

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-4
)	(Low Power)
(Shoreham Nuclear Power)	
Station, Unit 1))	

TESTIMONY OF WILLIAM J. MUSELER

1. Q. Please state your name and business address.

A. 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.

2. Q. What is your occupation?

A. I am currently Director, Office of Nuclear, for LILCO, reporting directly to the Vice President of Nuclear. I was recently appointed as Assistant Vice President of Electric Operations for LILCO, a position I will assume late in the second quarter of this year.

3. Q. What are your responsibilities as Director, Office of Nuclear?

A. 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.

4. Q. Please describe your occupational history with LILCO.

A. I have been employed by LILCO since 1973, holding the following positions:

1981-83 Manager of Construction and Engineering responsible for supervision of the Unified Construction Organization (UNICO) construction, engineering and licensing activities for Shoreham.

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

1979-80 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 Final Safety Analysis Report (FSAR).

- 1975-77 Mechanical Construction Engineer at Shoreham responsible for monitoring the onsite mechanical effort (for example, piping, welding, mechanical equipment, and the like)
- 1973-75 Assistant Project Engineer at 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.

5. Q. What was your occupational history prior to joining LILCO?

A. 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 responsibilities associated with Heavy Water Moderated Organic Cooled Reactor (HWOCR) and Pressurized Water Reactor (PWR) systems. I have also worked for EBASCO Services as Project Engineer responsible for all Architect/Engineer design and engineering activities associated with the Allens Creek Nuclear Power Station, a boiling water reactor (BWR).

6. Q. What is your educational background?

A. I have a Bachelor's Degree in Engineering Science from Pratt Institute, Master of Science Degree in Mechanical Engineering from Worcester Polytechnic Institute, and I have completed one year of post-graduate work in nuclear engineering at the University of Florida with additional courses in industrial management at 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.

7. Q. Are you a member of any professional societies or organizations that bear on your qualifications as an expert in the operation of a nuclear power station?

A. I am a member of the American Nuclear Society and have served as Chairman of the Long Island Section of the Society. I have also been a member of the Construction Committee of the Edison Electric Institute.

8. Q. Through your experience, have you become familiar with the design, construction and intended method of operation of the Shoreham Nuclear Power Station?

A. Yes.

9. Q. What is the purpose of your testimony?

A. The purpose of this testimony is to set forth the commitments and procedures LILCO has made and will adhere to during Phases II-IV of LILCO's low power testing program described in LILCO's Supplemental Motion for Low Power Operating License. These commitments and procedures will further minimize the already remote possibility that any loss of AC power will occur and adversely affect operation of the plant from a safety standpoint. As Director, Office of Nuclear, I am authorized to speak on behalf of LILCO with respect to these commitments and procedures.

10. Q. Why is LILCO making these commitments?

A. 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 promptly to place the reactor in a cold shutdown condition in the event certain natural phenomena are threatened or other conditions exist on LILCO's grid that might jeopardize the availability of offsite AC power to Shoreham.

11. Q. What are the conditions that might jeopardize the availability of offsite power to Shoreham?

A. The principle possibilities fall generally into two categories. The first category relates to disturbances induced by the loss of major generating units on LILCO's system or by events outside the LILCO system transmitted to the LILCO grid via its interconnections with other power grids. With respect to transients induced by the loss of major generating units on LILCO's system, the FSAR demonstrates that the LILCO grid will remain stable assuming the loss of the Northport Station, LILCO's largest generating unit. FSAR § 8.2.2.2. The Northport Station actually consists of four separate units at 370 MW each. It is, therefore, extremely unlikely that all four units would be lost in a single event as is assumed in the FSAR analysis. Therefore, a disturbance as severe as that postulated in the FSAR is unlikely ever to be experienced. In addition, procedural and physical modifications to LILCO's system including numerous blackstart gas turbines at diverse locations and procedures giving mandatory priority for the supply of AC power to

Shoreham have greatly enhanced the ability to supply power to Shoreham in the unlikely event that offsite power is lost as a result of a disturbance initiated through LILCO's interconnections. These procedural and physical modifications to the LILCO system are described in the testimony of William G. Schiffmacher.

