crowns). See TDI Responses to NRC Staff Questions, dated 12/16/83, at page 8;

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress.

(b) documents showing the results of testing of the model AN and AE piston assemblies that support the results of static and analytic studies (id.);

RESPONSE: See response to Request No. 3 above.

(c) documents showing the operating experience of the modified model "AF" piston skirts in nuclear and non-nuclear applications (id.);

RESPONSE: See response to Contention I., Request

No. 1.

(d) documents showing the results of testing of the model AE and AN piston assemblies (in TDI's experimental R5-V12 engines and elsewhere) (id.);

RESPONSE: See response to Contention I., Request

No. 1.

(e) documents showing the operating experience of the model AE piston in nuclear and non-nuclear applications (id.);

RESPONSE: See response to Contention I., Request

No. 1. The County has also received the DRQR component tracking list.

(f) documents and drawings showing that the modified piston skirt design improves stress distribution in the area of the fastener holes and in the circumferential mid rib blend to the wrist pin boss (id. at page 9);

RESPONSE: A DRQR final report will be produced as soon as it becomes available. In addition, see response to Contention I., Request No. 1.

(g) documents showing that the protection afforded the fasteners against cyclic loading could be achieved with 13 belleville washers instead of the 26 original washers (id.);

RESPONSE: See response to Contention I., Request
No. 1.

(h) documents attributing the several field failures of the model AN pistons to "high residual stresses not removed by a stress relief process" (id.);

RESPONSE: See response to Contention I., Request
No. 1.

(i) documents showing the changes made to the corebox in which the mold for the piston skirt interior is formed (id.).

RESPONSE: See response to Contention I., Request
No. 1.

5. Documents showing the results of failure analyses of the model AF and AE pistons.

RESPONSE: LILCO has produced an FaAA report on AE and AF pistons. See reponse to Contention I., Request No. 1.

6. To the extent not included in request number I.9., supra, detailed drawings of the AE and AF piston pins and their dimension.

RESPONSE: See response to Contention I., Request No.
1.

7. Documents showing manufacturing specifications for the model AE piston skirts, crown, bolts and pins.

RESPONSE: See response to Contention I., Request No.
1.

8. Documents showing procedures, hold points and specifications for piston tinning (plating).

RESPONSE: See response to Contention I., Request No.

1.

9. Documents showing piston cracking on the engines of the Star and Pride of Texas ships.

RESPONSE: See response to Contention I., Request No.

1.

10. All drawings and photographs showing piston skirt damage. (See FaAA's 'Preliminary Metallurgical Analysis of Cracked Piston Skirts, 12/8/83).

RESPONSE: See response to Request No. 3 above and response to Contention I.A.I., Request No. 9.

I.A.4 Cylinder Heads

1. To the extent not included in request number I.9., supra, detailed engineering drawings of current production cylinder heads.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing engineering calculations on firedeck thickness.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the results of finite element analyses performed on cylinder heads.

RESPONSE: LILCO is unaware of any documents that are responsive to this request.

4. Documents showing cylinder head failures at Grand Gulf.

RESPONSE: See response to Contention I, Request No.

1.

5. All repair records for each of the cylinder heads listed in the September 30, 1983 letter from Mr. Trussell (TDI) to J. Molina (Titan Navigation).

RESPONSE: See response to Contention I, Request No.

1.

I.B.I. Exhaust Temperatures

1. Documents showing the manufacturer's manual or procedure(s) permitting approximately 1100°F exhaust temperatures for the Shoreham EDGs.

RESPONSE: See response to Contention I., Request No.

1.

2. All documents showing engineering analyses that provide the basis for the approximately 1100°F exhaust temperatures for the Shoreham EDGs.

RESPONSE: See response to Contention I., Request No.

1.

CONTENTION II.A.

II.A.1 Connecting Rod Bearings

1. To the extent not included in request number I.9., supra, detailed engineering drawings of the original and new bearing design including dimensions.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing the results of engineering analyses of the bearing oil film pressure.

RESPONSE: A DRQR report on connecting rod bearings will be produced as soon as it is completed.

3. Documents showing FaAA's review of LILCO's bearing maintenance procedures.

RESPONSE: See response to Request No. 2 above.

