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

March 21, 1984 SNRC-1026

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

LILCO's Supplement To Motion For
Low Power Operating License
Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

Dear Mr. Denton:

Enclosed herewith is one copy of Long Island Lighting Company's SUPPLEMENT TO MOTION FOR LOW POWER OPERATING LICENSE. This Supplement, together with its four supporting affidavits, was served upon all parties to this proceeding on March 20, 1984. A copy was also hand delivered to Mr. Ralph Caruso, the NRC Project Manager for Shoreham. Ten additional copies are being express delivered to your attention as of the date of this letter.

LILCO is available, at your convenience, to provide any additional information or to meet with your Staff at any time in the interest of expediting your review of this filing. Please do not hesitate to contact the undersigned at (516) 929-6111 to discuss this matter further.

Very truly yours,

B R McCaffrey

B. R. McCaffrey
Manager, Nuclear Compliance and Safety

JPM:ck

Attachment

cc: C. Petrone
R. Caruso
R. Starostecki, Region I

8403270197 840321
PDR ADOCK 05000322
G PDR

A001

FC-8935

HUNTON & WILLIAMS
707 EAST MAIN STREET P.O. BOX 1535
RICHMOND, VIRGINIA 23212
TELEPHONE 804-788-8200
TWX-710-956-0061

WASHINGTON, D.C.
NEW YORK, NEW YORK
LOS ANGELES, CALIFORNIA
RALEIGH, NORTH CAROLINA
NORFOLK, VIRGINIA
KNOXVILLE, TENNESSEE

FILE NO. 24566.3
DIRECT DIAL NO. 804 788-8361

March 20, 1984

Lawrence Brenner, Esq.
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Fourth Floor
East West Towers (North Tower)
4350 East-West Highway
Bethesda, Maryland 20814

Dr. Peter A. Morris
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Fourth Floor
East West Towers (North Tower)
4350 East-West Highway
Bethesda, Maryland 20814

Dr. George A. Ferguson
Administrative Judge
Atomic Safety and Licensing
Board Panel
School of Engineering
Howard University
2300 6th Street, N.W.
Washington, D.C. 20059

Gentlemen:

LILCO hereby files today the enclosed Supplemental Motion for Low Power Operating License. The supporting affidavits which accompany the motion have not been executed yet. Signed copies will be served as soon as possible.

Sincerely,

Anthony F. Earley, Jr.

Anthony F. Earley, Jr.

221/765
Enclosure
cc: Service List

DJPE
8403210177

LILCO, March 20, 1984

CERTIFICATE OF SERVICE

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

I hereby certify that copies of LILCO's Supplemental Motion for Low Power Operational License were served this date upon the following by first-class mail, postage prepaid, or by hand, as indicated by an asterisk.

Lawrence Brenner, Esq.*
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Fourth Floor
East West Towers (North Tower)
4350 East-West Highway
Bethesda, Maryland 20814

Dr. Peter A. Morris*
Administrative Judge
Atomic Safety and Licensing
Board Panel
U.S. Nuclear Regulatory
Commission
Fourth Floor
East West Towers (North Tower)
4350 East-West Highway
Bethesda, Maryland 20814

Dr. George A. Ferguson*
Administrative Judge
Atomic Safety and Licensing
Board Panel
School of Engineering
Howard University
2300 6th Street, N.W.
Washington, D.C. 20059

Chairman Nunzio J. Palladino*
U.S. Nuclear Regulatory
Commission
1717 H Street, N.W.
Washington, D.C. 20555

Commissioner Victor Gilinsky*
U.S. Nuclear Regulatory
Commission
1717 H Street, N.W.
Washington, D.C. 20555

Commissioner Thomas M. Roberts*
U.S. Nuclear Regulatory
Commission
1717 H Street, N.W.
Washington, D.C. 20555

Commissioner James K. Asselstine*
U.S. Nuclear Regulatory
Commission
1717 H Street, N.W.
Washington, D.C. 20555

Commissioner Frederick M. Bernthal*
U.S. Nuclear Regulatory
Commission
1717 H Street, N.W.
Washington, D.C. 20555

Atomic Safety and Licensing
  Appeal Board Panel
U.S. Nuclear Regulatory
  Commission
Washington, D.C. 20555

Secretary of the Commission
U.S. Nuclear Regulatory
  Commission
Washington, D.C. 20555

Atomic Safety and Licensing
  Board Panel
U.S. Nuclear Regulatory
  Commission
Washington, D.C. 20555

Martin Bradley Ashare, Esq.
Attn: Patricia A. Dempsey, Esq.
County Attorney
Suffolk County Department of Law
Veterans Memorial Highway
Hauppauge, New York 11797

Herbert H. Brown, Esq.*
Lawrence Coe Lanpher, Esq.
Karla J. Letsche, Esq.
Kirkpatrick, Lockhart, Hill,
  Christopher & Phillips
8th Floor
1900 M Street, N.W.
Washington, D.C. 20036

Mr. Marc W. Goldsmith
Energy Research Group
4001 Totten Pond Road
Waltham, Massachusetts 02154

MHB Technical Associates
1723 Hamilton Avenue
Suite K
San Jose, California 95125

Mr. Jay Dunkleberger
New York State Energy Office
Agency Building 2
Empire State Plaza
Albany, New York 12223

Bernard M. Bordenick, Esq.*
David A. Repka, Esq.
U.S. Nuclear Regulatory
  Commission
Maryland National Bank Building
7735 Old Georgetown Road
Bethesda, Maryland 20814

Stephen B. Latham, Esq.
Twomey, Latham & Shea
33 West Second Street
P. O. Box 398
Riverhead, New York 11901

Ralph Shapiro, Esq.
Cammer and Shapiro, P.C.
9 East 40th Street
New York, New York 10016

James B. Dougherty, Esq.
3045 Porter Street
Washington, D.C. 20008

Howard L. Blau, Esq.
217 Newbridge Road
Hicksville, New York 11801

Jonathan D. Feinberg, Esq.
New York State
Department of Public Service
Three Empire State Plaza
Albany, New York 12223

Anthony F. Earley, Jr.

Hunton & Williams
707 East Main Street
Post Office Box 1535
Richmond, Virginia 23212

DATED: March 20, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before 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)	)	
	)	

SUPPLEMENTAL MOTION FOR LOW POWER OPERATING LICENSE

Hunton & Williams
707 East Main Street
Richmond, Virginia 23212

March 20, 1984

~~DJPC~~
~~8403210181~~

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before 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)	)	

SUPPLEMENTAL MOTION FOR LOW POWER OPERATING LICENSE

Hunton & Williams
707 East Main Street
Richmond, Virginia 23212

March 20, 1984

LILCO, March 20, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before 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)	)	

SUPPLEMENTAL MOTION FOR LOW POWER OPERATING LICENSE

I. INTRODUCTION

The Shoreham Nuclear Power Station represents both a huge commitment of economic resources and Long Island's only power plant not dependent on foreign oil. Thus, there are compelling reasons for the station's early operation. Instead of being free to begin necessary and beneficial low power testing and training, however, Shoreham faces six to nine months of delay rooted in litigation concerning diesel generators. This delay is unnecessary to assure the public health and safety for the activities authorized by a low power license.

LILCO filed its motion for a low power license on June 8, 1983. In ruling on that motion, the Licensing Board resolved favorably to LILCO all issues relevant to low power operation except for Suffolk County's then recently admitted diesel contention. In the words of the Licensing Board:

> Even though we resolve all contentions which are the subject of this Partial Initial Decision favorably to LILCO, at least insofar as operation at levels up to five percent of rated power is concerned, we do not authorize the issuance of the license for fuel loading and low-power operation which LILCO has requested at this time. No such license may be authorized until such time as that portion of Suffolk County's recently admitted emergency diesel generator contention may be resolved in LILCO's favor, at least insofar as necessary to support a finding of reasonable assurance that Shoreham can be operated at levels up to five percent of rated power without endangering the health and safety of the public.

Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), LBP-83-57, 18 NRC 445, 634 (1983).

Without waiving any aspect of the pending low power motion, LILCO now supplements that motion to show that the pending diesel issues need not be resolved to support the granting of a low power license for Shoreham. Specifically, LILCO requests prompt NRC approval for the following activities at Shoreham:

(a) Phase I: fuel load and precriticality testing,

(b) Phase II: cold criticality testing,

(c) Phase III: heatup and low power testing to rated pressure/temperature conditions (approximately 1% rated power); and

(d) Phase IV: low power testing (1-5% rated power).

These phases are distinct; each consists of a separate set of operations and testing. Together, they include the full sequence of activities associated with fuel loading and low power testing up to 5% of rated power.

During Phases I and II, AC power and a fortiori diesel generators are not necessary to satisfy the Commission's regulations. Performance of these activities simply poses no danger to public health and safety. For Phases III and IV, LILCO also meets the substantive requirements of the NRC's regulations pertaining to AC power sources. First, during these operations, Shoreham will have fully tested, though not fully litigated, TDI diesels available for operation. Second, even assuming all three of these diesels fail to operate, LILCO will also have ample alternate sources of AC power available for Shoreham such that there will exist reasonable assurance of no undue risk to the public health and safety from the operation of the plant at power levels up to 5% rated power. Against this background, the ongoing diesel generator litigation poses no obstacle to the early issuance of a low power license.

As a practical matter, LILCO believes that whether Shoreham is entitled to such a license is a question that only

the Nuclear Regulatory Commission itself can decide. The intensely political environment that now envelops Shoreham makes virtually certain that the NRC's highest tribunal must act before the plant will be allowed to conduct any operations, even loading fuel. Recognition of this reality prompts LILCO to request:

1. That this Board promptly refer the present supplemental motion to the Commission for decision, pursuant to 10 CFR § 2.718;

2. That if the Board decides against immediate referral, it then consider and decide this supplemental motion in an expedited fashion and thereafter certify its decision to the Commission, pursuant to 10 CFR § 2.730.

II. A LOW POWER LICENSE SHOULD BE AUTHORIZED

The facts supporting this supplemental motion are presented in the following attached affidavits:

Affidavit of Jack A. Notaro and William E. Gunther, Jr. (Notaro Affidavit);

Affidavit of William G. Schiffmacher (Schiffmacher Affidavit);

Affidavit of Dr. Glenn G. Sherwood, Dr. Atambir S. Rao and Mr. Eugene C. Eckert (Sherwood Affidavit); and

Affidavit of William J. Museler (Museler Affidavit).

A. Phase I: Fuel Load and Precriticality Testing

Phase I includes operations producing no risk whatever to public health and safety. The various activities, tests and training attendant to fuel loading and precriticality testing are described in the Notaro Affidavit at ¶¶ 6, 7. In general, during initial core loading, 560 fuel bundles are placed in specified locations within the reactor vessel and tests are performed concerning water chemistry surveillance, control rod drive stroke time and friction, installation, calibration and use of special startup neutron instrumentation, and core verification instrument operability. In addition to the check of systems reliability provided by these tests, valuable experience is gained by personnel assigned to the Reactor Engineering Section, Radiochemistry Section, Operating Section, Maintenance Section, and Instrumentation and Control Section.

Once fuel is in the vessel, core verification must be conducted prior to the reactor's going critical. Notaro Affidavit at ¶ 7. At this stage, instrumentation and control technicians verify and calibrate 31 local power range monitor instruments. Health physics technicians survey various locations in the plant to determine background radiation levels within the plant with fuel in the vessel. Operators test control rod

drive scram times. And, operation of the recirculating pumps with fuel in the vessel is conducted to determine core internal pressure drops and to verify system performance. Again, valuable experience is obtained by the plant personnel.

For these precriticality activities, diesel generators are not necessary to satisfy the Commission's regulations. The necessity for diesel generators derives from GDC 17, which states in pertinent part:

> An onsite electric power system . . . shall be provided . . . to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

10 CFR Part 50, Appendix A.

During fuel loading and precriticality testing, no AC power is required in order to meet these requirements. This conclusion is confirmed by a review of FSAR Chapter 15's mandated safety analysis. During Phase I activities, most of the anticipated operational occurrences and postulated accidents covered in Chapter 15 simply could not occur. Sherwood

Affidavit at ¶¶ 8-10. Even those events that are possible would have no impact on public health and safety, if they were in fact to occur. Id. at ¶¶ 11-13. Thus, fuel design limits and design conditions of the reactor coolant pressure boundary would not be exceeded and core cooling would be maintained even assuming anticipated operational occurrences, postulated accidents and the absence of diesel generators.1/ Id. at ¶ 13.

The license LILCO seeks with respect to fuel load and precriticality testing is identical to the low power approval recently authorized by the Commission for the Diablo Canyon plant. As the Commission noted:

> The risk to public health and safety from fuel loading and pre-criticality testing is extremely low since no self-sustaining nuclear chain reaction will take place under the terms of the license and therefore no radioactive fission products will be produced.

Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 & 2), CLI-83-27, 18 NRC ___, slip op. at 5 (Nov. 8, 1983). The Commission's conclusion that the risks are extremely low for operation of a reactor with fuel loaded, but no

---

1/ Containment integrity is not an applicable concept during fuel loading and precriticality testing because these activities are conducted with the head removed from the vessel.

self-sustaining chain reaction, is echoed in the attached Sherwood Affidavit. No fission products or decay heat will be produced during precriticality operations at Shoreham. Sherwood Affidavit at ¶¶ 7, 11. Accordingly, these activities present no risk at all to the public health and safety, even assuming the absence of any AC power.

Also, the Commission recognized that there was no need for hearings concerning Pacific Gas and Electric's request to load fuel and conduct precriticality testing because these activities presented no significant safety issues:

> Since there are no significant safety issues material to fuel loading and pre-criticality testing, and there will be no prejudice to future Commission decisions, a consideration of the equities favors denial of the Joint Intervenors' request to defer the decision on the licensee's request for reinstatement and extension of the license to load fuel and conduct pre-criticality testing pending the holding of a hearing on the licensee's request.

Pacific Gas and Electric Co. (Diablo Canyon Nuclear Power Plant, Units 1 and 2), CLI-83-27, 18 NRC ___, slip op. at 6 (Nov. 8, 1983).

The rationale for the Commission's grant of a license to Diablo Canyon applies with even greater force with respect to Shoreham. Quality assurance litigation calling into question many aspects of the Diablo Canyon design was ongoing at the time of the Commission's action. Shoreham, however, already has a massive, favorable Partial Initial Decision on all safety issues except those concerning its existing diesel generators. See generally Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit 1), LBP-83-57, 18 NRC 445 (1983) (opinion), and unpublished Board Findings of Fact and Appendices. Since there is no requirement for diesels during Phase I, the assurance of no risk to the public health and safety from Phase I activities is even greater at Shoreham than at Diablo Canyon because all quality assurance issues at Shoreham have been favorably resolved.

B. Phase II: Cold Criticality Testing

Phase II also includes operations that entail virtually no risk to the public because, in the event of the limiting design basis accident, months would be available to restore cooling water to the core. This phase achieves reactor criticality at extremely low power levels (.0001% to .001%). During this phase, the effectiveness of each of the 137 control rods in controlling reactivity is measured. Reactor operators will be

able to perform reactivity control manipulations. And, core cleanliness verification and installation of vessel internals occurs. Along the way, the plant staff places in service, operates, tests and maintains 41 reactor and support systems.

Overall, approximately 5,000 manhours of valuable training and experience take place during Phases I and II of low power testing. Notaro Affidavit at ¶ 11. Significantly, LILCO's Phase I and II program is designed to provide Shoreham's operating personnel with more BWR experience and training than would result from a conventional program. Id. at ¶¶ 7-9, 11, 24.