The second category consists of weather and seismic related events. The possible 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 also notes that the site is located in an area of low seismicity. As stated in the FSAR, it is estimated that the maximum earthquake intensity experienced at the site has been IV-V (Modified Mercalli scale). Id. An intensity V (MM) earthquake can be correlated to a maximum horizontal ground acceleration of approximately 0.03g which is substantially less than an earthquake acceleration of 0.2g that is the design basis for Shoreham.

Although these possible events are not likely to cause a complete loss of offsite power, LILCO will take the added steps described below to reduce the risk of loss of offsite power below that which is acceptable for normal full power operations.

12. Q. Under what conditions will LILCO be committed to initiate cold shutdown?

A. LILCO will initiate steps to place the plant 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 watch" or a "severe thunderstorm watch" for the Shoreham area issued by the National Weather Service;
- (c) a "winter storm watch" for the Shoreham area issued by the National Weather Service, including ice storms;
- (d) a coastal flood warning for the Shoreham area issued by the National Weather Service predicting that a high tide greater than 5 feet above normal high water will occur within 24 hours;
- (e) an indication of seismic activity of .01g on the Shoreham seismic monitors;
- (f) the outage of two of the four LILCO interconnections to Consolidated Edison and the New England Power Grids;

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

13. Q. What is a "hurricane warning?"

A. A "hurricane warning" is issued by the National Weather Service (NWS) when a storm, which has reached hurricane force (winds greater than 74 miles per hour), is predicted to strike a specific area, generally within twenty-four hours. The ability of the NWS accurately to predict the short-term behavior of hurricanes has improved steadily over the past decade and the storm tracking capability of current weather satellites has further enhanced the accuracy of these predictions.

14. Q. Why does the commitment to initiate cold shutdown in the event of a hurricane warning enhance the safety of operating the plant at low power levels up to 5%?

A. Since it would typically take six hours to place the plant in cold shutdown, LILCO's commitment in this instance ensures that the plant will, in fact, be in a cold shutdown condition well in advance of the actual presence of a threat to offsite power because of an approaching hurricane. Since the reactor is

depressurized and below 200 degrees F. in cold shutdown, the possibility of a LOCA is reduced. Also, a large portion of the decay heat in the core would be dissipated by the time the reactor has been cooled down and prior to any threat to the offsite power source. Therefore, more time would be available to restore power following the loss of offsite power in this case, than the power restoration times discussed in the testimony of Messrs. Dawe, Eckert, Rao and Kascsak.

Accordingly, this commitment to initiate cold shutdown in the event of a hurricane warning both reduces the potential for the worst case design basis accident and significantly extends the time available to restore AC power.

15. Q. What is a "tornado watch?"

A. A "tornado watch" is a weather advisory issued by the NWS when atmospheric conditions in a specified geographic area are favorable for the development of tornados. "Severe thunderstorm watches" are issued on the same basis as "tornado watches". A "watch" is issued as soon as the NWS believes a tornado or

severe thunderstorm might form in a given area. When a tornado or a severe thunderstorm is actually sighted visually or on radar in a given area, the "watch" is upgraded to "warning" status. LILCO will initiate reactor shutdown at the "watch" level. Even at the "warning" status, additional response time is usually available before the actual onset of a tornado or severe thunderstorm in the Long Island area because these storms generally move from west to east and Long Island is on the east end of the New Jersey/New York City/Long Island area usually cited in the advisories.

16. Q. How does this commitment to initiate cold shutdown in the event of a tornado watch or severe thunderstorm watch enhance the safety of operating the plant at low power levels?

A. Since a "tornado watch" is the earliest notification provided by the NWS of a potential tornado or severe thunderstorm threat to the Long Island grid, LILCO's commitment to commence reactor shutdown on the issuance of either of these weather advisories ensures the maximum possible time will be available to achieve plant shutdown in the event a tornado or

thunderstorm actually threatens the offsite power system. Actual experience indicates that many times tornados or thunderstorms will not form at all following issuance of a watch.

