TESTIMONY OF LONG ISLAND LIGHTING COMPANY

1. Supplemental Testimony of William E. Gunther and William G. Schiffmacher

2. Testimony of John T. Christian, Ahmed E. Meligi and Robert C. Wiesel

3. Testimony of Thomas W. Iannuzzi and Kenneth A. Lewis

4. Testimony of Cornelius A. Szabo

5. Testimony of Anthony Nozzolillo

6. Testimony of Brian R. McCaffrey

LILCO, July 16, 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-4
	)	(Low Power)
(Shoreham Nuclear Power Station,	)	
Unit 1)	)	

SUPPLEMENTAL TESTIMONY
OF WILLIAM E. GUNTHER
AND WILLIAM G. SCHIFFMACHER
ON BEHALF OF LONG ISLAND LIGHTING COMPANY

Q.1. Gentlemen, you previously testified in this proceeding on April 24 and 25. What is the purpose of this supplemental testimony?

A. (Gunther and Schiffmacher) The purpose of this supplemental testimony is to provide additional details concerning those matters about which we testified on April 24 and 25, to describe further the procedures which will be followed in operating the AC power sources during low power testing and to describe the training and other benefits which will accrue from conducting low power testing early.

Q.2. Mr. Gunther, during your previous testimony on April 24, 1984, certain matters were stricken from an affidavit incorporated with your testimony. Many of those matters pertained to training benefits from the low power testing program proposed by LILCO. Please describe those training benefits.

A. (Gunther) Important hands-on experience is gained by reactor operators during the power ascension program, including the low power test program. Beyond the normal training benefits gained during low power testing, LILCO intends to give the operators additional training during the low power test program. This testimony describes the training benefits that LILCO will gain if low power testing is allowed to proceed.

Fuel loading and precriticality testing (Phase I) involve placing fuel in the vessel and c nducting 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.

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.

Important operator hands-on experience is gained during Phase II, cold criticality testing. Reactor operators must annually perform a minimum of ten reactivity control manipulations. LILCO intends to permit the operators to perform many of these manipulations during the low power test program. In particular, during the cold criticality phase of the low power program, additional time has been allotted in the schedule so that all operating crews will have the experience of taking the reactor critical. 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 this valuable BWR experience.

During the course of fuel loading, precriticality testing, and cold criticality testing (Phases I and II), the plant staff must place in service, operate, test and maintain 41 plant systems. These 41 systems are described at pages 219 and 220 of the April 24, 1984 transcript of this proceeding.

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 5,000 total man-hours of training accomplished and achieved during fuel loading, precriticality testing, and cold criticality testing described above.

Phases III and IV involve heatup of the plant to normal operating temperatures and pressures and testing up to 5% of rated power. First, rod withdrawal sequences are followed to achieve criticality and system heatup from ambient conditions to 150 psig. The plant is then taken in steps to 250 psig, 250 to 350 psig, 350 to 550 psig, 550 to 800 psig and 800 to 920 psig. Once rated conditions are achieved, the power level is increased in progressive steps from 1% to 5% of rated thermal power. These activities are described in detail in my prior testimony at pages 221-26 of the April 24, 1984 transcript of this proceeding. Operating personnel and instrumentation and control technicians receive valuable training and experience in the course of these steps.

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 the 54 plant systems described at page 227 of the April 24 transcript. It is important to emphasize again 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 already, LILCO intends to expand the low power testing program. For example, time has been scheduled at the conclusion of Phase IV testing for reactor operators to perform additional reactor heatups. Each operating crew will be given the opportunity to experience plant response to the transients involved with heatup and pressurization of the vessel and operation of important systems such as the High Pressure Coolant Injection (HPCI) and the Reactor Core Isolation Cooling (RCIC) systems. It is estimated that 6,000 man-hours of training will occur during Phases III and IV, in addition to the 5,000 man-hours during Phases I and II.

Q.3. In addition to the training benefits you just described, are there other benefits associated with LILCO's low power testing proposal?

A. (Gunther) Approval of LILCO's low power exemption request is likely to accelerate the time it will take to bring the plant to full power operation. The power ascension test program at Shoreham, which will ultimately result in the plant achieving 100% of rated power, will take 9 to 10 months to complete. This program includes the fuel loading and low power testing effort (Phases I through IV). These four phases will take approximately 2-3 months to complete. Thus, by performing these activities as soon as possible, 2-3 months can be cut off the power ascension timetable because once emergency planning and diesel generator issues are resolved, the test program could proceed to raise power above 5%.

Another important benefit of LILCO's low power proposal is that it may eliminate delays in Shoreham reaching full power operation if problems are encountered during low power testing. Although LILCO does not expect problems and we believe that a 2-3 month schedule is achievable, testing delays are not unknown. Some plants have taken many months to complete low power testing. Thus, by loading fuel and starting low power testing as soon as possible, LILCO may reduce the possibility that testing problems could cause substantial delay in reaching full power.

Q.4. When you last testified, you discussed LILCO's procedures for the restoration of AC power. Has LILCO now finalized these procedures?