In Phase II, like Phase I, no emergency AC power (including diesels) is required to meet the NRC's regulations and protect the public health and safety. Again, this is demonstrated by the analysis in the Sherwood Affidavit. The extremely low power levels achieved during cold criticality testing result in such insignificant amounts of decay heat that essentially unlimited time -- months -- would be available to restore cooling to the core, in the event of even a limiting design basis accident.2/ Moreover, under the plant conditions

---

2/ Although virtually no power would be needed if a Chapter 15 event were to occur, LILCO will take steps to ensure that the plant is shut down during specified circumstances that might have an impact on AC power availability. See Museler Affidavit at ¶ 7-9, 11.

present in Phase II, many events analyzed in Chapter 15 simply could not occur or would be very unlikely when compared to the situation during normal operations. As in precriticality testing, even the possible Chapter 15 events would have no impact on public health and safety regardless of the diesels' availability. Thus, the risk to the public is virtually nonexistent. It follows that the onsite power provisions of GDC 17, requiring sufficient capacity to assure the prescribed safety functions set out in the criterion, are met because no emergency AC power (onsite or offsite) is needed.

Given the absence of any need for emergency AC power during Phase II, the Diablo Canyon rationale as discussed above applies with equal force here. Consistent with the ruling in Diablo Canyon, LILCO is entitled forthwith to approval for Phase II activities at Shoreham.

C. Phases III and IV: Heatup and Low Power Testing to Rated Pressure/Temperature Conditions (Approximately 1% Rated Power) and Low Power Testing (1% - 5% Rated Power)

During these phases of low power testing, reactor heatup and pressurization are achieved, and the power level is taken in progressive steps first to 1% of rated power and then from 1% to 5% of rated power. During the course of these activities, the plant staff will be required to place in service,

operate, test and maintain the 54 plant systems identified in paragraph 24 of the Notaro Affidavit. The operation of these systems and the other activities performed during these phases of low power testing provide extremely valuable training and hands-on experience for Shoreham's personnel. These activities include rod withdrawal sequences, testing and calibration of neutron monitoring instrumentation, gathering information concerning initial heatup and operation of nuclear steam supply and power generation systems, initial operation of control systems, and much other work that cannot be undertaken prior to heatup of the plant to rated temperatures and pressures. Notaro Affidavit at ¶¶ 12-24. In light of LILCO's intention to perform expanded training throughout low power testing, Messrs. Notaro and Gunther estimate that approximately 6,000 manhours of experience will be gained during Phases III and IV. Id. at ¶ 24.

Operation of the plant during Phases III and IV poses far less risk to the public health and safety than does operation of the plant at 100% rated power. This reduced risk is attributable to three factors. First, operation at low power results in a small inventory of fission products in the core compared to full power operation. This low fission product inventory substantially reduces the amount of decay heat present

in the core following shutdown and substantially reduces the radioactivity in the core that could be released upon fuel failure. Sherwood Affidavit at ¶ 26. Second, operation of the plant at low power gives the operator increased time to take appropriate manual actions. This minimizes the severity of transients and reduces the likelihood that there will be any need for automatic operation of the plant's safety systems. Id. at ¶ 27. And third, the capacity requirements for mitigating systems (such as cooling and ventilation systems) are substantially reduced because of the low power levels. This reduces the amount of plant equipment needed to mitigate events (i.e., fewer pumps) and, as a result, reduces AC power requirements.3/ Id. at ¶ 28.

Chapter 15 of Shoreham's FSAR provides the results of analyses for the spectrum of transient and accident events that must be accommodated by the plant to meet NRC regulations. Sherwood Affidavit at ¶ 4. A review of the 38 Chapter 15 events shows that three of them cannot occur during Phases III

3/ Decisions in other contexts have recognized that these three factors substantially reduce the risk attributable to low power operation. See Southern California Edison Co. (San Onofre Nuclear Generating Station, Units 2 and 3), LBP-82-3, 15 NRC 61, 188-89 (1982); see also Duquesne Light Co (Beaver Valley Power Station, Unit No. 1), LBP-76-3, 3 NRC 44, 66 (1976); 46 Fed. Reg. 61132-33 (1981); 46 Fed. Reg. 47764-65 (1981).

and IV. Id. at ¶ 24. Of the remaining 35 events, 31 do not require an assumption of the loss of offsite AC power concurrent with the event.4/ Thus, these Chapter 15 results are not affected by the status of the diesel generators since they are not required to mitigate these events. Id. at 25.

For the four Chapter 15 events that do assume a loss of normal offsite AC power, there is reasonable assurance that emergency AC power will be available at Shoreham to accomplish the required safety functions. First, LILCO will have available for operation fully tested TDI diesel generators throughout Phases III and IV of the low power testing program. Museler Affidavit at ¶ 11. To ensure the operability of the TDI diesels during Phases III and IV, LILCO will meet all of the applicable requirements of the Shoreham Technical Specifications. The Technical Specifications require that the operability of AC power sources be periodically demonstrated in the event a diesel or offsite power source is unavailable. For example, if one diesel or one offsite power circuit is unavailable, LILCO must demonstrate that the other two diesels are operable by starting them within one hour and then once

4/ This assumption would be particularly inappropriate for Shoreham because of the ready availability of alternative AC power sources, both onsite and offsite. See Schiffmacher Affidavit.

every eight hours thereafter. Id. If the inoperable diesel or offsite circuit is not restored within 72 hours, the plant must be shut down. Id. The Technical Specifications also include periodic surveillance testing requirements for the diesels to ensure their operability. Id. Thus, notwithstanding the ongoing diesel generator litigation, Shoreham will in fact have available diesels that have demonstrated their ability to operate in the rigorous pre-operational test program. This operability will be maintained as required by the Technical Specifications.

Second, even in a world of conservative assumptions, it is simply not credible that all AC power to Shoreham will be lost. This is apparent from the following six part analysis.

1.

At the outset, a LILCO system-wide blackout is not likely. LILCO's bulk power transmission system has a generating capacity of 3,721 megawatts, achieved through a combination of various types of generating units. As the Schiffmacher Affidavit indicates:

> Subsequent to the Northeast Blackout of 1965, LILCO implemented substantial measures to increase reliability of its system. These included installation of blackstart gas turbines at each of its major generating stations and implementation of automatic

> underfrequency load shedding procedures. In the 18 years since, there has been no loss of the entire LILCO grid. There has only been one incident in which LILCO has lost any appreciable portion of its bulk power transmission system. That one incident affected LILCO's system east of Holbrook. Despite the lack of any procedures then in effect mandating priority emphasis on restoring power to Shoreham, power was restored to the entire Shoreham area within one hour and four minutes. With the priority procedures now in effect to restore power to Shoreham and the availability of several independent deadline blackstart gas turbines, all of which are described below, it has been demonstrated by exercises that today power can be restored to Shoreham in a matter of minutes.

Schiffmacher Affidavit at ¶ 10 (footnote omitted). In short, both the nature of the available facilities and their history of reliability make a system-wide blackout unlikely. Moreover, LILCO's 138 KV and 69 KV high voltage transmission network is tied to the New York Power Pool and the New England Power Grid. Thus, in the event LILCO suffered an internal power deficiency, an additional 1,090 MW would be available to LILCO through three interconnections with the New York Power Pool and another 285 MW of power could flow through the tie with the New England Power Grid. Id. at ¶¶ 7, 9.

2.

The configuration of LILCO's transmission circuits feeding Shoreham further assures the availability of power to

the site. Shoreham is served by multiple circuits over different rights-of-way, as well as an underground line. Four 138 KV transmission circuits run to Shoreham along two separate and independent rights-of-way. Additionally, three 69 KV circuits enter the Wildwood Substation, approximately one mile south of Shoreham and, from there, a separate 69 KV circuit enters the site. These transmission lines, like the entire LILCO transmission network, are designed to withstand winds of at least 100 to 130 miles per hour. Schiffmacher Affidavit at ¶¶ 12-14. Moreover, the 69 KV circuit from the 69 KV substation to the reserve station service transformer is underground and therefore less susceptible to damage. Id. at ¶ 13.

3.

That LILCO's system will provide power to Shoreham is further assured by a number of independent gas turbines located at various places and designed to start during system blackout conditions. There are 10 gas turbines at Holtsville (approximately 20 miles from Shoreham), 5 of which are now, or by April will be, equipped with blackstart capability, and two of which already have deadline start capabilities specifically to support Shoreham.5/ Schiffmacher Affidavit at ¶ 18. Under

---

5/ "Blackstart" means the ability to start independently of another power source. "Deadline start" means the capability to

(footnote continued)

procedures tested monthly at Holtsville, restoration of power to Shoreham can be accomplished in less than 15 minutes upon the automatic starting of one gas turbine and the system operator's clearing of a transmission line to Shoreham. Actual tests have shown that power can be restored in 6 minutes. Id. LILCO's system operators are well trained that implementation of this procedure is the paramount priority in the event of a blackout. Id.

4.

Providing still more blackstart power capability in the event of a system blackout are two gas turbines east of Shoreham at Southhold (15 MW) and East Hampton (20 MW), either of which is capable of supplying adequate power to Shoreham. These units operate independently of the 10 Holtsville gas turbines. Schiffmacher Affidavit at ¶ 19. Moreover, LILCO has blackstart gas turbines at each of its major generating stations, including Port Jefferson, which is 11 miles west of Shoreham and connected to it through a 69 KV line. Id. at ¶¶ 10, 19.

(footnote continued)

start automatically without operator intervention and without reliance on another power source. A "blackstart" generator without "deadline start" must be started manually.

5.

If one assumes the failure all of the sources of power discussed so far, despite their diversity, redundancy and reliability, then in the interests of stringent conservatism a dedicated 20 MW gas turbine is being installed and will be operational on the site by April 1984. This turbine is equipped with a fully automatic ("deadline") blackstart capability; it will start automatically upon the loss of voltage to the 69 KV bus. Schiffmacher Affidavit at ¶ 20. In only two to three minutes, it can restore power to the plant's emergency buses. Id. at ¶ 21.6/ To further assure restoration of AC power, LILCO's procedures call for concurrent, rather than sequential, efforts to restore power to Shoreham using this 20 MW gas turbine and all other available means. Id. at ¶ 20. Thus, this onsite gas turbine will start immediately and automatically while system operators simultaneously restore power to the Shoreham transmission facilities via Holtsville, East Hampton, Southhold, Port Jefferson, and all of the other available means. Id.

6/ LILCO plans periodic tests of this 20 MW gas turbine to ensure its continued operation and reliability. Additionally, LILCO will maintain a mobile source of fuel at the site should anything happen to the stationary fuel source for the turbine. Museler Affidavit at ¶ 8.

6.

Finally, to go beyond stringent conservatism, LILCO has assumed the near incredible -- that all of the power sources described above fail. To service this hypothesis, LILCO will install by May 1984 a block of four 2.5 MW blackstart mobile diesel generators at Shoreham. These mobile units will be connected directly into the plant's four KV bus network, thereby being capable of supplying power to the plant's emergency four KV network. Schiffmacher Affidavit at ¶ 25. Thus, these diesels will bypass the station's normal service transformer and reserve transformer in the event emergency power is needed. Id. Only two of the four mobile units will be necessary to provide the power required for safe shutdown under normal or accident conditions. Id. at ¶ 27.

In sum, there is a backup for every credible failure of AC power, and more. If one of LILCO's major generating stations goes out of service, blackstart gas turbines are available at each. If an extremely unlikely system-wide failure occurs, power is available through the two power pools to which LILCO is connected. If these pools fail, independent blackstart gas turbines at three locations away from Shoreham, and at each of LILCO's major generating stations, will provide power to the plant in minutes, using the available transmission

system. If the entire transmission system fails, the 20 MW gas turbine located on site is available to start automatically and provide power to Shoreham. And if that gas turbine fails simultaneously with a collapse of everything else, then there still remain the four mobile diesel generators also located onsite and ready to serve required plant loads. All of these supplementary sources of AC power stand apart from -- while also complementing -- the TDI diesels.

It is also well to be clear that time is not so much of the essence after an accident at low power as it is after one at full power. The most limiting Chapter 15 event during Phases III and IV low power testing is the loss of coolant accident (LOCA). Sherwood Affidavit at ¶ 29. Although a loss of offsite power is assumed in the FSAR analysis for this accident, such an assumption is unwarranted for the reasons just given.7/ Even if AC power were lost at the same time a LOCA occurred, the low fission product inventory would result in substantially longer periods of time to restore core cooling to prevent core damage than during a LOCA at full power. Thus,

---

7/ Moreover, because the plant will not be connected to the grid during Phases III and IV, accident or transient events will not cause perturbations on the grid that could, in turn, affect the availability of offsite power. Sherwood Affidavit at ¶ 30.

during Phase III approximately five hours would be available to restore make-up water for core cooling before the limits of 10 CFR § 50.46 and Appendix K were exceeded. Id. at 29, and Exhibit 4. During Phase IV approximately one hour would be available to restore cooling water. Id. Given the ready availability of both onsite and offsite AC power sources, there is more than reasonable assurance that the core would be cooled in the event of a LOCA during Phases III and IV. Id. at ¶ 31.

Finally, to further assure the safety of Phases II, III and IV testing, LILCO will take steps to place the reactor in a cold shutdown condition in the event of any of the following:

(a) a "hurricane warning" for the Shoreham area issued by the National Weather Service;

(b) a "tornado warning" for the Shoreham area issued by the National Weather Service;

(c) a "severe storm warning" for the Shoreham area issued by the National Weather Service;

(d) a prediction for the Shoreham area by the National Weather Service of abnormally high tides greater than 5 feet above mean high water within 24 hours;

(e) an indication of seismic activity of .01g on the on the Shoreham seismic monitors;

(f) the unscheduled outage of two of the four LILCO interconnections to Consolidated Edison and the New England Power Grid; and

(g) a low electrical frequency condition that causes an alarm on the LILCO transmission system.

Museler Affidavit at ¶ 7.

LILCO's reliance on the combined effectiveness of onsite and offsite AC power sources is consistent with NRC precedent. Although differing in context, the reasoning of the Appeal Board in Florida Power and Light Co. (St. Lucie Nuclear Power Plant, Unit No. 2), ALAB-603, 12 NRC 30 (1980), indicates the interrelationship of onsite and offsite AC power sources in determining compliance with GDC 17. The Licensing and the Appeal Boards there observed that onsite diesel generators were inherently unreliable, even though technically complying with GDC 17. In considering whether GDC 17 was nonetheless met, the Appeal Board noted that "[t]he ability to restore some source of AC power after a station blackout provides reasonable assurance that such an event will not result in core damage or undue hazard to the public health and safety." 12 NRC at 60-61. It is instructive that the Appeal Board did not rely solely on the availability of diesels or solely on the availability of offsite power, but combined the two in assessing the overall assuance that AC power would be available to protect the public health and safety. See also Consumers Power Co. (Big Rock Point Nuclear Power Station), CLI-76-8, 3 NRC 598 (1976) (one

onsite diesel acceptable in light of high availability of offsite power). Significantly, St. Lucie involved an application for a full power license; LILCO is requesting permission to operate only at low power.

In conclusion, the presence of fully tested TDI diesels, a reliable transmission system, the availability of other, multiple sources of AC power, both onsite and offsite, and the numerous, systematic measures that LILCO will take to prevent the loss of emergency power, all provide reasonable assurance that Shoreham can operate up to 5% of rated power without undue risk to the public health and safety.

III. REFERRAL AND CERTIFICATION

Referral pursuant to 10 CFR § 2.718(i) and certification pursuant to § 2.730(f) are governed by the same test, as this Board has observed:

> Whether review should be undertaken on "certification" or by referral before the end of the case turns on whether a failure to address the issue would seriously harm the public interest, result in unusual delay or expense, or affect the basic structure of the proceeding in some pervasive or unusual manner.