Within thirty minutes of commencing plant shutdown, the reactor will be subcritical. It will be cooled down and depressurized at a rate of less than 100 degrees F. per hour; the normal cooldown rate is 60 - 70 degrees F. per hour. Therefore, the commencement of reactor shutdown on the issuance of a tornado or severe thunderstorm watch immediately begins to reduce the already unlikely possibility of an accident, and provides more time for restoration of AC power to the plant in the event the tornado or severe thunderstorm temporarily disables the plant's offsite power sources.

17. Q. What is a "winter storm watch?"

A. A "winter storm watch" is highlighted in forecasts and in special weather statements to cover the possible occurrence of the following weather elements either separately or in combination: blizzard conditions, heavy snow, snow in areas where it is

relatively rare, accumulations of freezing rain or freezing drizzle and/or heavy sleet (ice storm conditions). A "winter storm watch" is the earliest notification by the NWS that a major storm may develop and may affect a specified geographical area of the United States. A "watch" provides longer advance notice of the potential occurrence of a winter storm than a "warning" provides. Generally, a "winter storm watch" is issued twenty-four hours or more in advance of the onset of storm conditions. A recent example of the predictive capability of the NWS occurred on February 10, 11, and 12, 1983. This February winter storm was generally regarded as a rapidly developing one. The New York Times referred to it as a "sneak" storm. Yet, the NWS issued a "winter storm watch" fully thirty-two hours prior to the onset of the storm. Even the "winter storm warning" -- the more imminent notice of the storm's arrival -- was issued eight hours before the onset of the February storm.

18. Q. What is achieved by shutting down the plant when a "winter storm watch" advisory is issued?

A. LILCO's commitment to commence reactor shutdown when a "winter storm watch" is designated permits LILCO to have the reactor in cold shutdown prior to the onset of a storm of this type. The "watch" point at which LILCO has committed to commence cold shutdown of the reactor typically provides twenty-four hours notice, and the plant can achieve cold shutdown in six hours. Since the reactor and its piping systems are depressurized in cold shutdown, the potential for the worst case accident (LOCA) is even more remote. In addition, the time available to restore AC power, in the unlikely event it is lost during the storm, is significantly extended because a large portion of the decay heat in the core would have been dissipated by the time the reactor has cooled down. This commitment to initiate cold shutdown at a winter storm watch demonstrates extreme caution since LILCO has never lost significant transmission network capability due to a winter storm or an ice storm.

19. Q. How much lead time is generally given when the National Weather Service (NWS) predicts abnormally high tides greater than 5 feet above normal high water?

A. The NWS generally provides notice of abnormally high tides of 5 feet above normal high water twenty-four hours in advance of the tide reaching the predicted levels. LILCO's commitment is to commence reactor shutdown at a prediction of high tide of five feet above normal high water. The design basis water level of the Shoreham plant is a still water level of 26 feet above mean low water which is approximately 20 feet above mean high water. This commitment is therefore extremely conservative. Shutting down the reactor at a warning of high tides greater than 5 feet above the normal high water level ensures that the plant will be in cold shutdown prior to any challenge to the plant's flood protection features.

20. Q. In the event of these weather watches or warnings, how long would the plant remain in cold shutdown?

A. When the weather advisory in question is lifted or cancelled, the plant would resume low power testing as authorized by the license.

21. Q. How are these weather advisories received by LILCO?

A. LILCO receives weather information from two sources, the Weather Service Corp. (WSC), a private weather

forecasting firm, and directly from the National Weather Service. WSC provides LILCO with weather forecasts twice daily via telecopier, and also provides telecopied special weather advisories when appropriate. Weather Service Corp. provides all NWS advisories and, therefore, gives LILCO an alternative means of receiving these NWS advisories. NWS forecasts and special weather advisories, including all watches and warnings, are received by LILCO directly when they are issued by the NWS; NWS forecast and special weather advisories are received by LILCO via teletype in the LILCO Electric System Operations Center in Hicksville.

