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 E. GUNTHER, JR.

1. Q. State your name and business address.

A. My name is William E. Gunther, Jr., my business address is Long Island Lighting Company, Shoreham Nuclear Power Station, P. O. Box 628, Wading River, New York.

2. Q. What is your occupation?

A. I am the Operating Engineer for the Shoreham Nuclear Power Station.

3. Q. What are your responsibilities as Operating Engineer for Shoreham?

A. My duties and responsibilities include direction of the day-to-day operation of station equipment, review and approval of operating procedures, active participation in training programs for licensed and unlicensed operators, and the establishment and maintenance of system performance requirements to support fuel load and power operation.

4. Q. Describe your education and professional background before becoming Operating Engineer for Shoreham.

A. From January, 1975, to April, 1983, I was the Instrument and Controls Engineer for the Shoreheam Nuclear Power Station. In this capacity, I was responsible for the calibration and maintenance of plant instrumentation, the writing of calibration and surveillance procedures, and the supervision of plant technicians.

From April, 1971, to December, 1974, I was assigned to the Electric Production Department of the Long Island Lighting Company. During this period, I was assigned as Maintenance and Controls Engineer, Operating Engineer, and Projects Engineer at three major oil-fired electric generating stations.

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 Reactor Operator (SRO) Certification from the General Electric Company on the Brunswick Unit 2 Boiling Water Reactor (BWR) in 1975 and I completed the General Physics Company BWR simulator program in December 1981 and obtained certification at the Reactor Operator and Senior Reactor

Operator levels. In November 1982, I obtained a Senior Reactor Operator license on Shoreham.

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

A. The purpose of this testimony is to describe the steps involved in the following phases of low power testing for Shoreham which comprise all of the activities LILCO will perform pursuant to the requested low power license.

<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)

Attachment 1 is a copy of my affidavit filed with LILCO's Supplemental Motion for Low Power Operating License. It describes in detail the testing and activities during each phase.

These four phases of low power testing are established milestones in the start-up program. The testing involved is described in Chapter 14 of the FSAR. The FSAR describes five phases for the start-up operations. The fifth is a warranty demonstration normally performed at

100% power and which will not be performed as part of the low power testing.

As Operating Engineer, I will be directly responsible for implementing many of the test procedures performed during the four phases of operation, and, as part of the Plant Staff management team, I will be responsible for reviewing all test results to assure acceptance criteria have been satisfactorily met.

This testimony also describes the procedures to be followed at the plant to restore AC power to Shoreham in the event of a loss of offsite power. As Operating Engineer, I am responsible for the review and approval of these procedures. I have assisted in the development of these procedures and am participating in the development of specific operating crew training.

<u>Phase I</u>

6. Q. What will occur during Phase I?

A. Phase I includes fuel loading and precriticality testing. Fuel loading and precriticality testing involve placing fuel in the vessel and conducting various

tests of reactor systems and support systems. Initial core loading requires the placement of 560 fuel bundles in specified locations within the reactor vessel. The testing during initial core loading takes at least 288 hours to accomplish. This testing includes (a) water chemistry surveillance testing, (b) control rod drive stroke time and friction tests, (c) installation, calibration, and utilization of special start-up neutron instrumentation, and (d) core verification instrument operability check.

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 testing includes (a) gathering local power range monitor (LPRM) sensitivity data, (b) performing zero power radiation surveys for background readings, (c) recirculation system instrument calibration checks, (d) control rod drive scram time testing, and (e) cold main steam isolation valve (MSIV) timing checks.

7. Q. During this phase of testing, does the reactor achieve criticality?

A. No.

8. Q. What steps will be taken to prevent taking the reactor critical?

A. During Phase I, the reactor mode switch is placed in the "Refuel" mode which permits only one control rod to be withdrawn at any time. This hardware interlock prevents the reactor from being taken critical since, by design, it is not possible to achieve criticality by withdrawing only one control rod. The design criteria for the core requires that withdrawal of the "highest worth" rod will not result in criticality. One exception to the one rod out constraint during Phase I is a shutdown margin test which is performed after 144 fuel bundles have been installed. This test proves that subcriticality is maintained following the withdrawal of eight control rods. Subcriticality demonstrates not only that the shutdown margin is met at that time, but also that it will be maintained throughout the loading of the balance of the core.