Long Island Lighting Co. (Shoreham Nuclear Power Station, Unit

1), LBP-83-21, 17 NRC 593, 598 (1983); Duke Power Co. (Catawba Nuclear Station, Units 1 and 2), ALAB-687, 16 NRC 460, 464 (1982); Consumers Power Co. (Midland Plant, Units 1 and 2), ALAB-634, 13 NRC 96, 99 (1981).8/

Compelling circumstances exist giving rise to a need for both prompt and final determination of the issues now presented. Failure to resolve them expeditiously will seriously harm the public interest. It will deprive LILCO of the opportunity to have Shoreham's personnel gain valuable experience and to test the plant's systems during an extensive period of low power operations. See generally Notaro Affidavit. And it will impair LILCO's capacity to move quickly toward full power operation once the TDI diesels have successfully completed the litigation process. Intolerable delay and expense will, in

---

8/ Section 2.718(i) permits the presiding officer of the Board to "[c]ertify questions to the Commission for its determination, either in his discretion or on direction of the Commission." This has been interpreted to allow referral of a question to the Commission (through the Appeal Board) before Board decision. E.g., Long Island Lighting Co., 17 NRC 593 (1983). As to those matters upon which the Board has already ruled, § 2.730(f) provides:

> When in the judgment of the presiding officer prompt decision is necessary to prevent detriment to the public interest or unusual delay or expense, the presiding officer may refer the ruling promptly to the Commission, and notify the parties either by announcement on the record or by written notice if the hearing is not in session.

fact, result should this supplemental motion become mired in a procedural morass. The acute demands of the situation stem from the physical completion of the plant, the enormous financial investment in it, an investment that now generates nothing but carrying charges, and Shoreham's unique capacity -- once it begins to generate electricity -- to lessen Long Island's now utter dependence on foreign oil to fuel its power plants.

IV. CONCLUSION

For the reasons discussed, LILCO is entitled now to a license to conduct the activities in Phases I through IV of Shoreham's low power testing program. The activities in Phases I and II pose no risk to the public health and safety, even in the absence of AC power. In Phases III and IV, fully-tested TDI diesels coupled with alternative, multiple sources of AC power, both offsite and onsite, provide reasonable assurance that AC power will be available in any emergency that may occur. Thus, Phases III and IV also pose no undue risk to the public health and safety. Accordingly, LILCO urges the Board to refer this supplemental motion to the Commission for prompt and final disposition, or failing that, to rule as quickly as is feasible on the issues presented and then certify the Board's decision directly to the Commission.

Respectfully submitted,

LONG ISLAND LIGHTING COMPANY

W. Taylor Reveley, III
T. S. Ellis, III
Robert M. Rolfe
Anthony F. Earley, Jr.

Hunton & Williams
Post Office Box 1535
Richmond, Virginia 23212

DATED: March 20, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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

AFFIDAVIT OF JACK A. NOTARO
AND WILLIAM E. GUNTHER, JR.

Jack A. Notaro and William E. Gunther, Jr., being duly sworn, depose and state as follows:

(1) My name is Jack A. Notaro and I have been the Chief Operating Engineer for the Shoreham Nuclear Power Station (SNPS) since April 1983. Prior to that time, from July 1978 through April 1983, I was assigned as Operating Engineer for Shoreham. During March-April 1981, I was assigned to the Operations Section of the Millstone Nuclear Power Station for the completion of a refueling outage and power operation training at greater than 20% power. My duties and responsibilities as Chief Operating Engineer of Shoreham include the formulation and implementation of the training programs for all station personnel, direction of the day-to-day operation of the unit, including startup operation and shutdown of all station equipment and development and review of the Operation Section of the Station Operation Manual and the overall management of the Operations, Training and Security sections of the station.

(2) I have a Bachelor of Mechanical Engineering degree (1970) and a Master of Business Administration degree (1974). I completed the General Electric BWR simulator program in July 1976 and obtained certification at the RO and SRO levels. In November 1982, I obtained a Senior Reactor Operator license on Shoreham.

(3) My name is William E. Gunther, Jr. and I have been the Operating Engineer for Shoreham since April 1983. My duties and responsibilities include the direction of the day-to-day operation and shutdown of all station equipment, final verification of all operating procedures, participation in initial requalification and replacement training programs for licensed and unlicensed operators and the establishment and maintenance of system operability to support fuel load.

(4) I have a Bachelor of Science degree in Electrical Engineering (1970) and a Master of Science degree in Electrical Engineering (1971). I earned a Senior Operator Certification from the General Electric Company on the Brunswick Unit 2 BWR in 1975 and I completed the General Physics Company BWR simulator program in December 1981 and obtained certification at the RO and SRO levels. In November 1982, I obtained a Senior Reactor Operator license on Shoreham.

(5) The purpose of this affidavit is to describe the steps involved in the following phases:

<u>Phase I</u>: Fuel Loading and Precriticality Testing

<u>Phase II</u>: Cold Criticality Testing

<u>Phase III</u>: Heatup and Low Power Testing to Rated Pressure/Temperature Conditions (approximately 1% rated power)

<u>Phase IV</u>: Low Power Testing (1-5% rated power)

These various phases will be described below, with a brief explanation of the testing and operations to be conducted during each phase.

<u>Phase I: Fuel Loading and Precriticality Testing</u>

(6) Fuel loading and precriticality testing involve placing fuel in the vessel and conducting various tests of reactor systems and support systems. Initial core loading involves the placement of 560 fuel bundles in specified locations within the reactor vessel. This major step requires significant testing as fuel loading progresses, and it takes at least 288 hours. The following testing is associated with initial core loading:

(A) Water chemistry surveillance testing. This testing must be performed prior to, during and after the fuel loading operation. The purpose of water chemistry surveillance testing is to ensure clarity of the water so that the fuel loading process can proceed and to minimize the amount of the corrosion products in the primary system.

(B) Control rod drive stroke time and friction tests. These tests are performed during the fuel loading step to ensure that the reactor shutdown capability is maintained at all times and to ensure the control rod drive mechanisms are performing as designed.

(C) Installation, calibration and utilization of special startup neutron instrumentation. This instrumentation is required for core loading activities to ensure proper monitoring of core conditions by the Operating, Reactor Engineering and Instrumentation and Control personnel. Source range monitor testing and alignment tests calibrate the neutron monitoring instrumentation and verify proper final alignment of this vital equipment.

(D) Core verification instrument operability check. These checks are performed to verify that the equipment utilized to determine that the core has been loaded correctly is operable. Final core verification checks are completed at this time.

The tests listed in (A) through (D) above involve valuable supplemental training and experience for personnel assigned to the Reactor Engineering Section, Radiochemistry Section, Operating Section, Maintenance Section and Instrumentation and Control Section. The training described in

steps (B), (C) and (D) can be fully accomplished only during the fuel load operation.

(7) Following placement of the fuel in the vessel, a number of tests must be performed to verify the operability of systems prior to going critical in the reactor. This phase of startup testing takes approximately 150 hours and includes the following:

(A) Local Power Range Monitor (LPRM) sensitivity data. During this test, the 31 local power range monitor strings are calibrated and verified to be operable. Instrumentation and control technicians will perform this testing, and obtain training in the use of calibration procedures and special test equipment.

(B) Zero power radiation survey for background readings. Various locations in the plant are surveyed by health physics technicians to determine background radiation levels with fuel in the vessel.

(C) Recirculation system instrument calibration checks. Operation of the recirculating pumps with fuel in the vessel is conducted to determine core internal pressure drops and to verify system performance. Operation of the system above minimum speeds with the vessel internals installed can be accomplished only with fuel in the reactor.

(D) Control rod drive scram time testing. Following fuel load, each control rod drive mechanism is scrammed from its full withdrawn position following control rod coupling surveillance testing to verify that rod insertion can be accomplished within the prescribed time.

(E) Cold MSIV timing. This functional test of the main steam isolation valves verifies that their opening and closing times are within technical specification acceptance criteria.

Again, the testing and activities described in (A) through (D) above can be accomplished only after fuel has been placed in the vessel. The experience and training gained from these activities will be an invaluable Shoreham-specific augmentation to the years of extensive preoperational training that the reactor operators have previously undergone.

Phase II: Cold Criticality Testing

(8) This phase involves a specified control rod withdrawal sequence that results in achieving reactor criticality at extremely low power levels (.0001% to .001% of rated thermal power). In addition, this step involves shutdown of the reactor by inserting all control rods in reverse order. While withdrawing each rod, reactor operators monitor the effect of its withdrawal in terms of neutron flux. By analysis and calculation, Reactor Engineering personnel are able to assign a "worth" to each control rod, i.e., the effectiveness of each rod in controlling reactivity. Important operator hands-on experience is gained during this step. Reactor operators must annually perform a minimum of ten reactivity control

manipulations. This experience provides additional training for reactor operators in the use of appropriate instrumentation and equipment to determine when criticality is achieved during the withdrawal of control rods. This important experience on the Shoreham reactor can be gained only after fuel has been placed in the vessel. Similarly, Reactor Engineering personnel obtain valuable training and experience during this closely monitored activity. LILCO plans to repeat the operations during this phase of low power testing to offer each operating shift crew this valuable BWR experience.

(9) Cold criticality testing requires plant maintenance personnel to install vessel internals in accordance with station procedures and with all refuel floor constraints in place. Maintenance personnel gain experience with the operation of the refuel bridge and reactor building crane.

(10) Also performed at this time is the installation of the expansion and vibration instrumentation. Cold baseline data are obtained at this point to determine pipe movement as heatup occurs later in the low power test program. The data provide a benchmark against which subsequent test results can be assessed.

(11) During the course of fuel loading, precriticality testing, and cold criticality testing, the plant staff must place in service, operate, test, and maintain 41 systems. These reactor systems and support systems include the following:

Control Rod Drive System (CRD)
Core Spray System
Diesel Generator
4160 V System
480 V System
120 V AC Instrument Bus
120 V AC Reactor Protection System (RPS)
120 V AC Ininterrupted Power Supply
125 V DC System
24 V DC System
Low Pressure Coolant Injection (LPCI)
HVAC-Drywell Cooling
Reactor Building Closed Loop Cooling Water System (RBCLCW)
Reactor Building Normal Ventilation System (RBNVS)
Residual Heat Removal System (RHR)
Reactor Recirculation System
Service Water
Reactor Building Standby Ventilation System (RBSVS)
Standby Liquid Control System
Condensate System
Feedwater System
HVAC - Control Room
HVAC - Turbine Building
Reactor Water Cleanup System
Station Air System
Turbine Building Closed Loop Cooling System
Containment Area Leakage Detection System
RBSVS & CRAC Chilled Water Systems
Neutron Monitoring Instrumentation
Reactor Manual Control
Radwaste Liquid Collection and Processing
Circulating Water
Demineralized Water
Well Water and Domestic Water System
Normal Station Service Transformer and 138 KV System
Reserve Station Service Transformer and 69 KV System

Fire Protection System
Fire Suppression System
Reactor Vessel Water Level
Radiation Monitoring System
Heat Tracing System

The operation of these systems provides valuable training and experience to operating plant personnel, including licensed operators. LILCO plans to repeat certain of the activities in this phase of low power testing to provide additional, valuable BWR operating experience. It is estimated that there will be 5000 total manhours of training accomplished and achieved during fuel loading, precriticality testing, and cold criticality testing described above.

Phase III: Heatup and Low Power Testing to Rated Pressure/Temperature Conditions (Approximately 1% Rated Power)

(12) During this phase of low power testing, reactor heatup and pressurization commences and the power level is taken in progressive steps to 1% of rated power. Along the way, the heatup and pressurization of the reactor vessel and associated piping systems enables the plant staff to perform important tests relating to thermal expansion of piping and integrated system operation under actual operating conditions. The principal steps associated with this phase of low power testing are described below.

(13) Rod withdrawal sequences are followed to achieve criticality and system heatup from ambient conditions to 150 psig. During this step, the following tests and training are accomplished:

(A) Conduct Source Range Monitor (SRM) response testing to verify source range monitoring calibration and response;

(B) Establish condenser vacuum following establishment of steam seals and other main turbine auxiliary systems;

(C) Obtain initial baseline readings for Nuclear Steam Supply (NSS) system thermal expansion;

(D) Place steam jet air ejectors in service on main steam;

(E) Achieve warmup of the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems,

(F) Achieve controlled warmup of reactor feed pump turbines and integrated operations of the condensate and feedwater systems;

(G) Obtain Intermediate Range Monitor/Source Range Monitor (IRM/SRM) overlap data;

(H) Obtain Intermediate Range Monitor (IRM) range 6-7 overlap data; and

(I) Perform an Average Power Range Monitor (APRM) calibration while heating up.

Operating personnel and instrumentation and control

technicians receive valuable training and experience in the course of these steps.

(14) With the reactor at 150 psig and during the continued heatup from 150 to 250 psig, the following system tests are performed:

(A) Drywell inspection;

(B) Data gathering for Nuclear Steam Supply (NSS) system thermal expansion;

(C) Data gathering for Balance of Plant (BOP) system thermal expansion;

(D) Operation of Main Turbine Electro-Hydraulic Control (EHC) System;

(E) Data gathering for Reactor Building Closed Loop Cooling Water (RBCLCW) steady state performance;

(F) RCIC initial operability demonstration with manual start and hot quickstart, condensate storage tank (CST) to CST recirculation;

(G) Motor Operated Valve (MOV) dynamic testing on Residual Heat Removal (RHR) system;

(H) HPCI initial operability demonstration with manual starts and hot quickstarts, CST to CST recirculation;

(I) Maintenance of suppression pool within technical specifications using RHR suppression pool cooling;

(J) Operation of steam seal evaporator, radwaste evaporator and main condenser deaerating system;

(K) Verification of capability to shut down the reactor from outside the control room utilizing the Remote Shutdown Panel.

(15) With the reactor at 250 psig and during the continued heatup from 250 psig to 350 psig, the following testing is performed:

(A) Maintain EHC pressure setpoint at 250 psig and withdraw control rods to open turbine bypass valves (BPV) for Safety Relief Valve (SRV) testing;

(B) Functionally test the Safety Relief Valves (SRV) manually opening one SRV at a time;

(C) Obtain drywell piping vibration data while performing the SRV tests;

(D) Gather data for system thermal expansion tests.

(16) With the reactor coolant system pressure between 350 psig and 550 psig, the following testing is performed:

(A) Place one reactor feedwater pump and the low flow feedwater controller in service and monitor their operation to ensure that they perform their function of supplying water to the reactor vessel at the appropriate flow rate;

(B) Gather data for system thermal expansion tests;

(C) Perform Average Power Range Monitor (APRM) heatup rate calibration;

(D) Verify loose parts monitoring system operability.

(17) With the reactor coolant system pressure between 350 psig and 800 psig, the following testing is performed:

(A) Conduct a drywell temperature inspection and gather data for system thermal expansion tests;

(B) Obtain Reactor Building Closed Loop Cooling Water System (RBCLCW) performance data;

(C) Scram selected control rods to obtain scram time data.

(18) With the reactor coolant system pressure at 800 psig and heatup to 920 psig, the following occurs:

(A) Scram selected control rods for scram time data;

(B) Obtain system thermal expansion data for nuclear steam supply systems and balance of plant systems.

<u>Phase IV: Low Power Testing (1-5%)</u>

(19) During this phase of low power testing, the power level is taken in progressive steps from 1% to 5% of rated thermal power. With the reactor coolant system at rated temperature and pressure, the operator will withdraw rods and open one Main Turbine bypass valve to establish a steam flow such that core thermal power is less than 5% rated thermal power. Once this condition is established, the following tests are performed:

(A) Demonstrate RCIC operability;

(B) Demonstrate HPCI operability;

(C) Perform dynamic motor operated valve tests, inservice leak tests and hot hanger sets on plant systems;

(D) Align Traversing Incore Probe (TIP);

(E) Calibrate the bottom reactor pressure vessel head drain line flow indicator and perform main steam isolation valve functional tests;

(F) Perform RCIC and HPCI controller tests (CST to CST recirculation); and

(G) Perform IRM/APRM overlap calibration.

(20) After the completion of the tests just listed, the first cooldown to ambient conditions will commence. During this cooldown, the following activities take place:

(A) Perform source range monitor/intermediate range monitor overlap calibration;

(B) Position one turbine bypass valve so that core thermal power is less than 5% and maximum steam flow is available for HPCI;

(C) Perform a HPCI/RCIC stability test to demonstrate the stability of the controller setting from the 1000 psig test;

(D) Perform a drywell and reactor building inspection of system thermal expansion instruments.