4. Documents describing TDI's bearing material sample testing program to check chemical and physical properties against specification and the certified material test report(s) supplied by the vendor.

RESPONSE: See response to Contention I, Request No.

1.

5. With respect to TDI's failure analysis on connecting rod bearing shells dated 10/17/83, documents showing:

(a) thickness measurements taken by TDI at 18 locations along the edge and 4 locations near the oil groove, and drawings indicating where those measurements were taken;

RESPONSE: See response to Contention I, Request No.

1.

(b) documents and drawings giving the original manufacturing tolerances for thickness of those 22 locations; and

RESPONSE: See response to Contention I, Request No.

1.

(c) figures 1, 2 and 3.

RESPONSE: See response to Contention I, Request No.

1.

6. With respect to FaAA's 10/31/83 Connecting Rod Bearing Failure Investigation, all documents showing the results of physical and metallurgical examinations of any bearings, computations of the design loads imposed on the bearings, and analyses of design features of the bearing system, including:

(a) documents showing all calculations made for determining the total range of crank pin deflection, end-to-end, at the No. 6 journal for (a) the 11" crank pin, and (b) the 12" crank pin;

RESPONSE: LILCO has produced documents responsive to this request.

(b) documents showing the results of finite element analysis and fracture mechanics performed by FaAA to determine the quantitative influence of journal deflection of bearing stresses;

RESPONSE: See response to Request No. 6(a) above.

(c) documents showing the results of scanning electron microscopic examinations and any drawings or documents indicating the locations and sizes of the voids in the cast material in the fracture plane.

RESPONSE: See response to Contention I.A.1, Request No. 9.

7. With respect to the 12/15/83 FaAA Analysis of Replacement Connecting Rod Bearings, Fatigue Life Prediction, Shoreham Nuclear Power Station:

(a) documents showing FaAA's finite element method stress analysis and fracture mechanics analysis of the fatigue cracking of the original and replacement connecting rod bearings (id. at 1);

RESPONSE: LILCO has produced documents in response to this request. In addition, a DRQR report on connecting rod bearings will be produced when it is completed.

(b) documents showing the computation of the stress intensity factor range of the original and replacement connecting rod bearings (id. at 6); and

RESPONSE: See response to Request No. 7(a) above.

(c) documents showing the basis for the following FaAA statement:

"Some engine manufacturers successfully operate engine sleeve bearings above industry guidelines in specific applications, by exercising careful control of engine component design, manufacturing, and operating conditions. LILCO appears to be exercising the degree of control necessary for successful operation at 26,780 psi peak oil film pressure." (Id. at 1-2).

RESPONSE: LILCO has produced documents responsive to this request.

(d) documents showing that the voids in the bearing shells (i) were not atypical of cast aluminum bearings and (ii) would not be detrimental to bearing life in the absence of abnormally high stresses (id at 3);

RESPONSE: LILCO has produced documents responsive to this request.

(e) documents showing the analysis which determined that the lack of parallelism and the voids in the bearings were not failure causes (id. at 1-2).

RESPONSE: LILCO has produced documents responsive to this request.

8. Documents showing the results of inspections, reports, tests, examinations and analyses of the connecting rod wrist pin bronze bearings on which linear indications were found, and all photographs and drawings depicting the nature and location of the linear indications. See NRC Morning Report dated February 16, 1984.

RESPONSE: See response to Contention I.A.1, request No. 9. In addition, a DRQR report on connecting rod bearings will be produced when it is completed.

II.A.2. Water Jacket Pumps

1. With respect to the 12/15/83 memo from Cox (FaAA) to Milligan (LILCO) concerning FaAA's water jacket pump inspection, all photographs referred to therein; documents showing the three pump failures in pumps with tapered shaft/key attachment design; and documents showing the results of the disassembly of the water jacket pump from EDG 101.

RESPONSE: See response to Contention I.A.1, request No. 9. In addition, LILCO has produced documents responsive to this request.

2. All drawings depicting the nature and location of the scoring indications found in the jacket water pump on EDG 102; all documents describing, referring to or commenting on the scoring indications on the jacket water pump.

RESPONSE: LILCO has produced documents responsive to this request.