Administrative procedures applicable during Phase I ensure the interlock is operable by requiring that the reactor mode switch be maintained in the refuel mode during this phase of operation. These procedures provide

step by step instructions to the operators and are performed under the direct supervision of qualified test personnel. These test personnel include LILCO's Reactor Engineering Department who are supported by General Electric's Startup Test Organization and Startup Transient Design and Analysis Group.

Phase II

9. Q. Please describe the activities conducted during Phase II.

A. This phase entails cold criticality testing. It involves a specified control rod withdrawal sequence that results in achieving reactor criticality at extremely low power levels, in the range of .0001% to .001% of rated thermal power. Shutdown of the reactor is achieved 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, that is, the effectiveness of each rod in controlling reactivity. This testing verifies fuel design

calculations and provides important empirical data that is utilized by Reactor Engineering personnel in the fuel management program.

Cold criticality testing requires plant maintenance personnel to install vessel internals in accordance with station procedures and with all refuel floor constraints in place. 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.

10. Q. How long does the reactor remain critical during this phase?

A. The primary purpose of this phase of testing is to verify shutdown margin calculations. As described in Chapter 14 of the FSAR, the shutdown margin will be measured by withdrawing the analytically strongest rod--that is, the rod predicted to result in the highest fission rate--or the equivalent (another rod plus an added reactivity) and one or more additional rods until criticality is reached. This procedure is completed and the

necessary data is obtained within 5 minutes after going critical. At its conclusion, the control rods are reinserted into the core, thereby stopping the reaction and returning the core to subcritical status. Satisfactory completion of this shutdown margin test at the time of the initial fuel loading assures that this criterion is met throughout the first fuel cycle.

11. Q. How is reactor power monitored during this phase?

A. The power level will be indicated by the source range monitoring instrumentation which, in addition to providing indication to the operator, also provides a scram signal to the Reactor Protection System if any one of four monitors reaches 2×10^5 counts per second (cps). Procedural requirements dictate that rod insertion commences when source range monitor indication reaches a level below that setpoint (1×10^5 cps). Corresponding power level when operating in this source range region is within the range of .0001% to .001% of rated power.

Phase III

12. Q. Please describe the activities conducted during Phase III.

A. During this phase of low power testing, reactor heatup and pressurization commence and the power level is taken in progressive steps to rated pressure and temperature conditions (approximately 1% of rated power). Along the way, the heatup and pressurization of the reactor vessel and associated piping systems enable the plant staff to perform important tests relating to thermal expansion of piping and integrated system operation under actual operating conditions. The principal testing accomplished during this phase include (a) High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) System operability demonstrations with manual starts and hot quickstarts, (b) Nuclear Steam Supply System thermal expansion testing, (c) motor operated valve dynamic testing, (d) offgas system performance testing, (e) safety relief valve functional tests, (f) drywell piping vibration data, and (g) control rod drive (CRD) scram time testing. Greater detail about the specific activities is reflected in Attachment 1.

13. Q. How is power monitored during Phase III?

A. During this heatup phase of operation, power will be maintained in range 6 to range 8 on the Intermediate Range Monitor which corresponds to approximately 1% of rated power. This standard BWR nuclear instrumentation is closely monitored by control room personnel to maintain a constant heatup rate until reaching rated conditions. Steady state power level is maintained by the manipulation of control rods as the reactor is pressurized to achieve rated pressure and temperature conditions. Once rated pressure and temperature conditions are obtained as indicated by control room instrumentation, rod withdrawal is terminated to prevent further power increases.

Once control rod withdrawal stops and the reactor is at rated temperature and pressure, the turbine bypass valve, which is sensitive to increases in pressure, will automatically operate to maintain a constant reactor pressure. Pressure sensing instrumentation provides a direct input to the turbine bypass valve to control its position.

Phase IV

14. Q. Please describe the operations to be conducted during Phase IV.

A. 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 control rods so that one main turbine bypass valve automatically opens to establish steam flow such that core thermal power is less than 5% rated thermal power.

The additional power provided at 5% allows sufficient steam to be supplied to demonstrate further the operability of the two high pressure, steam driven injection cooling systems -- HPCI and RCIC -- at full reactor pressure conditions. In addition, power range instrumentation calibrations are performed and system thermal expansion data are obtained during this phase.

