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:

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. 52-46158-10
Qualified in Suffolk County
Commission Expires March 30, 1985