3. With respect to NRC Inspection Report No. 83-02,

(a) the memorandum (referred to on page 8 of 10 of section 7) which addressed jacket water pumps installed in EDGs furnished to, among others, LILCO;

(b) the failure analysis referred to on page 9 of 10, id.;

(c) the memorandum referred to, id., that is not in agreement with the failure analysis;

(d) the memorandum concerning the design of the jacket water pump, id.;

(e) "Comparison of R-48 Engine Front End Amplitude of 4th Order at 450 RPM." Id. at 9 of 10.

RESPONSE: LILCO's review of documents for any responsive to this request is still underway.

4. Documents showing the torque required for removal of the impeller on EDG 101.

RESPONSE: LILCO has produced documents responsive to this request.

5. Photographs, and all documents showing analyses, of the driven end gearing.

RESPONSE: This subject will be addressed in a DRQR report, which will be produced as soon as it is completed.

6. All documents showing the effect of the location of the jacket water pump on vibration of the EDGs.

RESPONSE: A DRQR report on jacket water pumps will be produced when it is completed.

II.A.3. Rocker Arm Assembly

1. To the extent not included in request number I.9., supra, detailed engineering drawings of the rocker arm assembly attachment to the cylinder head and subcover.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing the engineering analysis of the rocker arm load transmittal to the engine structure.

RESPONSE: See response to Contention I, Request No.

1.

II.A.4 Fuel Lines

1. Documents identifying all TDI engines in nuclear and non-nuclear applications that lacked shrouded fuel lines for the period between 1974 and 1980.

RESPONSE: See response to Contention I, Request No. 1 above.

II.A.6 Electrical Cables

1. Documents identifying all engine cables used at Shoreham and documents showing certifications of compliance with IEEE standards and cable manufacturer's temperature ratings.

RESPONSE: Documents responsive to this request have been produced.

II.A.7 Camshaft Lobes

1. Documents describing the camshaft inspection procedure and the criteria for acceptance for further use.

RESPONSE: The information sought in this request is the subject of the DRQR Program. When the pertinent DRQR report is completed, a copy will be produced.

2. Any and all photographs and drawings depicting the nature and location of camshaft lobe pitting on EDG 101; all documents showing the results of examinations, inspections, reports and analyses of the camshaft lobe pitting, and all documents describing, commenting on or referring to the pitting.

RESPONSE: LILCO has produced documents in response to this request. LILCO is in the process of locating the requested photographs. See also response to Request No. 1, above.

II.A.8 Turbocharger Thrust Bearings

1. To the extent not included in request number I.9., supra, detailed engineering drawings of the Shoreham EDG

- (a) turbocharger thrust bearings;
- (b) turbocharger thrust bearing prelude system;
and
- (c) turbocharger thrust bearing lubrication system.

RESPONSE: The turbocharger and its components were not manufactured by TDI. LILCO has requested these documents from the manufacturer, Elliott Co., but LILCO has not received any responsive documents.

2. Documents describing system details of the turbocharger prelubrication systems (e.g., oil types, flow rates).

RESPONSE: See response to Contention I, Request No.

1. If no responsive documents are available at TDI, then see response to Request No. 1 above.

3. Documents showing the design bases for the turbocharger prelube and lubrication system.

RESPONSE: See response to Request No. 2 above.

4. All photographs and drawings depicting the nature and location of the damage to, and all documents showing the results of, inspections, reports, examinations and failure analyses of, the turbocharger thrust bearings, including those that failed at Shoreham in February, 1984. See NPC Morning Reports dated February 6, 10 and 14, 1984. Documents and drawings showing modifications to the failed turbocharger thrust bearings. Id.

RESPONSE: See response to Contention I.A.1. Request No. 9. LILCO will furnish a DRQR final report on this subject as soon as it becomes available. In addition, LILCO has produced documents responsive to this request.

II.A.9 Air Supply Tubing

1. Documents showing air supply tubing run evaluations (Affidavit of J.C. Kammeyer, 2/7/84, at page 4) and all documents showing engineering and design change requests that initiated all changes.

RESPONSE: LILCO has produced documents responsive to this request.

2. Documents showing criteria used in determining support points.

RESPONSE: See response to Request No. 1 above.