Controlled cooldowns and heatups are then performed to demonstrate the stability of RCIC and HPCI controller settings and to verify system thermal expansion data. It is important to perform this testing to verify that

the primary system temperature changes resulting from the heatup and cooldown process have no detrimental effect on HPCI and RCIC performance. In addition, the production of reactor steam at 5% power permits additional testing such as (a) hot hanger sets on plant systems, (b) alignment of the traversing incore probe, (c) calibration of the bottom reactor pressure vessel head drain line flow indicator, and (d) main steam isolation valve (MSIV) functional tests. Attachment 1 contains greater details of the testing to be performed.

15. Q. How will LILCO monitor the power levels to ensure that they do not exceed 5% of rated power?

A. Several methods are used to verify that the power level does not exceed 5% of rated power. The primary method that has been employed by other BWRs during power ascension testing is by controlling the main turbine bypass valve position. A direct correlation exists between valve position and steam flow so that the position of the bypass valve indicates to the operator the amount of steam flow. Maintenance of the #1 bypass valve position below 50% open assures the operator that reactor power is less than 5% of rated. The steam flow resulting from

a 50% open valve position actually corresponds to less than 4% of rated steam flow. To achieve this, the operator constantly monitors the position of the bypass valve and then inserts control rods as required to maintain the bypass valve position at less than 50% open.

Redundantly, other instrumentation such as the power range instrumentation (APRMs) and feedwater flow rate indication provides information allowing the operator to determine that power is maintained below 5% rated power.

Plant Procedures for Restoring AC Power

16. Q. As Operating Engineer for Shoreham, are you familiar with various procedures in effect to ensure that Shoreham will have available sufficient AC power in the event of an emergency to provide core cooling?

A. Yes. I directed the development of the procedures for plant operator action in the event AC power is lost during Phases I, II, III and IV and using AC power sources other than the TDI diesels. I am also responsible for ensuring the proper implementation of these procedures. These procedures include all methods of restoring AC power, both by use of the GM diesels at the site, the 20

MW gas turbine at the site, and all other sources of power under the system operator's control. With respect to the sources under the system operator's control, the plant operator's function is, of course, limited to completing plant procedures to allow those sources to power the plant's emergency systems.

17. Q. Some of the procedures to restore AC power require communication between LILCO's System Operator in Hicksville and Shoreham's plant staff. How does this communication occur?

A. There are three means of communication between the System Operator and the Shoreham control room: a dedicated telephone line, a UHF radio link and the LILCO plant telephone system. The dedicated telephone line and the radio communications link are supplied power from an inverter and would be available despite any loss of AC power. The LILCO plant telephone system is powered from a separate inverter and would also be available regardless of any loss of AC power.

18. Q. What is the procedure in effect for placing the reactor in cold shutdown condition during a hurricance warning, tornado watch, severe thunderstorm watch, winter storm watch or prediction of high tides?

A. Upon notification from the System Operator that an unusual weather condition is predicted, the plant will activate the Emergency Procedure dealing with "Acts of Nature (less than or equal to 5% power)." This procedure provides instruction as to the measures to be taken, including the direction to immediately commence a controlled reactor shutdown. The conditions under which LILCO will implement this procedure are described in detail in William Museler's testimony.

19. Q. Describe the procedure for shutting down the reactor upon an indication of seismic activity of .01g on the Shoreham seismic monitors.

A. If the seismic monitor senses activity in excess of .01g, an alarm will sound in the control room. The control room operator will immediately commence a controlled shutdown of the reactor to achieve a cold shutdown condition. This requirement is specified in a station procedure.

20. Q. Describe the procedure for achieving cold shutdown of the reactor in the event of an outage of 2 of the 4 interconnections with the New York Power Pool and New England Power Exchange or upon a low frequency condition on LILCO's grid.

A. Upon notification from the LILCO System Operator that such conditions exist, subject to the exception for short outages for inspection, testing or minor maintenance as described in William Museler's testimony, the control room operator will initiate a controlled reactor shutdown in accordance with station procedures.

21. Q. In each of these events, how long will it take to achieve cold shutdown of the reactor?

A. In each of these events, the same controlled cooldown procedure is required which, from rated conditions, would result in a cold shutdown condition within 6 hours. Although the Technical Specifications allow 12 hours or more to achieve cold shutdown condition, this assumes that the reactor is operating at full power which, of course, it will not be.

22. Q. When will the reactor be restarted following any of these events?

A. The reactor would not be restarted until the condition which precipitated the shutdown had cleared as verified by the System Operator. Additionally, in the case of a seismic event, restart would not commence until

concurrence had been obtained from the NRC via the resident inspector at Shoreham.

23. Q. What is the procedure for providing AC power to the necessary emergency core cooling systems in the event offsite AC power is lost?