(21) Then comes a second heatup to rated conditions. During this heatup, the key activities include:

(A) Demonstration of the source range and intermediate range monitor response to control rod withdrawal;

(B) Gathering of system thermal expansion data;

(C) Calibration of the average power range monitors.

(22) When the plant is at rated temperature and pressure, the plant staff verifies that core thermal power is less than 5% rated thermal power by performing a heat balance. After the verification of core thermal power is complete, a RCIC cold quickstart and endurance run are performed.

(23) Subsequent to the completion of the second test period at 920 psig, the plant will be cooled down to ambient conditions. During this cooldown, the plant will obtain nuclear steam supply system thermal expansion data for the second time. When ambient conditions are reached, the low power tests are concluded. Repeated startups and heatups to rated conditions will be performed at Shoreham, however, so that each operating crew can be given the opportunity to experience plant response to the tests and activities presented above.

(24) In order to support and perform all of the functions and tests performed during Phases III and IV described above, the plant staff will be required to place in service, operate, test and maintain 54 plant systems. In addition to the reactor systems and support systems listed in paragraph 12 above, these are as follows:

Automatic Depressurization System (ADS)
HPCI
Offgas System
RCIC
Generator Seal Oil System
Main Steam System
Turbine Generator
Turbine EHC
Turbine Lube Oil System
Steam Seal System
Area Leakage Detection
Reactor Vessel Pressure and Temperature Systems
Remote Shutdown System

It is important to emphasize once more that the operation of these systems and the various functions and tests performed during Phases III and IV of low power testing, as with the activities during Phases I and II, will provide valuable training and experience to operating plant personnel, including licensed operators. As noted in this affidavit LILCO intends to expand the fuel load and precriticality testing, cold criticality testing and low power testing activities to provide Shoreham's operating personnel with additional operating experience above

that which would result from a conventional fuel load and low power testing program. It is estimated that 6000 manhours of training will occur during Phases III and IV, in addition to the 5000 manhours during Phases I and II.

____
Jack A. Notaro

____
William E. Gunther, Jr.

STATE OF NEW YORK)
) To-wit:
COUNTY OF SUFFOLK)

Subscribed and sworn to before me this ____ day of March, 1984.

My commission expires: ______________________.

____
Notary Public

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before 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)	)	

AFFIDAVIT OF WILLIAM G. SCHIFFMACHER

William G. Schiffmacher, being duly sworn, deposes and states as follows:

(1) My name is William G. Schiffmacher and I have been Manager of the Electrical Engineering Department at LILCO since August 1981. I have been employed by LILCO since June 1965 in a variety of technical, management and supervisory positions, the principal ones of which are as follows:

July 1972-November 1972	Supervisor, Substation Operations Responsible for coordinating efforts of 15-20 field personnel involved in operation of the electric system.
November 1972-September 1975	Supervisor, Transmission and Intersystem Planning Responsible for planning and recommending system transmission projects including substations; complement of 5 engineers.

September 1975- December 1977	Manager, Electric System Planning Responsible for conduct of all studies and investigations for planning LILCO's electric facilities. Division is organized into four specialties - generation, economics, transmission and inter-system studies. Work includes preparation of reports and testimony for economic and technical aspects of, among others, Shoreham and Jamesport nuclear units and associated transmission and interconnection facilities. Personnel complement of 15 includes 12 engineers, 1 economist and 2 technicians.
December 1977- May 1979	Manager, Substation Design and System Control and Protection Responsible for the physical-electrical design of all substations and complete engineering and design of all protective relaying, supervisor control and telemetering systems for LILCO; complement of 12 engineers.
May 1979- April 1981	Manager, Electric System Planning Same as above.
April 1981- August 1981	Manager of Overhead and Underground Distribution Materials

(2) As Manager, Electrical Engineering Department, my duties and responsibilities include responsibility for all electrical engineering, including overhead and underground transmission, substation engineering, distribution engineering,

and electrical engineering associated with nuclear and fossil plants and buildings.

(3) I have a Bachelor of Electrical Engineering degree from Manhattan College (1965) and a Master of Science degree in Management Engineering (1969) from Long Island University.

(4) The purpose of this affidavit is to describe all of the normal and additional sources of AC power available to support the Shoreham Nuclear Power Station without reliance on the Transamerica Delaval emergency diesel generators. This explanation will describe the high reliability provided by the numerous and diverse means of providing adequate AC power to Shoreham.

(5) There are numerous sources of AC power available to and designed for Shoreham. Each has substantial backup in the unlikely event of failure. They include the following, all of which are depicted in Exhibit A:1/

(a) LILCO has a 138 KV and a 69 KV high voltage network system with significant interconnection

---

1/ For convenience, the facilities described below are referenced to Exhibit A by letters noted in parentheses here and in triangles on the exhibit. Additional detail and perspective are provided in Exhibit A-1.

capacity (i) with the New York Power Pool through Consolidated Edison (three ties totaling 1090 MW) and (ii) with the New England Power Grid through lines beneath Long Island Sound through Connecticut Light & Power Company (285 MW). See (A) Exhibit A; Exhibit B (LILCO Interconnections). This ensures the availability of sufficient power throughout the system to serve Shoreham's needs. Moreover, each of LILCO's major generating facilities is equipped with a backup blackstart2/ gas turbine to provide starting power under blackout conditions. As an example, Port Jefferson is a major generating station with two 185 MW steam generating units and a blackstart gas turbine only eleven miles from Shoreham. See (L) Exhibit A.

(b) Within the LILCO system, there are four 138 KV circuits into the Shoreham 138 KV switchyard (see (D) Exhibit A) along two separate and distinct rights-of-way. See (B, C) Exhibit A. Also, Shoreham is supplied by three separate 69 KV circuits entering a separate switchyard at Wildwood which connects to the

---

2/ "Blackstart" indicates the ability to be started independently of any other power source.

Shoreham 69 KV switchyard. See (E) Exhibit A. In contrast, GDC 17 requires only "two physically independent circuits (not necessarily on separate rights-of-way)" and permits a single switchyard.

(c) Even in the event the entire grid is unavailable, the LILCO system includes 10 gas turbines at Holtsville (Holtsville is approximately 20 miles from the Shoreham site), 50 MW per turbine, two of which are presently equipped with deadline blackstart capability designed and installed to support Shoreham. See (F) Exhibit A. Three more will be equipped with blackstart capability by April, 1984.3/

(d) As further backup, there are three blackstart gas turbines located at Southhold (see (G) Exhibit A), East Hampton (see (H) Exhibit A), and Port Jefferson (see (L) Exhibit A), each of which can supply 69 KV power to Shoreham.

3/ Two of the five have deadline blackstart and the other three will be started by the system operator. Deadline operation implies automatic start without operator intervention if system power is lost.

(e) At the site, LILCO is completing the installation of a 20 MW gas turbine with deadline blackstart capability. See (I) Exhibit A. This will provide adequate AC power to Shoreham even in the unlikely event all transmission supplies are lost.

(f) To allow further independence from the LILCO grid and independence from the normal station service transformer and reserve station service transformer, LILCO is in the process of obtaining and installing a block of four 2.5 MW blackstart mobile diesel generators to be located on site and routed into the plant's emergency 4 KV buses. See (J) Exhibit A; Exhibit C (Plant 4 KV system).

With this general description of the variety of AC power sources for Shoreham as background, I will turn next to a more detailed description of each source and a consideration of its role in providing additional assurance that adequate AC power will be provided to Shoreham under normal and emergency conditions.

LILCO'S SYSTEM GRID AND INTERCONNECTION CAPACITY

(6) LILCO has a generating capacity of 3721 MW

consisting of 2240 MW of baseload steam turbine units, 432 MW of mid-range and peaking steam turbine units and 1049 MW of internal combustion peaking units consisting of gas turbines and diesel generators.

(7) In addition to LILCO's bulk power transmission system, LILCO is interconnected with the New York Power Pool through Consolidated Edison. This interconnection is made through three ties providing an additional 1090 MW of power if needed as follows: 4/

	Voltage	Summer Normal	Ratings LTE	(MW) STE
Lake Success-Jamaica	138KV	238	341	427
Valley Stream-Jamaica	138KV	271	318	441
Shore Road-Dunwoodie	345KV	581	839	1479

(8) Since all members of the New York Power Pool (NYPP) are required to maintain reserve capacity of 18% over their peak demand, and since the Pool members do not experience peak demands at the same times, a Pool-wide 22% reserve margin

---

4/ Exhibit B (LILCO Interconnections) depicts the various interconnections with their nominal ratings. The slight differences in power ratings between Exhibit B and the above ratings resulted from rounding off. Exhibit B also reflects only normal power ratings and not the long-term emergency (LTE) and short term emergency (STE) ratings included above.

is achieved. Furthermore, the NYPP operates with enough spinning reserve to cover the loss of the largest generation source in the state.

(9) LILCO is also connected with the New England Power Grid beneath Long Island Sound through the Northport-Norwalk tieline which is a 138 KV line rated at 285 MW.

(10) Subsequent to the Northeast Blackout of 1965, LILCO implemented substantial measures to increase reliability of its system. These included installation of blackstart gas turbines at each of its major generating stations and implementation of automatic underfrequency load shedding procedures.5/ In the 18 years since, there has been no loss of the entire LILCO grid. There has only been one incident in which LILCO has lost any appreciable portion of its bulk power transmission system. That one incident affected LILCO's system east of Holbrook. Despite the lack of any procedures then in effect mandating priority emphasis on restoring power to Shoreham, power was restored to the entire Shoreham area within one hour and four minutes. With the priority procedures now in effect

---

5/ Underfrequency load shedding schemes allow restoration of a balance between load to be served and generation available by automatically disconnecting load from the system. This prevents cascading outages of multiple facilities on the system.

to restore power to Shoreham and the availability of several independent deadline blackstart gas turbines, all of which are described below, it has been demonstrated by exercises that today power can be restored to Shoreham in a matter of minutes.

(11) The reliability of LILCO's bulk transmission system was further evidenced when Consolidated Edison's system experienced a blackout in 1977. LILCO's entire bulk transmission system remained on line and there was no interruption in service to the LILCO system.

THE DESIGNED SYSTEM FOR SHOREHAM

A. Transmission Network

(12) The Shoreham Nuclear Power Station is interconnected to the LILCO system through 138 KV and 69 KV circuits. Four 138 KV transmission circuits serve the 138 KV Shoreham switchyard. Two circuits emanate from the Holbrook 138 KV substation, (B-1) Exhibit A; one from the Wildwood-Riverhead 138 KV substation, (C-1) Exhibit A; and one from the Brookhaven 138 KV substation, (C-2) Exhibit A. See also Exhibit D (LILCO system diagram). Two separate and independent rights-of-way are provided, each containing two of the four 138 KV circuits. The 138 KV switchyard is arranged in a

two bus configuration with circuit breakers and switches arranged to permit isolation and/or repair of either bus section. This permits continuation of 138 KV power supplied from separate rights-of-way even if an entire bus section is out of service.

(13) Additionally, three 69 KV circuits feed the Wildwood substation which is approximately one mile south of Shoreham and from there, one 69 KV circuit enters the site. These three circuits emanate from Riverhead (see (E-1) Exhibit A), Holtsville (see (E-2) Exhibit A), and Port Jefferson (see (E-3) Exhibit A). See also Exhibit D. The 69 KV line from Wildwood to the Shoreham 69 KV switchyard has been placed underground in the vicinity of the 138 KV facilities to maintain complete independence of supply between the normal station service (NSS) and reserve station service (RSS) transformers. See (K-1) Exhibit A. The circuit continues underground from the substation to the RSS transformer. Furthermore, in the unlikely event that either of these underground sections should fail, a bypass 69 KV circuit (bypassing the 69 KV switchyard) to the RSS transformer has been provided. See (K-2) Exhibit A. By utilizing this bypass circuit, power can be restored without having to repair the underground cable or route power through the Shoreham 69 KV switchyard. This bypass allows

reestablishment of the 69 KV RSS supply substantially more quickly than the 72 hours as required in Technical Specification "Electrical Power Systems 3/4.8.1.1" without the necessity of removing the nuclear plant from service.

(14) Both the 138 KV and 69 KV lines form part of the LILCO network transmission system. This system is designed to withstand winds of minimum speeds of 100-130 mph. Other natural phenomena such as tornadoes, hurricanes and earthquakes have not adversely impacted LILCO's bulk transmission system. Nevertheless, when such phenomena are expected, specific precautionary procedures will be invoked as described in the affidavit of William J. Museler.

(15) Even in the unlikely event that any of the transmission facilities are damaged, LILCO has the ability to reconstruct such facilities rapidly. LILCO routinely constructs its own transmission facilities. Therefore, LILCO has a large force of trained personnel to construct and restore transmission facilities. These trained crews are available 24 hours a day to respond to emergency conditions. In order to assure prompt responsiveness for the lines serving Shoreham, LILCO is undertaking extraordinary measures to preplan such an operation. This includes measures such as pre-assigning poles

and hardware and storing this equipment at optimized locations, as well as conducting additional training of overhead lines personnel. Using these measures, LILCO can restore a mile of 69 KV transmission facilities within 24 hours. While it is not anticipated that such extensive damage would occur on any one transmission line, this capability provides a benchmark indicating the expeditious manner in which LILCO could restore facilities.

(16) Additionally, the necessity for reconstructing transmission facilities at any instant in order to serve Shoreham is minimized by the nature of the transmission system. It is a network system of interconnected lines which provide the ability to route or reroute power over multiple paths.

B. Independent Blackstart Generators

(17) The reliability of LILCO's system providing power to Shoreham is further enhanced by a number of independent gas turbines at various locations specifically designed to start during blackout conditions. Exhibit A shows the location of these gas turbines discussed below.

(18) The LILCO system includes 10 gas turbines at Holtsville, 2 of which are equipped with deadline blackstart capability and 3 of which will have blackstart capability designed and installed to support Shoreham. See (F) Exhibit A. All five blackstart turbines are under the control of and can be started by the system operator.6/ Power from these gas turbines is capable of being supplied to Shoreham through various transmission paths ultimately leading to any of the 138 KV lines or the three 69 KV lines to Shoreham as depicted in Exhibit A. Under simulated conditions, tests have shown that power can be restored to Shoreham from Holtsville in 6 minutes. The system operator (in close coordination by telephone and/or radio with the Shoreham control room) deliberately isolates these gas turbines so that the system appears to be in a blackout mode. A unit automatically starts and the operator then clears a transmission line express to Shoreham. Implementation of this procedure has been directed in LILCO's Emergency and Unusual Procedures Manual as the paramount priority for the LILCO system operator in the event of a blackout. Tests of the Holtsville gas turbines and practice restoration

---

6/ The system operator controls the entire LILCO grid from a central point. There are 3 such operators on duty at all times at Hicksville.

of power to Shoreham are conducted twice a month. See Museler Affidavit at ¶ 18.

(1.) There are additional deadline blackstart gas turbines at 2 locations east of Shoreham, Southhold (15 MW) (see (G) Exhibit A) and East Hampton (20 MW) (see (H) Exhibit A), either of which is capable of supplying adequate power to Shoreham in the event the Holtsville units are unavailable. Power from each of these units is supplied to Shoreham by 69 KV circuits to Riverhead where routing to Shoreham can continue via 69 KV or 138 KV lines. See Exhibit D. A description of testing to assure the reliability of these units is included in the Museler affidavit. Finally, there is a blackstart gas turbine at the Port Jefferson 370 MW steam plant eleven miles to the west of Shoreham which is also capable of supplying power to Shoreham. See (L) Exhibit A.