II.A.10 Base Plates

1. Documents showing or comparing the different dimensions of the saddles and bolt holes for EDGs 101, 102 and 103.

RESPONSE: Information sought in this request is the subject of a DRQR report, which will be furnished as soon as it is completed.

2. Documents showing the results of the TDI report on bearing cap stud loading.

RESPONSE: See response to Contention I, Request No. 1.

3. Documents showing the results of analyses of the base plate cracking.

RESPONSE: Information sought in this request is the subject of DRQR report, which will be furnished as soon as it is completed. In addition, LILCO has produced documents responsive to this request.

4. Documents showing the results of reports on bearing saddle indications, cracks or failures.

RESPONSE: See response to Request No. 3 above.

5. With respect to the 12/7/83 memorandum from Wells (FaAA) to Milligan/Judge concerning baseplate cracking,

(a) documents showing the results of the journal orbit analysis conducted by TDI, the FaAA analyses of the forces on the main bearing caps, and all documents showing the calculations by FaAA that allegedly show that the frictional shear stress and

normal stress in the vicinity of the stud holes are too low to cause growth of these cracks;

(b) documents showing crack indications in EDG 102 or 103 bases, and documents showing calculations demonstrating that the side loads developed between the studs and the 1-1/8" wall adjacent to the bearing saddle are more than sufficient to fracture this wall; and

(c) documents showing U.S. Coast Guard data on other non-counter weighted DSR-48 engines that have base plate cracks.

RESPONSE: LILCO's review of documents for any response to this request is still in progress.

II.A.11 Turbocharger Bolts

1. Documents, including LDR 1629, showing deficiencies, defects, non-conformances and other problems with Shoreham turbocharger bolts, and the dispositions thereof.

RESPONSE: LILCO has produced the documents sought in this request. In addition, the information sought in this request is the subject of a DRQR report, which will be produced when it is completed.

II.A.12 Cylinder Liners

1. Photographs and drawings depicting the nature and location of pitting and cracking in cylinder liners on the Shoreham EDGs; documents showing the results of inspections, tests, examinations, reports and analyses of such pitting and cracking, and documents describing, commenting on or referring to the pitting and cracking.

RESPONSE: See response to Contention I.A.1., Request No. 9. In addition, LILCO has produced documents responsive to this request.

2. Documents showing analyses of other cylinder liner failures in TDI series R-4 and RV-4 engines.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing any analyses of faulty injector tips with respect to cylinder problems.

RESPONSE: See response to Contention I, Request No.

1.

II.A.13 Design Modifications

1. Documents showing TDI diesel product improvements, design modifications or other changes to the Shoreham EDGs that affect fit, form or function (since the EDGs were released), documents showing LILCO's comments on such improvements, and documents showing TDI's bases for the recommended changes.

RESPONSE: LILCO has produced documents responsive to this request.

2. Detailed design drawings of the current governor linkage at Shoreham and documents showing the change request for its installation.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the engineering analyses for the change to VITON "O" rings, the fuel oil header ejector system addition, the turbocharger bracket change, the head stud replacement, the tapered fit drive gear hub and impellor modification, and the control system improvements for high temperature main bearing shutdowns and vibration shutdowns.

RESPONSE: See response to Contention I, Request No.

1.

CONTENTION II.B

II.B.3 Connecting Push Rod Weld

1. Documents showing analyses of the Shoreham push rod design and manufacture.

RESPONSE: Information sought in this request is the subject of a DRQR report, which will be furnished when it is completed.

2. Documents showing the results of failure analyses of connecting push rods at Shoreham.

RESPONSE: Information sought in this request is the subject of a DRQR report, which will be furnished when it is completed.

3. Documents showing the specifications for the original and replacement connecting push rods, and documents showing engineering analyses of material used for the specifications.

RESPONSE: See response to Contention I, Request No.

1.

II.B.5 Air Start Valves

1. Documents showing the results of failure analyses of air start valves.

RESPONSE: LILCO is not aware of any documents that are responsive to this request.

II.B.6 Non-Class IE Control Power and Components

1. Documents showing the specifications for control devices and control components at Shoreham.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing the results of failure analyses performed by or for TDI or Cleveland Electric Illuminating Co.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the design interface between TDI and LILCO for control power and components.