22. Q. Describe the procedure for notifying the plant operator of such weather advisories.

A. The LILCO System Operator has written instructions to notify the Shoreham Watch Engineer immediately whenever a weather advisory of the type discussed earlier is received in the LILCO Electric System Operations Center. The LILCO System Operator is instructed to call the Watch Engineer by dedicated phone link to Shoreham. The System Operator also has the ability to reach the Shoreham Control Room via

regular commercial telephone and by radio. The only information that needs to be communicated is that one of the specified weather advisories has been issued. Shoreham Operating Procedures then require and describe the procedures for the Watch Engineer to commence reactor shutdown after being notified of a specified weather advisory by the System Operator. The procedures for reactor shutdown are described in William Gunther's testimony.

23. Q. You have also stated that LILCO is committed to initiate cold shutdown in the event that the Shoreham seismic monitors indicate seismic activity of .01g. Describe the Shoreham seismic monitor upon which you will rely to measure seismic activity.

A. The Shoreham seismic monitoring system consists of 3 onsite accelerometers for measurement of ground acceleration. These accelerometers are continuously in service and will automatically initiate a magnetic tape data storage system in the event of any ground acceleration in excess of .01g. This automatic initiation will be annunciated through the sounding of an alarm in the main control room at Shoreham. A second alarm will sound in the Shoreham control room if ground acceleration in excess of 0.1g occurs.

24. Q. Why did you choose to commit to shut down at 0.01g?

A. LILCO selected 0.01g as the point to initiate cold shutdown of the reactor because it is well below the conservative Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE) values of 0.1g and 0.2g respectively. The 0.01g acceleration is also well below the largest earthquake on record on Long Island (0.03g). A ground acceleration of 0.01g is only 10% of the OBE acceleration of 0.1g currently requiring the initiation of shutdown procedures. This acceleration (0.01g) is also only 5% of the Safe Shutdown Earthquake acceleration (0.2g). By committing to shut down the plant at a level of seismic activity well below the level normally requiring shutdown, LILCO has decreased the likelihood that a loss of offsite power will occur while the plant is operating.

Moreover, the seismic monitors installed in the plant can detect the smaller tremors that, in some cases, occur in advance of higher level tremors. In those cases where a smaller tremor precedes a larger one, LILCO's commitment to begin cold shutdown at a ground acceleration of 0.01g virtually ensures that Shoreham

would have either commenced or completed the reactor shutdown process prior to the onset of potentially damaging seismic activity. This commitment to initiate cold shutdown at a ground acceleration level of 0.01g, therefore, increases the time available to restore AC power.

25. Q. Are there procedures requiring plant staff to shut down the plant when an alarm indicates a ground acceleration of 0.01g?

A. Yes. The procedure requires the Watch Engineer to commence reactor shutdown when the control room annunciator sounds indicating the 0.01g acceleration has been experienced.

26. Q. When would the plant be restarted following an indication of seismic activity exceeding 0.01g?

A. The plant will not be restarted until LILCO consults with the NRC through its site inspector.

27. Q. LILCO has also committed to initiate cold shutdown when 2 out of 4 interconnections with the New York Power Pool or New England Power Exchange are out of service. What advantage is achieved by requiring cold shutdown under these conditions?

- A. By suspending Phase II, III and IV operations and initiating reactor shutdown when two of the four LILCO interconnections to other electric systems are out of service, LILCO is reducing the exposure of Shoreham for the already remote potential for electrical disturbances on the LILCO system that might result in a temporary loss of the entire LILCO system.

The interties provide one means to compensate for the possible trip of large generating stations on the LILCO system. Other means include the fossil units already operating at the time, 500 MW of gas turbine capacity at Holtsville, the backup gas turbines at each major generating station and the gas turbines at East Hampton and Southold.