C. Onsite 20 MW Gas Turbine

(20) The redundant methods of restoring power to Shoreham described above complement and provide yet another backup for the most rapid method of restoring AC power to Shoreham which is a dedicated 20 MW gas turbine being installed at the site. See (I) Exhibit A. This gas turbine has deadline blackstart capablity and is scheduled to be operational in

April 1984. Thus, even with the loss of all alternative AC power sources and their backups, including the Holtsville, Southhold and East Hampton gas turbines, more than adequate AC power could be provided by the 20 MW gas turbine on the site. It has the ability to carry all plant emergency load together with some selected plant nonemergency load. LILCO's procedures call for concurrent, rather than sequential, efforts to restore power to Shoreham using any and all of the available power sources. That is, the 20 MW gas turbine will start automatically, while the system operator will simultaneously institute action to restore power to Shoreham through the transmission system.

(21) The 20 MW gas turbine is connected to the 69 KV bus at Shoreham. It is also equipped with fully automatic (deadline) blackstart capability which gives it the ability to start automatically upon loss of voltage to the 69 KV bus and pick up load as required. The 69 KV bus supplies power to the reserve station service transformer via an underground 69 KV cable. Power can be restored to the reserve station service transformer in approximately 2-3 minutes.

(22) With its newly installed low pressure air start system and fuel control system, the 20 MW gas turbine at

Shoreham is virtually identical to the gas turbine at East Hampton which has had an operational availability of 97.9%. LILCO's procedures for testing this 20 MW gas turbine to assure its reliability are described in the Museler Affidavit.

(23) The 20 MW gas turbine should be able to fulfill its function even after a seismic event. It is a Turbo Power and Marine (Pratt and Whitney) gas turbine. There are no substantive differences between Pratt and Whitney gas turbines specifically designed in accordance with the seismic building code and the 20 MW unit at Shoreham. The code requires that machines withstand a .3g horizontal acceleration. Accordingly, Turbo Power and Marine has assured LILCO that the 20 MW gas turbine would be structurally sound during a design basis seismic event at Shoreham which would exert only a .2g horizontal acceleration and .113g vertical acceleration. See letter of John T. O'Brant attached as Exhibit E.7/

7/ There is no seismic information available as to the electrical panels associated with the unit. If the unit were operating, there is a possibility that it would trip during a design basis earthquake because of relay contact bounce. It would restart automatically in a deadline mode after conclusion of the seismic event if necessary to provide AC power. However, usually the gas turbine will be in a standby mode, ready to run and provide power after such a seismic event has occurred and resulted in some disruption of the normal system power supply.

(24) In an effort to minimize the risk of damage to the fuel tank and associated piping in a seismic event, LILCO will constantly have available a standby mobile supply of fuel for the 20 MW gas turbine (and for the 4 mobile diesels discussed below) by having a loaded tanker truck on site at all times during low power operation.

MOBILE AC POWER SOURCES

(25) Though not necessary or required, LILCO will provide a sixth AC power source to operate upon the unlikely loss of Shoreham's normal designed sources of AC power (i.e., in addition to the blackstart gas turbines at Holtsville, the blackstart gas turbines at Southhold, East Hampton and Port Jefferson and the 20 MW blackstart gas turbine at Shoreham), LILCO is installing at Shoreham a block of four 2.5 MW General Motors EMD blackstart mobile diesel generators, model 20-645 E-4, to be directly connected into the plant's 4 KV bus network which, in turn, will provide power to the emergency 4 KV buses (see (J) Exhibit A). This provides the additional benefit of being able to supply power to the emergency 4 KV buses in the unlikely event of the simultaneous loss of the NSS and RSS transformers and all three of the TDI diesel generators.

(26) These mobile diesel generators will be able to supply power to the plant's emergency systems within 30 minutes of starting the diesels.

CONCLUSION

(27) Even under system blackout conditions, there are numerous ways to feed power to Shoreham. For example, upon loss of the LILCO grid, the multiple units at Holtsville, or the Southhold, East Hampton or Port Jefferson gas turbines can generate adequate power. Upon the inability to start any of these system blackstart gas turbines or upon the loss of the transmission routes into the site, the onsite 20 MW gas turbine remains available and will start automatically and provide power to the RSS transformer. If that were to fail, there are still four mobile diesel generators available to serve required plant loads.8/ A maximum of two of the four mobile units9/ would be required for safe shutdown under normal or accident conditions. Accordingly based on the historical reliability of the LILCO grid, the multiple redundant sources of power available to Shoreham under blackout conditions and the

---

8/ The three TDI diesels would also be available. See Museler Affidavit at ¶ 11.

9/ Testing may show that only one mobile unit will suffice.

multiple transmission paths into the area, the availability of AC power to Shoreham is reasonably assured and is considerably greater than contemplated by applicable NRC regulations.

____
William G. Schiffmacher

STATE OF NEW YORK)
) To-wit:
COUNTY OF _________)

Subscribed and sworn to before me this ____ day of March, 1984.

____
Notary Public

My commission expires: ________________________

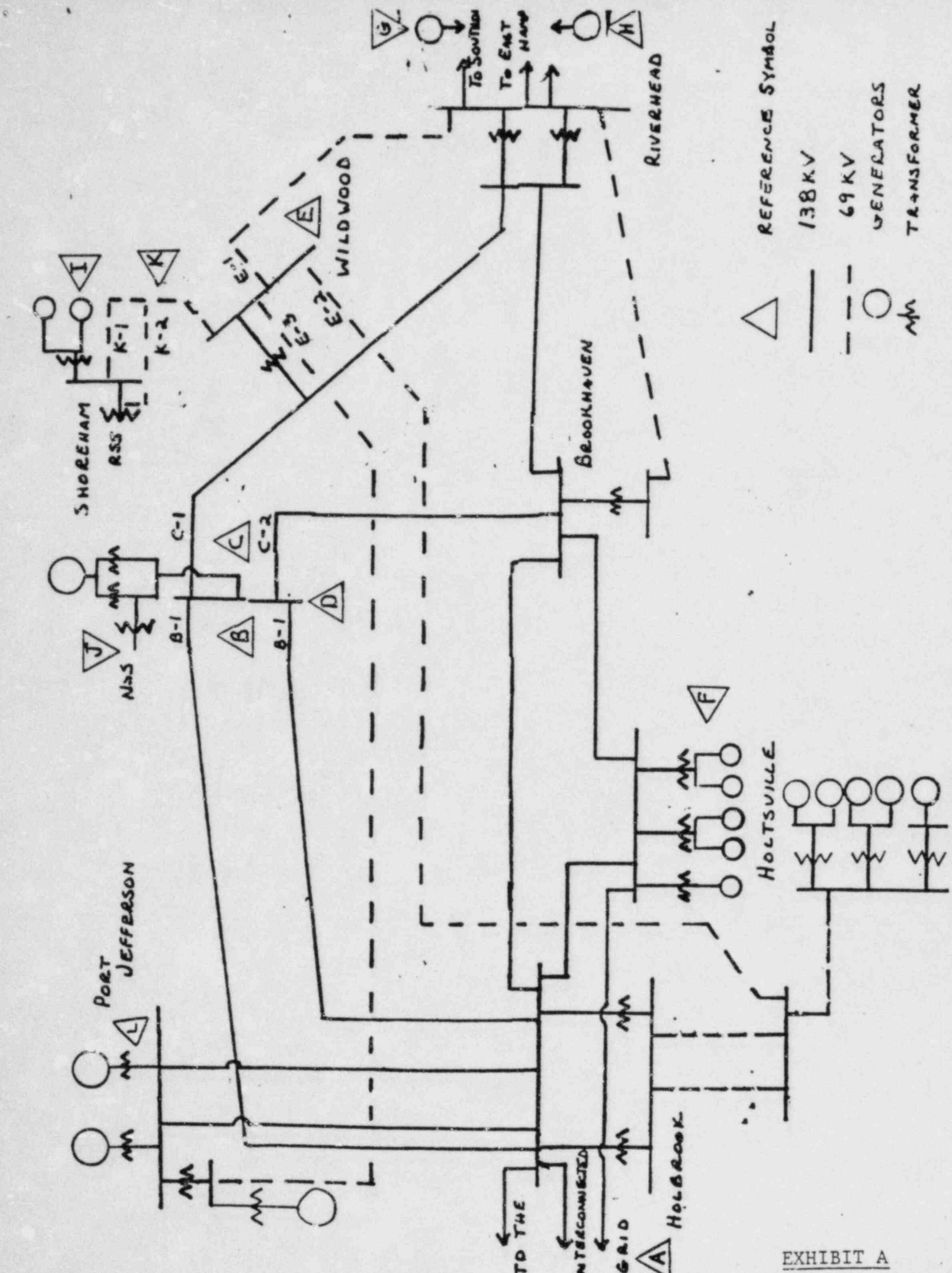
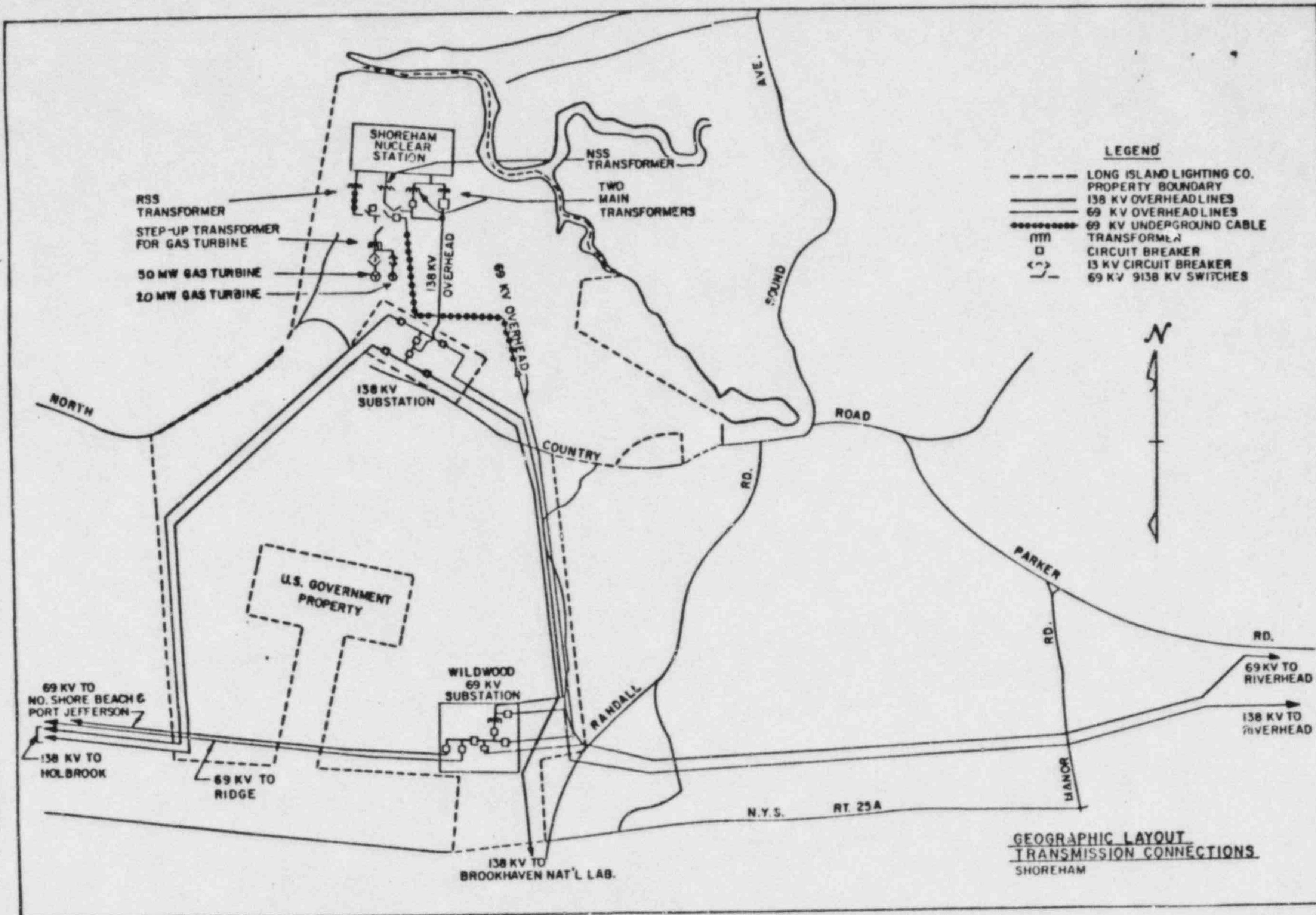
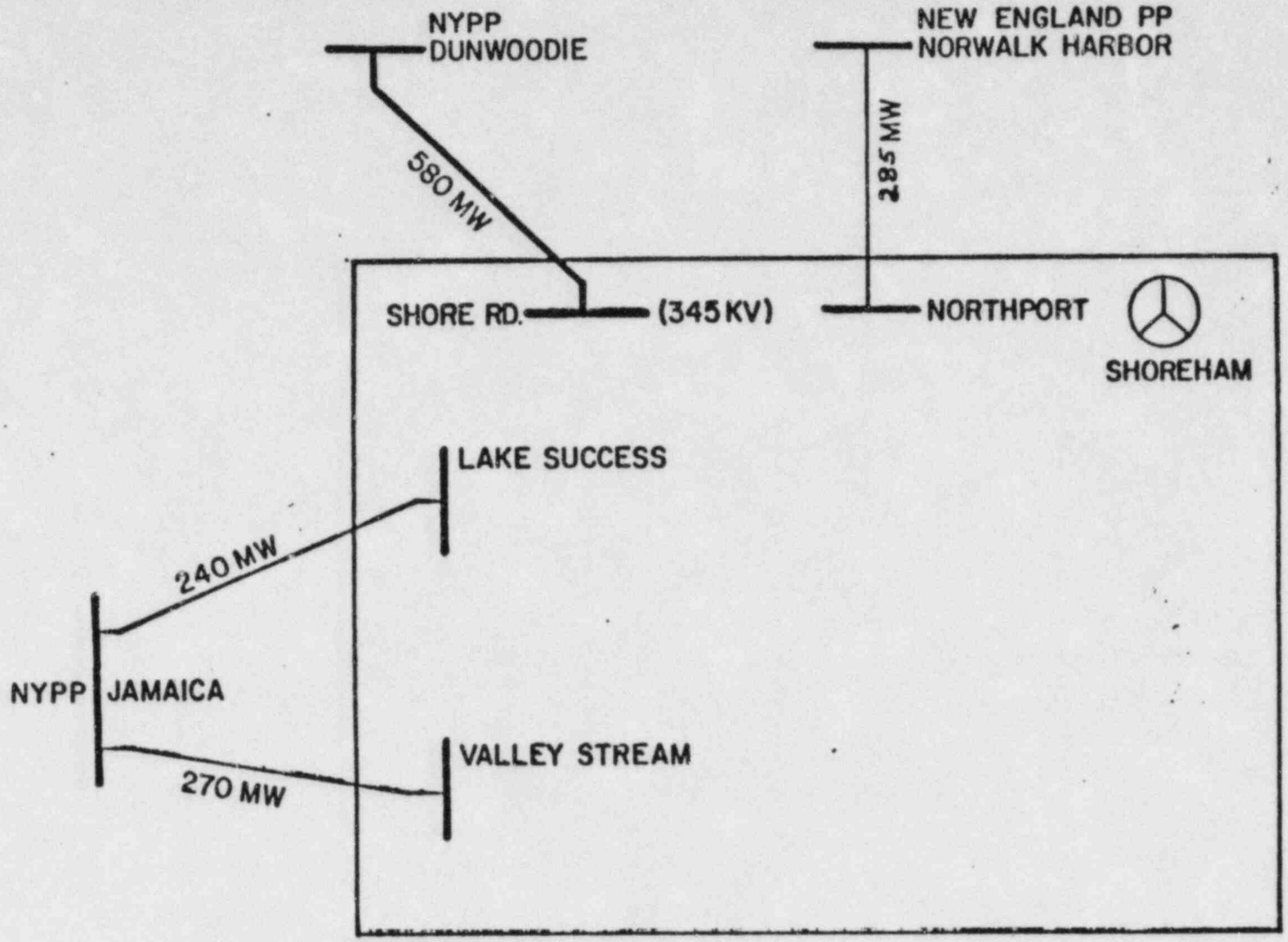