RESPONSE: LILCO has produced a list of the requested drawings. The drawings are available for review at the Shoreham Nuclear Power Station at Wading River, New York.

II.B.7 Crankcase Capscrews

1. Documents showing the results of failure analyses performed on crankcase capscrews at Grand Gulf.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents describing the operating conditions at Grand Gulf at the time of the failure of the crankcase capscrews.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the specification for torquing of the capscrews and documents showing whether the specification was met.

RESPONSE: See response to Contention I, Request No.

1.

II.B.8 Fuel Oil Line

1. Documents showing analyses of the adequacy of the supports of the fuel lines at Shoreham.

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress.

2. Documents showing the results of failure analyses prepared by or for MP&L or TDI on the failure of the main fuel oil line at Grand Gulf.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the operating conditions at Grand Gulf at the time of the failure of the fuel oil line.

RESPONSE: See response to Contention I, Request No.

1.

4. Documents showing the engineering change and redesign of the fuel oil line.

RESPONSE: See response to Contention I, Request No.

1.

II.B.9 Sensing Line

1. Design drawings of the starting air system and piping at Shoreham.

RESPONSE: LILCO has produced a list of drawings that are responsive to this request. The drawings will be made available for review at the Shoreham Nuclear Power Station at Wading River, New York.

2. Documents showing the results of failure analyses conducted by or for MP&L or TDI.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the seismic design criteria for the diesel starting air system at Shoreham.

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress.

I.B.11 Link Rod Assembly

1. Documents showing the results of failure analyses on the link rod assembly.

RESPONSE: LILCO is not aware of any documents sought by this request.

2. Design drawings of the original and revised link rod assembly.

RESPONSE: See response to Contention I, Request No.

1.

II.B.12 Governor Flexible Drive Coupling

1. Documents showing the results of failure analyses for the governor flexible drive couplings prepared by or for Duke Power or TDI.

RESPONSE: See response to Contention I, Request No.

1.

2. Design drawings of the Shoreham drive coupling.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents identifying the manufacturer(s) of the Shoreham and Catawba governors.

RESPONSE: LILCO's review of documents for any responsive to this request is still in progress.

II.B.13 Rotor and Stator

1. Manufacturing drawings for the Shearon Harris generator.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents, including correspondence, showing the results of inspections, examinations, tests, reports and analyses of the Shearon Harris rotor, stator and AC box.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the results of failure analyses performed on the generator by or for Carolina Power or TDI.

RESPONSE: See response to Contention I, Request No.

1.

II.B.14 Air Check Valves

1. Documents showing the results of failure analyses of the air check valves.

RESPONSE: The air check valves at Shoreham did not fail. LILCO has no documents responsive to this request.

2. Documents identifying the locations where the check valves were used.

RESPONSE: LILCO has produced the document responsive to this request.

valves. 3. Design drawings of the failed and redesigned

RESPONSE: See response to Contention I, Request No.

1.

II.B.15 Pneumatic Logic

1. Documents showing the differences in pneumatic logic between Grand Gulf and Shoreham.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing the results of failure analyses performed by or for Grand Gulf and TDI.

RESPONSE: See response to Contention I, Request No.

1.

II.B.16 Relay Tachometer

1. Documents showing the specification used for the Shoreham relay tachometer.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing the results of the failure analyses performed on the tachometer for or by Grand Gulf or TDI.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing the manufacturing specification for the Grand Gulf relay tachometer.

RESPONSE: See response to Contention I, Request No.

1.

CONTENTION III

1. All inspection and test records for the Shoreham EDGs prepared by or for TDI, including copies of the Manufacturing Engineering Route Sheet or other shop traveler, which verify that the EDGs and their components were manufactured to specified requirements and which demonstrate that those items will perform satisfactorily in service.

RESPONSE: See response to Contention I, Request No.

1. In addition, LILCO has produced several production route sheets.

CONTENTION III.A

III.A.1 Cylinder Heads

1. Documents showing temperature control procedures implemented for melting during cylinder head casting, including holding times.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing steps taken to ensure cleanliness of the cylinder head metal.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents showing how and where samples of the metal are taken from the cylinder head pour for chemical analysis.

RESPONSE: See response to Contention I, Request No.