28. Q. Does the commitment apply to all outages or only unscheduled outages of the interties?

- A. The commitment applies to any outage of the interties regardless of the cause. LILCO's commitment is to maintain three of the four interties in service during Phases II, III and IV and to commence reactor shutdown if the number of available interties drops

below three. The only exception to this commitment is that in the event one intertie is out of service and a short (less than 8 hours) outage of a second intertie is required for inspection, testing or minor maintenance, LILCO would continue normal Shoreham operations. For these types of short duration scheduled outages the intertie could be restored to service if the need arose.

29. Q. How will this commitment be implemented?

A. Written instructions have been issued to all System Operators and their alternates requiring notification of the Shoreham Watch Engineer or designee whenever the number of available interties drops below three for any reason, subject only to the short term scheduled outage of a second intertie as described in the previous question.

30. Q. Finally, you stated that LILCO has committed to place the plant in cold shutdown in the event of a low electrical frequency condition causing an alarm on the LILCO transmission system. Please describe this alarm.

- A. There is an audible annunciator in the LILCO Electric Operations Center which alarms when the electrical frequency on the LILCO system dips to 59.93 Hz.
31. Q. What additional measure of safety will be gained by placing the plant in cold shutdown in the event of a low frequency alarm?
- A. A low electrical frequency condition indicates that the grid, or a portion of the grid, has the potential for becoming unstable. The initiation of reactor shutdown when a low frequency condition exists ensures that the plant will have commenced reactor shutdown prior to any possible loss of offsite power due to this condition. Again, it provides additional time to restore the AC power to the plant in the event that the low electrical frequency condition actually results in a temporary loss of offsite power to Shoreham.
32. Q. What procedure will be followed to alert plant staff of this condition?
- A. Written instructions to all System Operators and their alternates provide for the System Operator to call the Shoreham Watch Engineer immediately when the

alarm has been sounded and verified, and the frequency either has not recovered for 5 minutes or has reached the second alarm point of 58.8 Hz. The alarm point at 59.93 Hz is the first of three levels at which protective actions are taken to protect the grid and LILCO is, therefore, taking a conservative approach in this area also.

33. Q. Will implementation of these shutdown procedures adversely affect the low power testing which LILCO seeks to conduct?

A. No. These shutdown procedures may lengthen the program somewhat if reactor shutdowns are required as a result of the specified physical phenomena actually occurring, but the added safety margin provided by these commitments is more important than any potential delays.

34. Q. In addition to the safeguards just discussed, does LILCO plan any surveillance testing of its power generation sources capable of supplying AC power to Shoreham?

A. Yes.

35. Q. Describe that surveillance testing.

A. 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 Southold 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 GM EMD diesel generators onsite can be manually started and can supply power to plant systems.

36. Q. What will LILCO do if any of the surveillance testing is unsuccessful?

A. If any one of the surveillance tests described above is 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.

37. Q. Mr. Museler, please summarize your testimony regarding LILCO's commitments.

A. In summary, during Phases II, III and IV of the low power test program, LILCO will establish additional administrative procedures requiring reactor shutdown in the event of a potential challenge to the offsite power system and will establish, through periodic testing, that the supplemental offsite power supplies to Shoreham are reliable during this low power testing period. These measures will further ensure that the operation of the Shoreham Nuclear Power Station for fuel loading and operation up to 5% of rated power will pose a negligible risk to the health and safety of the public.

DOCKETED
LILCO, April 20, 1984

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CERTIFICATE OF SERVICE OFFICE OF SECRETARY
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In the Matter of
LONG ISLAND LIGHTING COMPANY
(Shoreham Nuclear Power Station, Unit 1)
Docket No. 50-322-OL-4
(Low Power)

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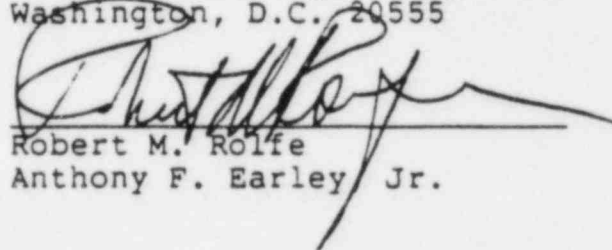
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