PORT JEFFERSON
SHOREHAM
RSS
K-1
K-2
NSS
B-1
C-1
C-2
B-1
E-1
E-3
E-2
WILDWOOD
TO THE
INTERCONNECTED
GRID
HOLBROOK
BROOKHAVEN
HOLTSVILLE
RIVERHEAD
TO SOUTHOLD
TO EAST HAMP
REFERENCE SYMBOL
138KV
69KV
GENERATORS
TRANSFORMER

EXHIBIT A



GEOGRAPHIC LAYOUT
TRANSMISSION CONNECTIONS
SHOREHAM

EXHIBIT A-1



LILCO INTERCONNECTIONS

EXHIBIT B

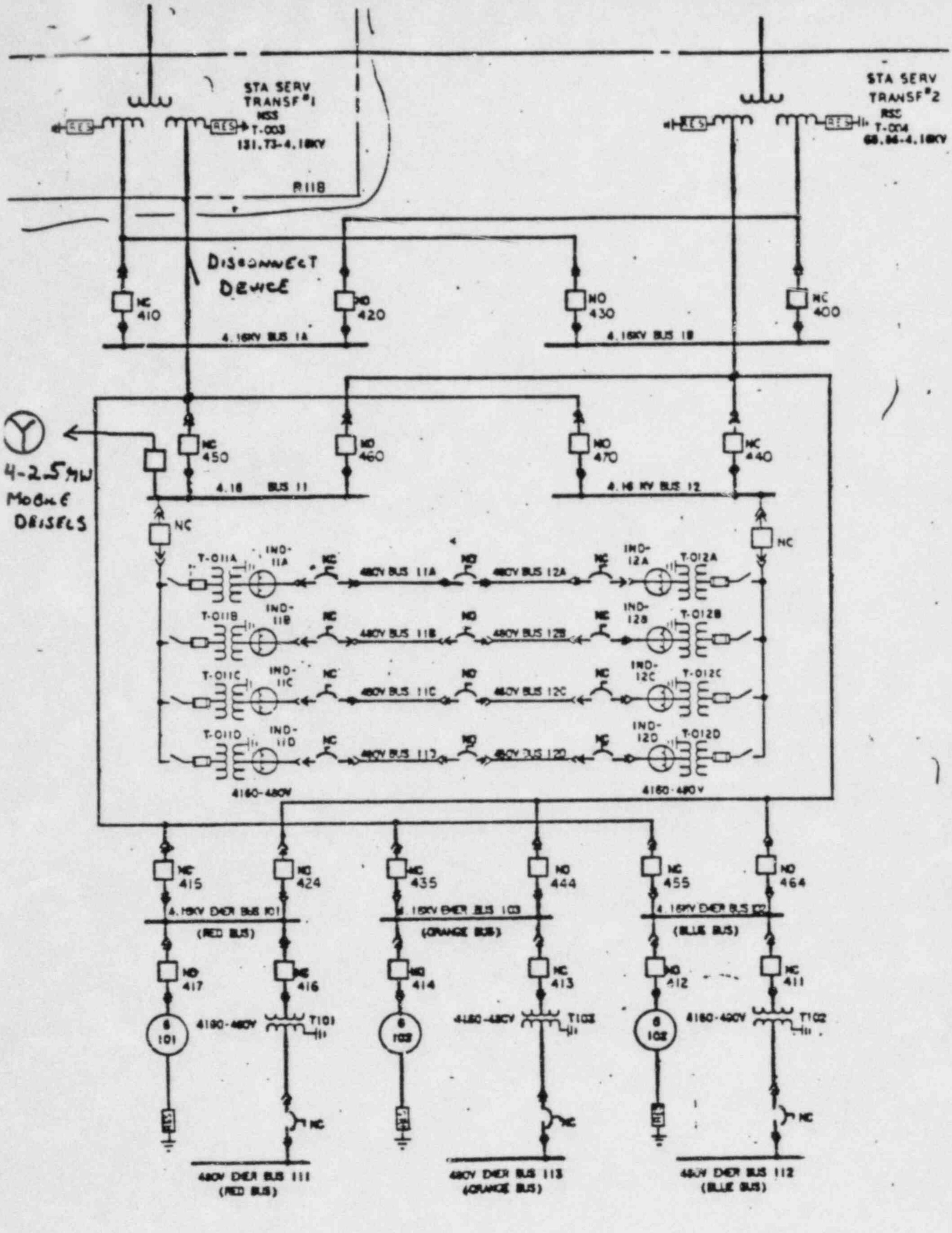


EXHIBIT C

Plant 4 KV System

2	REDRAWN AND TITLE CHANGED	8	ADDED & REMOVED RELAYS. REL WIR. TRANS & GEN RDS.

UNITED TECHNOLOGIES TURBO POWER

Turbo Power and Marine Systems, Inc.

400 Main Street
East Hartford, Connecticut 06108
203/565-4321

March 1, 1984

Long Island Lighting Company
175 East Old Country Road
Hicksville, NY 11801

Attention: Mr. Richard Zambratto

Gentlemen:

In response to your request for information relative to the seismic resistance capability of TPM FT4 units, the following is offered.

Prior to 1975-76, the structural design of FT4 units incorporated a variety of NEMA, ANSI, ASCE, and AWB specifications, but did not incorporate specific seismic load requirements. Beginning in about 1975, we initiated design incorporation of the "Universal Building Code" which includes a 0.3g horizontal load requirement, but no vertical load requirement.

The "Universal Building Code" requirement is that the structures and equipment be able to withstand a 0.3g horizontal load, but does not require that the unit operate through that load. We do not know whether installed protective relays and the Rowan relays installed in the FT4 sequencer units could withstand such a load without tripping.

Even though the structural design of pre 1975-76 units, which includes the West Babylon and the Holbrook units, did not incorporate the 0.3g horizontal load requirement specifically, it is our opinion that all those units would withstand the 0.2g horizontal and 0.113g vertical load requirement you mentioned and still be operable. The concern about operating through such an event without tripping relays would still apply.

There is one other minor point worth mentioning: in a Power Pac (one engine, one generator), the engine/generator coupling is rigid and provides a fixed restraint for the generator rotor which would absorb any axial "g" load without significant movement. In a Twin Pac (two engines, one generator), the engine/generator couplings are the flexible Bendix type which could allow some generator rotor axial movement due to imposition of horizontal load. This axial movement might compress one flexible coupling in the direction of movement and impart a momentary impact load on the power turbine thrust bearing. This remote possibility could result in a peening of the bearing ball/races leading to an eventual failure of the bearing. The restraining stretching action of the opposite end coupling makes this a minor concern.

The gas turbine itself is designed to withstand much higher "g" loads, due to severe flight and military shipboard blast load requirements in the 5-10g range.

EXHIBIT E

I hope this satisfies your immediate need. If we turn up any additional information, we will pass it along.

Very truly yours,

John T. O'Briant
Manager, Product Support

jfp

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before 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)	)	
	)	

AFFIDAVIT OF DR. GLENN G. SHERWOOD, DR. ATAMBIR S. RAO, AND MR. EUGENE C. ECKERT

Glenn G. Sherwood, Atambir S. Rao, and Eugene C. Eckert being duly sworn, depose and state as follows:

(1) My name is Glenn G. Sherwood. I am employed by the General Electric Company as Manager, Safety and Licensing Operation. My business address is General Electric Company, 175 Curtner Avenue, San Jose, California 95125. I have been employed in this position since 1976. My responsibilities include supervision of the preparation of licensing submittals for General Electric BWRs, including analyses performed in Chapter 15 of safety analysis reports. In particular, I have been involved in the supervision of licensing matters for the Shoreham Nuclear Power Station since the initial submittal of the Shoreham Final Safety Analysis Report (FSAR). In this regard, I am familiar with the analyses performed in Chapter 15 of that document. From 1974, when I joined General Electric,

to 1976, I was the Manager, Program Control Section. My responsibilities included managing engineering and manufacturing work flow for General Electric's nuclear group. I have a Bachelor of Science degree in Engineering from the U.S. Naval Academy and a Ph.D. in Engineering from the University of Michigan.

(2) My name is Atambir S. Rao. I am employed by the General Electric Company as Manager, Plant Safety Systems Engineering. My business address is General Electric Company, 175 Curtner Avenue, San Jose, California 95125. I was appointed to my present position in 1984. My responsibilities include ECCS performance analysis, containment performance response analysis, and plant safety performance evaluations, including FSAR safety analyses. I have previously held a number of positions relating to accident and transient analyses since I first joined General Electric in 1973. Earlier responsibilities have included modeling and analyzing the thermal hydraulic behavior of BWR fuel following loss of coolant accidents, assessing the implication of advances in heat transfer, fluid mechanics, thermodynamics and two-phase flow on overall BWR system response during transients and loss of coolant accidents, developing emergency operator guidelines, and assessing containment thermal hydraulic and radiological response for various

accidents and transients. I have been assigned as Manager, Emergency Core Cooling Systems (ECCS) Engineering (1979-80), and Manager, Containment and Radiological Engineering (1982-84). I received a Ph.D and a Masters degree in Mechanical Engineering from the University of California, Berkeley, and a Bachelor of Technology in Mechanical Engineering from the Indian Institute of Technology, Kanpur, India.

(3) My name is Eugene C. Eckert. I am employed by the General Electric Company as Manager, Power Transient Performing Engineering, a position I have held since 1971. My business address is General Electric Company, 175 Curtner Avenue, San Jose, California 95125. I am responsible for establishing the simulation requirements of the computer models needed to perform transient analyses, development of design procedures evaluation of BWR stability, and evaluation and specification of the functional protection systems required for reactor abnormal transient protection. Immediately upon joining General Electric Company in September 1959, I participated in assignments which included large jet engine control design, aircraft nuclear propulsion control analysis, nuclear submarine kinetics and control analysis, and industrial control simulation analysis at GE's Research and Development Center. In 1962, I joined General Electric's Nuclear Energy Division to

work on Boiling Water Reactor simulation and dynamic analysis. I have been responsible for design and licensing documentation of the dynamic analysis for several GE BWRs and have participated in initial startup testing of many of the units. I received a Bachelor of Science Degree in Electrical Engineering from Valparaiso University in Indiana in 1958. I attended Stanford University under an Oak Ridge Fellowship and received a Master of Science Degree in Engineering Science in August 1959.

(4) Chapter 15 of the Shoreham FSAR provides the results of analyses for the spectrum of accident and transient events that must be accommodated by the Shoreham plant to demonstrate compliance with the NRC's regulations. This portion of the safety analysis is performed to evaluate the ability of the plant to operate without undue risk to the health and safety of the public. The Shoreham FSAR was submitted to the NRC Staff for review and has been approved by the Staff in its Safety Evaluation Report for Shoreham (NUREG-0420).

(5) At the request of the Long Island Lighting Company, General Electric, in conjunction with cognizant LILCO and Stone & Webster personnel, has reviewed all of the events considered in Chapter 15 of the FSAR to determine the effect on public health and safety of the operation of the Shoreham plant

during fuel load, criticality testing and low power operations. Although the FSAR considers all phases of the operation of the plant from fuel load to operation at 100% power, this review was performed specifically to confirm that operation of the Shoreham plant during low power operation will pose no undue risk to public health and safety. The review of Chapter 15 was divided into three parts: (1) fuel load and precriticality testing (Phase I), (2) cold criticality testing (Phase II), and (3) low power testing up to 5% of rated power (Phases III and IV).1/ The review was based upon the same criteria and bases as the original Chapter 15 analyses. Where assumption of a loss or unavailability of offsite power was required in the original analyses, potential unavailability of the TDI diesel generators was considered in this review.

(6) The General Electric review of Chapter 15 confirms that operation during the phases identified above will not result in any undue risk to the public health and safety. In fact, the risk from any Chapter 15 event during both the fuel load and precriticality phase and the cold criticality testing phase is essentially non-existent. The risk to the

---

1/ Parts (1) and (2) correspond to Phases I and II, respectively, as described in the Affidavit of Messrs. Notaro and Gunther. Part (3) corresponds to Phases III and IV, combined, as described in that affidavit.

public health and safety from the Chapter 15 events postulated for low power testing up to 5% of rated power is small in comparison to the risks already found acceptable for 100% power operation. As already indicated, this review considered the impact of potential diesel unavailability.

Phase I: Fuel Loading and Precriticality Testing

(7) This phase of operation of the Shoreham plant includes only initial fuel loading and precriticality testing. The reactor will remain at essentially ambient temperature and atmospheric pressure. The reactor will not be taken critical. Any increase in temperature beyond ambient conditions will be due only to external heat sources such as recirculation pump heat. There will be no heat generation in the core. Details of the steps to be performed during these operations are described in the Phase I discussion in the affidavit submitted by Messrs. Notaro and Gunther.

(8) The review of the Chapter 15 analysis revealed that of the 38 accident or transient events addressed in Chapter 15, 18 of the events could not occur during Phase I because of the operating conditions of the plant. An additional 5 events could physically occur, but given the plant conditions, could not constitute events in the context of the Chapter 15

safety analysis. The remaining 15 events could possibly occur, although occurrence is highly unlikely given the plant conditions. In any event, it is readily apparent that the potential consequences of these 15 events would be trivial. Exhibit 1 below lists the category into which each Chapter 15 event falls.

(9) The 18 Chapter 15 events which could not occur during Phase I are precluded by the operating conditions of the reactor. These events all involve operating modes or component operation which are not possible during this phase. For example, during fuel loading and precriticality testing, the reactor is at essentially ambient temperature and atmospheric pressure. Accordingly, no steam is available. Thus, all events which would require pressurized conditions are precluded. Events such as turbine trip (FSAR § 15A.1.2), loss of feedwater heating (FSAR § 15A.1.8) and inadvertent opening of a safety relief valve require the generation of steam for the event to occur. Similarly, there is no steam flow to interrupt, thus precluding an MSIV closure event (FSAR § 15A.1.4). Other events are precluded by definition. Thus, events such as continuous control rod withdrawal during power range operation (FSAR § 15A.1.11) and operation of a fuel assembly in an improper location (FSAR § 15A.1.16) cannot be postulated.

(10) In addition to the 18 events which simply cannot occur, there are 5 events for which the component operation evaluated in Chapter 15 could occur, but the phenomena of interest in Chapter 15 could not exist. All recirculation pump events, such as recirculation pump trip (FSAR § 15A.1.20) and abnormal startup of an idle recirculation pump (FSAR § 15A.1.25), would be of interest only if they could affect core physics or thermal-hydraulic conditions. With no heat generation or boiling in the core, there are no pertinent phenomena (such as temperature differences or void collapses) to evaluate. Another example, the core coolant temperature increase event (FSAR § 15.A.1.26), postulates a loss of RHR cooling. Even if the RHR system was operated in Phase I, there would be no temperature increase from decay heat to evaluate should the RHR system be lost.

(11) The remaining 15 events addressed in Chapter 15 could possibly occur. However, our review established that all are trivial events which have no potential to impact public health and safety. Prior to initial criticality, there are no fission products in the core and no decay heat exists. It follows that core cooling is not required. In addition, with no fission product inventory, there are no fission product releases possible. Thus, for reactor events such as a control

rod removal error (FSAR § 15A.1.13) and a control rod drop (FSAR § 15.1.33) and for non-reactor events such as a fuel handling accident (FSAR § 15.1.36) or a liquid radwaste tank rupture (FSAR § 15.1.32), there could be no radiological consequences. Therefore, there is no risk to public health and safety.

(12) Even a loss of coolant accident (FSAR § 15.1.34) could have no radiological consequences during Phase I. No core cooling is required. No fission product release is possible. The fuel simply could not be challenged by a complete draindown of the reactor vessel for an unlimited period of time.

(13) In summary, the review of Chapter 15 events for fuel loading and precriticality testing indicates that many Chapter 15 events simply cannot occur, and for those that can, there can be no radiological consequences. Therefore, there is no possible risk to the public health and safety. This conclusion is not affected by any postulated diesel generator unavailability because it is in no way dependent on the availability or unavailability of any AC power.