1.

4. Documents showing procedures used to clean the cylinder head mold including grinding allowances and how dimensions are determined.

RESPONSE: See response to Contention I, Request No.

1.

5. Documents showing cylinder head casting inspection procedures, including where inspection stations are located; documents showing inspection criteria and inspection equipment for castings.

RESPONSE: See response to Contention I, Request No.

1.

6. Documents showing the rework request procedure.

RESPONSE: See response to Contention I, Request No.

1.

7. Documents showing the cylinder head molding procedures, such as preheating and pouring rate procedures, including calculated time for cooling and time until shakeout. Also documents showing the types of sands and stabilizers used, mold support placement, and analysis of the adequacy of the gating, risers, sprue and chills.

RESPONSE: See response to Contention I, Request No.

1.

8. All manufacturing process documents prepared by or for TDI since 1980 regarding changes to the foundry practices for casting the cylinder heads including documents setting forth the eleven changes in technique made in 1981, the seven changes in 1982, the two changes made prior to June 1983, and any changes made since that time; all documents maintained by the foundry such as complete records of the examination results and the monthly review of repair experiences. (See Letter NSC-83-273, A.W. Zeuthen to M.H. Milligan.)

RESPONSE: See response to Contention I, Request No.

1.

9. Documents showing LILCO's inspection and audit of TDI's manufacturing process for the cylinder heads, including the "Objective Evidence" referred to in the "Comments section of th Audit Evaluation Forms for the audits of TDI on October 28-30, 1975, February 23, 1976 and June 18, 1976.

RESPONSE: LILCO has produced these documents.

III.A.2 Connecting Rod Bearings

1. Documents showing manufacturing procedures for the bearings, including steps involved in manufacturing of the aluminum-top layer, the barrier layer, and the electroplated babbit layer.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents describing the cause(s) of porosity in the bearings.

RESPONSE: A DRQR report on this subject will be furnished when it is completed. See also response to Contention I, Request No. 1.

3. Documents showing the effect of porosity on the plating of the babbit.

RESPONSE: A DRQR report on this subject will be furnished when it becomes final. See also response to Contention I, Request No. 1.

4. Documents showing manufacturing procedures used to guard against various types of porosity occurrences.

RESPONSE: See response to Contention I, Request No. 1.

III.A.3 Pistons

1. Documents showing manufacturing procedures for the model AE and AF pistons.

RESPONSE: See response to Contention I, Request No. 1.

2. Documents showing temperature control methods implemented throughout the manufacturing process.

RESPONSE: See response to Contention I, Request No. 1.

3. Documents showing piston manufacturing inspection criteria procedures.

RESPONSE: See response to Contention I, Request No.

1.

III.A.4 Fuel Line

1. Documents showing inspection procedures and criteria relative to the high-pressure fuel lines.

RESPONSE: LILCO has produced documents responsive to this request.

III.A.5 Generator Rotor

1. With respect to the Parsons Peebles Failure Analysis Report-EF-3060

(a) documents from Parsons Peebles-Electric Products, Inc., referred to in the 11/2/83 telephone memorandum (Kammeyer, SWEC, and Silverberg, Parsons Peebles) supplementing the failure analysis;

(b) documents showing action taken by Stone & Webster in response to the above-mentioned failure analysis;

(c) documents showing the damage to or repair of the generator rotor.

RESPONSE: LILCO has produced documents responsive to this request.

2. With respect to the 10/28/83 Woodward Governor failure analysis,

(a) documents showing the results of metallurgical examinations undertaken;

RESPONSE: LILCO has produced documents responsive to this request.

(b) documents and data showing the tests performed by Woodward Governor;

RESPONSE: The information sought in this request will be the subject of a DRQR report, which will be produced when it is completed.

(c) documents and data supporting the conclusion of the metallurgist that "the failure was a typical brittle fracture caused by excessive torsional impact loading in the acceleration mode, and [that] it occurred at the weakest section."

RESPONSE: See response to Request No. 2(b) above.

III.A.6 Cylinder Liners

1. Documents showing manufacturing procedures for the cylinder liners.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing inspection procedures and criteria for the cylinder liners.

RESPONSE: See response to Contention I, Request No.

1.