A. In the event that offsite power is actually lost, communications with the System Operator would be established to obtain information regarding the ability to restore power to the Station from sources within the System Operator's control. The System Operator has a number of alternatives available to restore power to the site, including a black start 20 MW gas turbine at the site and other black start gas turbines at Holtsvile, East Hampton, Southhold and Port Jefferson. More than enough power would be available from any one of these sources to meet all plant emergency AC power requirements.

If power restoration cannot be accomplished through the system operator, the control room will activate a station procedure to supply power to the plant's emergency buses from the GM EMD diesel generators. This procedure accomplishes the following:

1. Verifies automatic start of the GM diesels.

2. Emergency bus loads are placed in a manual start to allow flexibility depending on the number of diesels available.

3. The System Operator opens two breakers to isolate the grid from the Normal Station Service Transformer (NSST). This enables power produced from the GM diesels to be dedicated to the emergency bus loads selected by the operator.

4. A field operator, upon direction from the control room, will close the breaker from the mobile diesels to supply power to Bus 11.

5. The control room operator then closes the NSST supply breaker to Bus 11, resets the Emergency Bus Program lockouts, and closes the NSST supply breakers to each of the emergency buses.

6. The control room operator then systematically starts emergency core cooling pumps to restore vessel water level.

24. Q. Do each of these power sources independently supply sufficient power to operate necessary core cooling systems?

A. Yes. For operation at 5% power or less, only some of the equipment on an emergency bus needs to be operated. Even with only one GM EMD diesel (2.5 MW), sufficient capacity is available to operate two independent emergency core cooling subsystems, which require at most 2 MW, either one of which is sufficient to cool the core

at the power levels involved here. The power available from the 20 MW gas turbine at the site is more than sufficient to power the loads necessary following operation at 5% power.

25. Q. Will Shoreham's plant staff procedures and the System Operator's procedures to restore power to Shoreham be implemented simultaneously?

A. Yes. The System Operator and the control room, while in direct communication, will perform their required actions simultaneously up to, but not including, bus energization. As a result, the gas turbines on the system, the 20 MW gas turbine at the site and the GM EMD diesels, will all be started concurrently and be available to provide AC power to the plant.

26. Q. How long will it take to implement these procedures?

A. By actual test, power has been supplied to the station from the Holtsville gas turbines in six minutes and from the 20 MW gas turbine at the site in three minutes. Power restoration to an emergency bus using solely the GM EMD diesel generators can be accomplished within 30 minutes.

27. Q. How will the plant operator determine on which power source to rely?

A. The control room can use various sources to restore power to the emergency loads. Based on information received from the System Operator, the control room will determine the course of action to take; that is, to use sources under the control of the System Operator, including 20 MW gas turbine at the site, or commence use of the GM EMD diesels. The first source available will generally be employed.

28. Q. Is your assessement of the time needed to restore power affected by this procedure?

A. No. Within approximately 10 minutes, the control room operator will have a clear indication from the System Operator of sources available, including the 20 MW gas turbine at the site. Meanwhile, the GM EMD diesels will be at rated speed able to supply bus 11 upon manual closure of a single breaker. A plant operator will have already been dispatched to accomplish this manual closure upon direction by the control room. This procedure can be completed within a total of 30 minutes from the loss of power, regardless of the outcome of the System Operator's attempt to restore power by other means.

29. Q. Based on the use of these procedures you have described, will LILCO be able to supply sufficient AC power to operate necessary cooling systems at Shoreham within 86 minutes in the event of a LOCA?

A. Yes. Power can be restored to the site from many different sources, only one of which is necessary. The source which requires the longest period of time for restoration of AC power is the EMD diesel generators. Even this power source can be made available in 30 minutes.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

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

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.

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(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:

Phase I:	Fuel Loading and Precriticality Testing
Phase II:	Cold Criticality Testing
Phase III:	Heatup and Low Power Testing to Rated Pressure/Temperature Conditions (approximately 1% rated power)
Phase IV:	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.

Phase I: Fuel Loading and Precriticality Testing

(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 550 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.

Phase IV: Low Power Testing (1-5%)

(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 <u>each</u> 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 30 day of March, 1984.

My commission expires: March 30, 1985.

Notary Public

CONNIE-MARIA PARDO
NOTARY PUBLIC, State of New York
No. 52-46153-10
Qualified in Suffolk County
Commission Expires March 30, 1985