<u>Phase II: Cold Criticality Testing</u>

(14) This phase of low power testing of the Shoreham

plant will include cold criticality testing of the plant at essentially ambient temperature and atmospheric pressure. The power level during this phase of testing will be in the range of .0001% to .001% of rated power. Details of the testing to be performed during this phase are described in the Notaro Affidavit.

(15) The review of Chapter 15 revealed that of the 38 accident or transient events included there, 15 of the events could not occur because of the operating conditions of the plant during Phase I. See Exhibit 2. A number of these events are not possible because the reactor will be at essentially ambient temperature and pressure and no steam will be generated. For example, the generator load rejection event (FSAR § 15A.1.1) could not occur during this testing phase because steam is needed to drive the main turbine generator to permit connecting it to the LILCO transmission system. Another example, the loss of condenser vacuum event (FSAR § 15A.1.21), could not occur because it assumes that steam is available to draw a vacuum in the main condenser. A third example, the inadvertent HPCI pump start event (FSAR § 15A.1.10), could not occur because there will be no steam available to power the HPCI pump, a steam driven ECCS pump. Other Chapter 15 events could not occur because they are precluded by the configuration

of the plant during this phase of low power testing. An example of this type of event is the MSIV closure (FSAR § 15A.1.4). The MSIVs will normally be closed throughout all of the operations conducted during this phase of low power testing. In any event, there is no steam generated by the reactor to flow through the steam lines.

(16) In addition to the 15 events that could not occur during Phase I, many of the 23 events remaining in the Chapter 15 analysis are far less likely to occur during low power testing than during normal operations. For example, the recirculation pump trip (FSAR § 15A.1.20), the recirculation pump seizure (FSAR § 15A.1.22), the recirculation flow control failures (FSAR § 15A.1.23 and 24) and the abnormal startup of idle recirculation pump (FSAR § 15A.1.25) events, although physically possible, are not as likely to occur because the recirculation pumps are used for only limited periods of time during this phase of the testing program. Similarly, the loss of feedwater event (FSAR § 15A.1.18) is very unlikely because little, if any, make-up water will have to be supplied to the reactor. Moreover, make-up water would not normally be supplied by the feedwater system under these conditions. Other very unlikely events include miscellaneous small releases outside primary containment (FSAR § 15.1.29), off design

operational transient as a consequence of instrument line failure (FSAR § 15.1.30), and feedwater system piping break (FSAR § 15.1.37). Thus, many of the Chapter 15 events that are physically possible during Phase II remain very unlikely in light of the plant conditions that will then exist.

(17) Nonetheless, all 23 possible events contained in Chapter 15 were reviewed to reaffirm that the consequences of these events, should one occur during Phase I of low power testing, would be bounded by the consequences analyzed for the event considered in the FSAR. A discussion of some of the 23 possible events contained in Chapter 15 illustrates the basis for this conclusion. The continuous control rod withdrawal during startup event (FSAR § 15A.1.12) is applicable to operation in the power, source and/or intermediate range of operation. During cold functional criticality testing, the reactor will operate in the source and intermediate ranges and therefore the conclusions contained in Chapter 15 are applicable to this event should it occur during this phase of low power testing. As the FSAR indicates, this event would not result in any release of radioactive material from the fuel at any power level. Another example is the fuel handling accident (FSAR § 15.1.36). As stated in the FSAR, the most severe fuel handling accident from a radiological viewpoint is a dropping

of the fuel assembly onto the top of the core. The FSAR analysis assumes that the fuel contains a fission product inventory equivalent to operation of 1000 days at full rated power. This assumption results in an equilibrium fission product concentration at the time the reactor is shut down. But as already noted, the fission product inventories in the core will be significantly less during Phase II low power testing than the inventories analyzed in the FSAR because of the extremely low power levels (.0001% to .001% of rated power) achieved during this testing. Thus, even if a handling accident took place and fuel damage did occur, there would be significantly less fission products to be released from the core than those that have already been analyzed and found acceptable in the FSAR. A third example is the liquid radwaste tank rupture event (FSAR § 15.1.32). This event assumes the rupture of a radwaste tank that contains a substantial amount of contaminated liquids generated during the operation of the reactor. But again, since Phase II low power testing results in insignificant power levels in the reactor, there will be little, if any, radioactive liquids in the radwaste tank should such a rupture occur. Thus, even the minimal consequences already described in the FSAR for the design basis event would be further reduced under these low power testing conditions. For each of these events, the review concluded that the consequences are significantly

less severe for any event occurring during the cold functional criticality testing than for the event analyzed in Chapter 15. To summarize, because of the extremely low power levels reached during this testing phase, fission product inventory in the core will be only a small fraction of that assumed for the Chapter 15 analyses. As indicated above, the FSAR assumes operation at 100% power for 1000 days in calculating fission product inventory; the inventory during Phase II low power testing will be less than one one-hundred-thousandth (.00001) of the fission product inventory assumed in the FSAR. Consequently, none of the events analyzed in Chapter 15 could result in a release of radioactivity during cold criticality testing that would harm the public health and safety.

(18) The review of Chapter 15 events for Phase II testing and the conclusions reached are unaffected by any unavailability of the TDI diesels. Of the 23 possible Chapter 15 events reviewed, 20 of the events in the FSAR do not require the assumption of loss or unavailability of offsite AC power. See Exhibit 2. Thus, our conclusions for these 20 of the 23 possible events are independent of the status of the diesels.

(19) The three events that do assume loss or unavailability of offsite AC power are (1) pipe breaks inside the primary containment (LOCA) (FSAR § 15.1.34), (2) feedwater

system piping break (FSAR § 15.1.37), and (3) the loss of AC power event (FSAR § 15A.1.19). With respect to these events, the LOCA would be the most limiting event. The review has shown that if a LOCA did occur during the cold criticality testing phase, however remote that possibility, there would be time on the order of months available to restore make-up water for core cooling. At the power levels achieved during Phase II, fission product inventory is very low. At most, decay heat will, on the average, be a fraction of a watt per rod, with no single rod exceeding approximately 2 watts. This is less, roughly, than the heat output of a Christmas tree bulb. It follows that the fuel cladding temperature would not exceed the limits of 10 CFR § 50.46 and Appendix K even after months without cooling and without any source of AC power.

(20) The loss of AC power event (FSAR § 15A.1.19) and the feedwater system piping break (FSAR § 15.1.37) under cold criticality testing conditions do not rely on the diesel generators for mitigation of the event. For these events, since no loss of coolant occurs and the decay heat is minimal, core cooling is achieved, without AC power, using the existing core water inventory and heat losses to ambient, for essentially unlimited periods of time. In any event, as demonstrated in the Schiffmacher Affidavit, AC power sources can and will be

readily supplied to the Shoreham plant even if one assumes the simultaneous loss of all three emergency diesel generators.

(21) In addition to our conclusions that the limiting LOCA event could not approach the limits of 10 CFR § 50.46 and Appendix K during Phase II low power testing, there are other reasons why our findings with respect to the three events that assume loss of AC power are independent of the availability of the TDI diesels. The LOCA (pipe break inside containment) and the feedwater system piping break postulate the double ended rupture of a piping system. Because the reactor will be at essentially ambient temperature and atmospheric pressure during Phase II, it is extremely unlikely that such a pipe break would ever occur. In fact, the NRC Staff does not require double ended ruptures to be postulated for low temperature and low pressure systems in safety analyses. Thus, these events are much less likely during cold criticality testing than during normal operation.

(22) The review of Chapter 15 events for cold criticality testing indicates that performance of these activities at Shoreham involves essentially no risk to the public health and safety. This conclusion is not affected by any postulated diesel unavailability. In fact, even if AC power were not available for extended periods of time, fuel design limits and

design conditions of the reactor coolant pressure boundary would not be approached or exceeded as a result of anticipated operational occurrences, and the core would be adequately cooled in the unlikely event of a postulated accident.

Phases III and IV:
Low Power Testing Up To 5% of Rated Power

(23) These aspects of low power testing will include operation of the plant at power levels up to 5% of rated power. Details of the testing to be performed during this phase of operation are described as Phases III and IV in the Notaro Affidavit.

(24) The review of the 38 Chapter 15 events for these phases of low power testing operations revealed that two of the events in Chapter 15, generator load rejection (FSAR § 15A.1.1) and turbine trip with generator breaker failure (FSAR § 15.1.2) cannot occur because the generator will not be connected to the grid during these phases of testing. A third event, the cask drop, is precluded by design as stated in FSAR § 15.1.28. See Exhibit 3.

(25) Of the remaining 35 events that can occur during this phase of operation, 31 of the events do not assume loss or unavailability of AC power. For each of these 31 events,

operation of the plant up to 5% of rated power will be bounded by the Chapter 15 analysis. Since the Chapter 15 analysis considers all possible phases of plant operation, it follows that operation at 5% can result in consequences less severe than those analyzed in Chapter 15. For example, the turbine trip event (FSAR § 15A.1.2) assumes that the limiting event occurs with the reactor operating at 105% of rated steam flow coupled with failure of the turbine bypass valves to open. Even this limiting event does not result in any fuel failures. FSAR § 15A.1.2 specifically notes that turbine trips at power levels less than 30% of rated power are bounded by the limiting analysis. Another example is the loss of feedwater heating event (FSAR § 15A.1.8). This event assumes continuous operation of the feedwater system and the most severe possible loss of feedwater heating, resulting in the injection of colder feedwater. For operation at power levels less than 5%, the impact of lost feedwater heating is minimal because of the low feedwater flow. Since these analyses are not required to assume the absence of AC power, potential unavailability of the TDI diesels has no effect on the assessment of these events.

(26) Not only are the results of these 31 events bounded by the Chapter 15 analysis, the consequences of these events are also less than the consequences stated in the FSAR.

First, the power limitations during low power testing up to 5% power, the fission product inventory in the core will not exceed 5% of the values assumed in the FSAR. In fact, because of the intermittant type of operations conducted during low power testing, equilibrium fission product inventory for even 5% power is unlikely to be achieved. This low fission product inventory reduces risk in two ways: (a) the amount of decay heat present in the core following shutdown is substantially reduced, and (b) the amount of radioactivity that could be released upon fuel failure is substantially reduced.

(27) The second factor contributing to the significantly lower risk during low power operation is the increased time available for preventive or mitigating action should such action be deemed desirable by the operator. Longer time is available because the limited power levels mean that it takes longer for the plant to reach setpoints and limits. For example, on loss of feedwater (FSAR § 15A.1.18), the water level in the reactor will decrease at a slower rate than if the event occured at 100% power. This gives the operator more time to act manually to restore feedwater before an automatic action takes place. Similarly, in the loss of condenser vacuum event (FSAR § 15.A.1.21), the operator will have more time to identify the decreasing vacuum and to take steps to remedy the

situation before automatic actions such as turbine trip, feedpump trip or main steam isolation occur. Another example is the main steam isolation valve closure event (FSAR § 15A.1.4). At five percent power, the amount of heat produced upon isolation of the reactor vessel (which is followed by a reactor scram) results in a much slower pressure and temperature increase than would be experienced at 100% power. This gives the operator more time to manually initiate reactor cooling rather than relying on automatic action. In effect, the operator may end the transient before there is any substantial impact on the plant.

(28) The third factor contributing to the significantly lower risk during low power testing is the reduction in the required capacity for mitigating systems. Because of the lower levels of decay heat present following operation at 5% power, the demand for core cooling and auxiliary systems is substantially reduced, permitting the operation of fewer systems and components to mitigate any event. It follows that the AC power requirements for event mitigation are substantially reduced for 5% power operation as compared to 100% power operation.

(29) As already noted, only four of the events analyzed in Chapter 15 require the assumption of the

unavailability of offsite AC power for operation during Phases III and IV. Of these four events, the loss of coolant accident is the most limiting event. The Chapter 15 LOCA analysis assumes the unavailability of offsite AC power. This is a conservative licensing assumption. In fact, as described in detail in the Schiffmacher Affidavit, there are multiple sources of AC power available to the Shoreham site (e.g., emergency diesel generators, two normal sources of offsite power, blackstart gas turbines at Holtsville, Southhold, and East Hampton, a blackstart gas turbine on the Shoreham site, and mobile diesel generators). Thus, AC power will be available at Shoreham to mitigate a loss of coolant accident during low power operations up to 5% rated power. In the unlikely event offsite AC power is lost, it can be restored within sufficient time to prevent exceeding the limits of 10 CFR § 50.46 and Appendix K. GE has determined that for 5% power so long as reflooding of the core has occurred within approximately one hour, § 50.46 criteria will be met.2/ As the Schiffmacher Affidavit demonstrates, power can be restored to Shoreham within minutes. An evaluation has been performed to assure the adequacy of containment isolation in the event AC power sources

---

2/ As shown in the Exhibit 4 below, lower power levels will result in more time to restore power and core cooling for a postulated LOCA. Thus, for 1% power approximately 5 hours are available.

cannot provide immediate isolation in a LOCA. Based upon the results of this evaluation, we have concluded that through the use of appropriate manual action, containment isolation can be accomplished in a timely manner.

(30) For the other three events, (1) loss of AC power (FSAR § 15A.1.19), (2) pipe break outside containment (PBOC) (steam line break accident) (FSAR § 15.1.35) and (3) feedwater system piping break (FSAR § 15.1.37), the reactor would automatically isolate. This isolation is not dependent upon the availability of AC power. For all three events, both HPCI and RCIC would be available to provide reactor coolant makeup. Given the heat capacity of passive heat sinks such as structural steel, suppression pool cooling would not be required for about 30 days. Therefore, there is ample time for AC power to be restored. Furthermore, assuming loss of offsite power in the context of pipe breaks outside containment (main steam line break accident and feedwater system break accident) is a conservatism which stems from the PBOC analysis methodology. That methodology requires the assumption of a loss of offsite power for pipe breaks which result directly in a plant trip of the turbine generator system or reactor protection system. Notwithstanding grid stability analyses, it is assumed that plant trips could cause perturbations of the grid, resulting in the

loss of offsite power. For operation at 5% power or less, however, the turbine generator is not connected to the grid, and therefore any assumption of induced perturbation to the offsite grid is not valid.

(31) Based on our review of Chapter 15, operation of the plant during low power testing up to levels of 5% of rated power poses no undue risk to the public health and safety. In fact, any risk is substantially less than that already found to be acceptable by the NRC Staff in its review of Chapter 15. Even if the Shoreham TDI diesels are assumed to be unavailable, there is ample assurance that fuel design limits and design conditions of the reactor coolant pressure boundary will not be exceeded as a result of anticipated operational occurrences, and that the core will be cooled and containment integrity and other vital functions will be maintained in the event of any postulated accident.

____
Glenn G. Sherwood

____
Atambir S. Rao

____
Eugene C. Eckert

STATE OF __________)
) To-wit:
COUNTY OF _________)

Subscribed to before me this __ day of March, 1984.

____
Notary Public

My commission expires: ____________________________

FUEL LOAD AND PRECRITICALITY TESTING

	Chapter 15 Event	Event Category
1.	Generator Load Rejection	*
2.	Turbine Trip	*
3.	Turbine Trip with Failure of Generator Breakers to Open	*
4.	MSIV Closure	*
5.	Pressure Regulator Failure - Open	*
6.	Pressure Regulator Failure - Closed	*
7.	Feedwater Controller Failure - Maximum Demand	***
8.	Loss of Feedwater Heating	*
9.	Shutdown Cooling (RHR) Malfunction - Decreasing Temperature	***
10.	Inadvertent HPCI Pump Start	*
11.	Continuous Control Rod Withdrawal During Power Range Operation	*

* Event not possible.