3. Documents, including LRD 1642, showing deficiencies and nonconformances and other manufacturing problems with Shoreham cylinder liners, and the dispositions thereof.

RESPONSE: LILCO has produced documents responsive to this request.

4. Documents showing analyses conducted on cylinder liner pitting, including how it could affect engine operation.

RESPONSE: The information sought in this request is the subject of a DRQR report, which will be furnished when it is completed.

III.A.7 Cylinder Head Subcover Assembly

1. Documents, including LDR 1541, showing deficiencies and nonconformances and other manufacturing problems with Shoreham cylinder heads subcover assemblies; and dispositions thereof.

RESPONSE: LILCO has produced documents responsive to this request.

2. Photographs and documents showing the location and nature of the cracking and documents showing the results of inspections, examinations, tests, reports and analyses of the cracking; documents showing engineering analyses and bases for the determination that the cracking would have no impact on engine operation.

RESPONSE: Documents responsive to this request have been produced. In addition, see response to Contention I.A.1, Request 9.

III.A.8 Cylinder Head Nuts

1. Documents showing manufacturing inspection procedures and criteria for the cylinder head nuts.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing the results of the FaAA analysis which determined that the cylinder head nuts were acceptable for operation.

RESPONSE: LILCO has produced documents responsive to this request.

III.A.10 Camshaft Lobes

1. Documents showing manufacturing procedures for the camshaft lobes.

RESPONSE: See response to Contention I, Request No.

1.

2. Documents showing the heat treatment method implemented during manufacture of the lobes.

RESPONSE: See response to Contention I, Request No.

1.

III.A.11 Fuel Injectors

1. Documents, including LDR 1639, showing deficiencies, nonconformances and other manufacturing problems with Shoreham fuel injectors, and dispositions thereof.

RESPONSE: LILCO has produced documents responsive to this request.

2. Documents showing inspection procedures and criteria for the injectors.

RESPONSE: LILCO has produced documents responsive to this request.

3. Documents showing the results of inspections of the damage to cylinder liners due to faulty injector tips.

RESPONSE: LILCO has produced documents responsive to this request.

CONTENTION III.B.

III.B.1 Piston Skirts

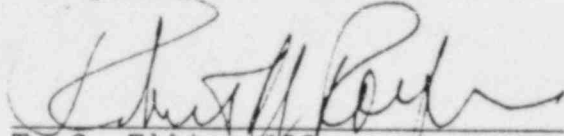
1. Documents showing the different heat treatment methods for the model AN, AF and AE pistons.

RESPONSE: See response to Contention I, Request No.

1.

Respectfully submitted,

LONG ISLAND LIGHTING COMPANY

A handwritten signature in dark ink, appearing to read "T. S. Ellis, III", written over a horizontal line.

T. S. Ellis, III

Robert M. Rolfe

Anthony F. Earley, Jr.

Hunton & Williams
Post Office Box 1535
Richmond, Virginia 23212

DATED: March 21, 1984

LILCO, March 21, 1984

DOCKET
UNIT

CERTIFICATE OF SERVICE

'84 MAR 23 A10:36

In the Matter of
LONG ISLAND LIGHTING COMPANY
(Shoreham Nuclear Power Station, Unit 1)
Docket No. 50-322 (OL)

OFFICE OF THE CLERK
DOCKETING & SERVICE
BRANCH

I hereby certify that copies of LILCO's Response to
Suffolk County's Request for Production of Documents were
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DATED: March 21, 1984

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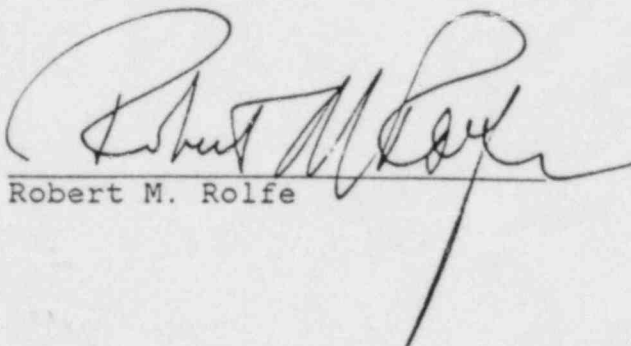
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