** Component operation possible but Chapter 15 phenomena cannot occur.

*** Event possible but no consequences.

12.	Continuous Rod Withdrawal During Reactor Startup	***
13.	Control Rod Removal Error During Refueling	***
14.	Fuel Assembly Insertion Error During Refueling	***
15.	Off-Design Operational Transients Due to Inadvertent Loading of a Fuel Assembly into an Improper Location	*
16.	Inadvertent Loading and Operation of a Fuel Assembly in Improper Location	*
17.	Inadvertent Opening of a Safety/Relief Valve	*
18.	Loss of Feedwater Flow	***
19.	Loss of AC Power	***
20.	Recirculation Pump Trip	**
21.	Loss of Condenser Vacuum	*
22.	Recirculation Pump Seizure	**
23.	Recirculation Flow Control Failure - Decreasing Flow	**
24.	Recirculation Flow Control Failure With Increasing Flow	**
25.	Abnormal Startup of Idle Recirculation Pump	**
26.	Core Coolant Temperature Increase	***
27.	Anticipated Transients Without SCRAM (ATWS)	*
28.	Cask Drop Accident	*
29.	Miscellaneous Small Releases Outside Primary Containment	***

30.	Off Design Operational Transient as a Consequence of Instrument Line Failure	***
31.	Main Condenser Gas Treatment System Failure	*
32.	Liquid Radwaste Tank Rupture	***
33.	Control Rod Drop Accident	***
34.	Pipe Breaks Inside the Primary Containment (Loss of Coolant Accident)	***
35.	Pipe Breaks Outside Primary Containment (Steam Line Break Accident)	*
36.	Fuel Handling Accident	***
37.	Feedwater System Piping Break	***
38.	Failure of Air Ejector Lines	*

Exhibit 2

COLD CRITICALITY TESTING

	Chapter 15 Event	Event Category	Assumes Unavailability of Offsite AC
1.	Generator Load Rejection	*	N/A
2.	Turbine Trip	*	N/A
3.	Turbine Trip with Failure of Generator Breakers to Open	*	N/A
4.	MSIV Closures	*	N/A
5.	Pressure Regulator Failure - Open	*	N/A
6.	Pressure Regulator Failure - Closed	*	N/A
7.	Feedwater Controller Failure - Maximum Demand	**	No
8.	Loss of Feedwater Heating	*	N/A
9.	Shutdown Cooling (RHR) Malfunction - Decreasing Temperature	**	No
10.	Inadvertent HPCI Pump Start	*	N/A
11.	Continuous Control Rod Withdrawal During Power Range Operation	*	N/A

---

* Event not possible.

** Event possible but essentially no consequences.

12.	Continuous Rod Withdrawal During Reactor Startup	**	No
13.	Control Rod Removal Error During Refueling	**	No
14.	Fuel Assembly Insertion Error During Refueling	**	No
15.	Off-Design Operational Transients Due to Inadvertent Loading of a Fuel Assembly into an Improper Location	**	No
16.	Inadvertent Loading and Operation of a Fuel Assembly in Improper Location	**	No
17.	Inadvertent Opening of a Safety/Relief Valve	*	N/A
18.	Loss of Feedwater Flow	**	No
19.	Loss of AC Power	**	Yes
20.	Recirculation Pump Trip	**	No
21.	Loss of Condenser Vacuum	*	N/A
22.	Recirculation Pump Seizure	**	No
23.	Recirculation Flow Control Failure - Decreasing Flow	**	No
24.	Recirculation Flow Control Failure With Increasing Flow	**	No
25.	Abnormal Startup of Idle Recirculation Pump	**	No
26.	Core Coolant Temperature Increase	**	No
27.	Anticipated Transients Without SCRAM (ATWS)	**	No
28.	Cask Drop Accident	*	N/A
29.	Miscellaneous Small Releases Outside Primary Containment	**	No

30.	Off Design Operational Transient as a Consequence of Instrument Line Failure	**	No
31.	Main Condenser Gas Treatment System Failure	*	N/A
32.	Liquid Radwate Tank Rupture	**	No
33.	Control Rod Drop Accident	**	No
34.	Pipe Breaks Inside the Primary Containment (Loss of Coolant Accident)	**	Yes
35.	Pipe Breaks Outside Primary Containment (steam line break accident)	*	N/A
36.	Fuel Handling Accident	**	No
37.	Feedwater System Piping Break	**	Yes
38.	Failure of Air Ejector Lines	*	N/A

Exhibit 3

5% POWER

	Chapter 15 Event	Event Category	Assumes Unavailability of Offsite AC
1.	Generator Load Rejection	*	N/A
2.	Turbine Trip	**	No
3.	Turbine Trip with Failure of Generator Breakers to Open	*	N/A
4.	MSIV Closures	**	No
5.	Pressure Regulator Failure - Open	**	No
6.	Pressure Regulator Failure - Closed	**	No
7.	Feedwater Controller Failure - Maximum Demand	**	No
8.	Loss of Feedwater Heating	**	No
9.	Shutdown Cooling (RHR) Malfunction - Decreasing Temperature	**	No
10.	Inadvertent HPCI Pump Start	**	No
11.	Continuous Control Rod Withdrawal During Power Range Operation	**	No

---

* Event cannot occur.

** Bounded by same event at higher power level per FSAR Chapter 15.

12.	Continuous Rod Withdrawal During Reactor Startup	**	No
13.	Control Rod Removal Error During Refueling	**	No
14.	Fuel Assembly Insertion Error During Refueling	**	No
15.	Off-Design Operational Transients Due to Inadvertent Loading of a Fuel Assembly Into an Improper Location	**	No
16.	Inadvertent Loading and Operation of a Fuel Assembly in Improper Location	**	No
17.	Inadvertent Opening of a Safety/Relief Valve	**	No
18.	Loss of Feedwater Flow	**	No
19.	Loss of AC Power	**	Yes
20.	Recirculation Pump Trip	**	No
21.	Loss of Condenser Vacuum	**	No
22.	Recirculation Pump Seizure	**	No
23.	Recirculation Flow Control Failure - Decreasing Flow	**	No
24.	Recirculation Flow Control Failure - With Increasing Flow	**	No
25.	Abnormal Startup of Idle Recirculation Pump	**	No
26.	Core Coolant Temperature Increase	**	No
27.	Anticipated Transients Without SCRAM (ATWS)	**	No
28.	Cask Drop Accident	*	N/A
29.	Miscellaneous Small Releases Outside Primary Containment	**	No

30.	Off Design Operational Transient as a Consequence of Instrument Line Failure	**	No
31.	Main Condenser Gas Treatment System Failure	**	No
32.	Liquid Radwaste Tank Rupture	**	No
33.	Control Rod Drop Accident	**	No
34.	Pipe Breaks Inside the Primary Containment (Loss of Coolant Accident)	**	Yes
35.	Pipe Breaks Outside Primary Containment (Steam Line Break Accident)	**	Yes
36.	Fuel Handling Accident	**	No
37.	Feedwater System Piping Break	**	Yes
38.	Failure of Air Ejector Lines	**	No

Exhibit 4

ECCS LOCA EVALUATIONS

			10 CFR § 50.46 Limits		
Core Avg. Power (% of rated)	Peak Rod MAPLHGR (KW/ft)	Time to 10 CFR § 50.46 Limits (min)	PCT (F°) (Limit 2200°)	Local Oxidation (Limit 17%)	Core Wide Oxidation (Limit 1%)
5.0	1.34	55	2200	6.5	less than 0.9
2.5	0.67	124	2200	8.4	less than 1.0
1.25	0.34	285	2100	9.0	1.0
.5	0.13	700	2000	9.0	1.0

ASSUMPTIONS: 10 CFR 50 Appendix K (Standard FSAR Basis)
Initial Conditions Based on Equivalent Core at Designated Core Average Power

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before 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)	)	
	)	

AFFIDAVIT OF WILLIAM J. MUSELER

William J. Museler, being duly sworn, deposes and states as follows:

(1) My name is William J. Museler and my business address is Long Island Lighting Company, Shoreham Nuclear Power Station, P. O. Box 618, Wading River, New York 11792. I am Director, Office of Nuclear, for LILCO, reporting directly to the Vice President, Nuclear. My duties and responsibilities as Director of the Office of Nuclear include the technical direction of the Shoreham diesel generator recovery effort, the coordination of the Company's licensing activities relating to Shoreham, and acting directly for the Vice President, Nuclear, as directed and in his absence.

(2) I have been employed by LILCO since 1973, holding the following positions:

1981-83 Manager of Construction and Engineering responsible for supervision of the UNICO Construction, Engineering and Licensing activities for Shoreham.

1980-81 Assistant Project Manager of Construction responsible for all Shoreham construction activities.

1977-80 Assistant Project Manager for Engineering, Licensing and Cost at Shoreham responsible for supervision of all LILCO and contractor activities in these areas and for establishing Company positions relating to NRC licensing review of the FSAR.

1975-77 Mechanical Construction Engineer at Shoreham responsible for monitoring onsite mechanical effort (e.g., piping, welding, mechanical equipment).

1973-75 Assistant Project Engineer on Shoreham and Jamesport responsible for reviewing base plant design, ensuring the procurement documents reflected appropriate design requirements, and preparing various licensing documents for the FSAR.

(3) Prior to joining LILCO, I served as Deputy Director of the Hydrogen Track Chamber (80") at the Brookhaven National Laboratory, and as an Associate Staff Engineer at Combustion Engineering with development and test reponsibilities associated with HWOCR and PWR systems. I have also worked for EBASCO Services as Project Engineer responsible for all engineering activities associated with the Allens Creek Nuclear Power Station (BWR). I have a Bachelor's Degree in Engineering Science, a Master of Science Degree in Mechanical Engineering, and I

have completed one year of post-graduate work in nuclear engineering at the University of Florida with additional courses in industrial management from the Polytechnic Institute of Brooklyn. I have held AEC Reactor Operator licenses on research reactors at the University of Florida and at Worcester Polytechnic Institute. I am a member of the American Nuclear Society and have served as Chairman of the Long Island Section of the Society.

(4) The purpose of this Affidavit is to set forth the commitments and procedures LILCO has made and will adhere to during specified portions of LILCO's low power testing program (Phases II-IV) in order to provide additional assurance that reliable AC power will always be available to Shoreham during these activities and that challenges to the reactor safety systems will be minimized. As Director, Office of Nuclear, I am authorized to speak on behalf of LILCO with respect to these commitments and procedures for the fuel load and low power testing phases.

(5) The major challenges to Shoreham's offsite power supply fall generally into two categories. The first relates to transients induced by the loss of major generating units on LILCO's system or by outside events transmitted to the LILCO

grid via its interconnections. With respect to these events, the FSAR demonstrates that the LILCO grid will remain stable assuming the loss of the largest LILCO generating unit. FSAR § 8.2.2.2. This analysis uses the Northport Station, which consists of four separate units (Units 1-4) at 340 MW each. It is extremely unlikely that all four units would be lost in a single event, as is assumed in the FSAR analysis. Therefore the severity of the analyzed transient is unlikely ever to be experienced. Moreover, procedural and physical modifications to LILCO's system have greatly reduced the already unlikely possibility of losing offsite power to Shoreham as a result of transients initiated through LILCO's interconnections. See Schiffmacher Affidavit generally and especially paragraph 10.

(6) The second general category of challenges to Shoreham's offsite power supply consists of weather and seismic related events. The frequency and severity of these events for the Shoreham area are discussed in FSAR §§ 2.3, 2.4 and 2.5. As stated in FSAR §2.3.1.3, the probability of a tornado striking the site is one in 23,200 years. FSAR §2.5.2.5.7 notes that the site is located in an area of low seismicity. In addition, as stated in the the FSAR, it is estimated that the maximum earthquake intensity experienced at the site has been IV-V (Modified Mercali scale). Id. An intensity V (MM)

earthquake can be correlated to a maximum horizontal ground acceleration of 0.03g which is significantly less than the design basis earthquake acceleration of 0.2g.

(7) In order to provide added assurance of safety during the initial criticality and low power testing Phases II, III and IV, LILCO has committed to initiate procedures immediately to place the reactor in a cold shutdown condition in the event of any of the following:

(a) a "hurricane warning" for the Shoreham area issued by the National Weather Service;

(b) a "tornado warning" for the Shoreham area issued by the National Weather Service;

(c) a "severe storm warning" for the Shoreham area issued by the National Weather Service;

(d) a prediction for the Shoreham area by the National Weather Service of abnormally high tides greater than 5 feet above mean high water within 24 hours;

(e) an indication of seismic activity of .01g on the Shoreham seismic monitors;1/

(f) the outage of two of the four LILCO interconnections to Consolidated

---

1/ The Shoreham seismic monitor alarms at this level (.01g), which is only 10% of the level currently requiring the initiation of shutdown procedures. This level of seismic activity is also only 5% of the SSE seismic activity.

Edison and the New England Power Grid; and

(g) a low electrical frequency condition which causes an alarm on the LILCO transmission system.

These commitments provide added assurance that cold criticality and low power testing up to and including 5% (Phases II, III and IV) will be accomplished under conditions optimum for ensuring the highest reliability of the AC power supply to Shoreham and the minimum risk of having a loss of AC power while the reactor is critical.

(8) In addition, with regard to alternative sources of AC power for Shoreham, LILCO has committed to, and will ensure that, the following operational steps are taken to provide yet additional assurance of AC power reliability for Shoreham during Phases III and IV of low power testing. LILCO will:

(a) demonstrate on a biweekly basis through an actual test that the Holtsville blackstart gas turbines can supply power to Shoreham in less than 15 minutes;

(b) demonstrate on a biweekly basis through an actual test that the 20 MW gas turbine at Shoreham can be manually started, synchronized and loaded to at least 13 MW on the grid;

(c) demonstrate on a monthly basis that the 20 MW gas turbine at Shoreham will start automatically on a loss of grid voltage signal;

(d) demonstrate on a biweekly basis that the East Hampton and Southhold gas turbines can be manually started, synchronized and loaded to at least 50% capacity on the grid; and

(e) demonstrate on a biweekly basis that at least 3 of the 4 mobile diesel generators on site can be manually started and operated at rated speed.

(9) If any one of the surveillance tests described in paragraph 8 are unsuccessful, corrective action will be taken within 72 hours or the plant will immediately initiate procedures to place the reactor in a cold shutdown condition.

(10) As described in Mr. Schiffmacher's affidavit, LILCO has provided more than the number of offsite power sources required by regulation. Importantly, some of the supplemental offsite power sources provided by LILCO are, in fact, located onsite at Shoreham.

(11) During Phases III and IV, of the low power testing, LILCO further commits that Shoreham plant will not be operated until the three TDI diesel generators at Shoreham have completed their preoperational test program as well as subsequent inspection and refurbishment in accordance with LILCO's enhanced maintenance program. During these phases, LILCO will comply with all applicable onsite power technical specifications. The

technical specifications contain requirements for demonstrating operability of the AC power sources (including the TDI diesels) or shutting down the plant when portions of the offsite power supply or the diesels are inoperable. For example, if one diesel or one offsite power circuit is unavailable, LILCO must demonstrate that one diesel is operable by starting it within one hour and then once every 8 hours thereafter. If the inoperable diesel or offsite circuit is not restored within 72 hours, the plant must be in hot shutdown within the next 12 hours and in cold shutdown within the following 24 hours. Other requirements exist for the unavailability of various combinations of power sources. The technical specifications also contain surveillance testing requirements for the diesels, the frequency of which is related to the performance of the diesels in previous tests. Thus, compliance with technical specifications will ensure that the TDI diesels are tested on a schedule consistent with their demonstrated in-service reliability.

(12) In summary, during appropriate phases of the low power test program, LILCO will establish additional administrative procedures relative to reactor shutdown in the event of a potential challenge to the offsite power system; will establish, through periodic testing, that the supplemental offsite power supplies to Shoreham are reliable during this low power

testing period; and will adhere to the appropriate technical specifications for the TDI diesels as indicated above. These additional measures will further ensure that the operation of the Shoreham Nuclear Power Station for fuel loading and operation up to 5% thermal power (Phases II-IV) will pose a negligible risk to the health and safety of the public.

____
William J. Museler

STATE OF NEW YORK)
) To-wit:
COUNTY OF SUFFOLK)

Subscribed and sworn to before me this ____ day of March, 1984.

____
Notary Public

My commission expires: ______________________.