A. (Gunther) Yes. A number of procedures have been revised or written to incorporate the supplemental power sources. Included in these procedures are emergency procedures, normal operating procedures, and test procedures:

TP 24.307.04, Bi-Weekly Surveillance Test of GM EMD Diesels;

TP 24.307.07, 20 MW Gas Turbine Monthly Surveillance Test;

TP 24.307.08, 20 MW Gas Turbine Semi-annual Surveillance Test;

TP 23.307.02, GM EMD Operating Procedure;

TP 24.307.05, Semi-annual Testing of GM EMD Diesels;

TP 29.015.03, Restoration of Power with GM EMD Diesels;

SP 29.015.02, Loss of All AC Power (Revised);

SP 23.308.01, Normal Electrical Distribution System (Revised);

SP 23.309.01, Emergency Electrical Distribution System (Revised);

TP 85.84042.3, GM EMD Diesel Electrical Functional Test;

TP 85.84042.1, GM EMD Diesel Mechanical Functional Test.

(Schiffmacher) As discussed on April 24 and 25, no procedures for the system operator to route power to Shoreham need be formally established other than the order to make Shoreham the first priority in restoring power. The System Operator's function is to route power to Shoreham through the best and fastest means available to him and he will do so based on the circumstances facing him in the event of an outage. Nevertheless, certain procedures have been established for restoration of power to Shoreham.

Q.5. Mr. Gunther, have the procedures you mentioned been communicated to the plant staff and operators?

A. (Gunther) Yes. Training has been provided to all six operating crews and to management license holders. This training included a detailed description of the EMD diesels and their auxiliaries, and the procedures associated with operating them during surveillance testing and in an emergency condition. As part of this training, a walk-through was conducted so that operating personnel could obtain hands-on experience concerning these engines and their relationship with the Shoreham Station power grid.

The training also covered the surveillance procedures associated with the 20 MW gas turbine. These procedures, required to satisfy the monthly and semi-annual SER surveillance requirements, are implemented in close coordination with the system operator who initiates the test by remotely opening the supply circuit breaker to the Reserve Station Service Transformer (RSST).

Q.6. Have existing plant procedures been revised to reflect availability of EMD diesel generators and the 20 MW gas turbine?

A. (Gunther) Yes. The permanent station procedure for the loss of all AC power has been revised to include an immediate action step that requires the operator to contact the system operator to determine the status of the 20 MW gas turbine. In addition, an indicating light for the 20 MW gas turbine output breaker position and the RSST supply breaker position (Shoreham OCB 640) have been installed in the Main Control Room so that the operator would have direct information regarding the availability of the unit. The RSST supply circuit breaker (Shoreham OCB 640) automatically opens on a loss of offsite power and guarantees that power provided by the 20 MW gas turbine is dedicated to use by the Shoreham station. The operator also has available a new procedure for the loss of all AC power which, among other things, directs the restoration of power using the EMD diesel generators.

Q.7. Have these procedures been tested or drilled?

A. (Gunther) A significant amount of testing has been conducted on all four of the GM EMD diesel generators. This testing has demonstrated the ability of the engines to start automatically on a loss of voltage condition, sequentially synchronize to their output bus, and carry required plant loads necessary to shut down the reactor safely.

Testing has also been conducted on the 20 MW gas turbine. The testing demonstrated the ability of the machine to start automatically and supply power to Shoreham within three minutes.

In addition, on July 2, 1984, tests were conducted and witnessed by the NRC and Suffolk County personnel to demonstrate the procedures utilized to restore power to emergency loads using the supplemental sources installed at Shoreham, namely, the GM EMD diesels and the 20 MW gas turbine. The tests demonstrated the ability of both the EMD diesel generators and the 20 MW gas turbine to supply power to emergency plant loads in a very short period of time.

1. GM EMD Diesel Generator Test

This test demonstrated the capability of the GM diesels to start automatically on a loss of voltage sensed at bus 11. Operating personnel then isolated the NSST from bus 11 (an NSST fault was simulated) and performed the necessary circuit breaker switching to restore power to emergency bus 103 which was deenergized at test initiation. Two RHR pumps were then started and operated at rated flow conditions.

Temporary Procedure 85.84042.3 was used to perform the test with the acceptance criteria being that the plant have at least one emergency core cooling pump at rated flow within thirty minutes of the loss of power condition. Rated flow (10,000 gpm) on the D RHR pump was achieved in eight minutes and twelve seconds, well within the thirty minutes acceptance criteria. A second RHR pump powered from the 103 bus was started and at rated flow within nine minutes of the loss of power initiation. As noted above, this rapid restoration of power was achieved even with the assumption of a fault on the low side of the NSST which required operation of the manual disconnect switch. Restoration would be even more rapid if no fault occurs on the NSST.

All four of the diesels started on the loss of power and three of the four synchronized to their common bus. Engine 403 did not synchronize within its allowed time and returned to an idle condition. This unit remained in a standby mode and the three available engines were lightly loaded carrying the 2100 kw load from the 2 RHR pumps and Bus 113 480 volt loads. Upon a request from the NRC Staff to manually start and synchronize the 403 engine, the test engineer reset the unit fault annunciator which caused a voltage signal in the 402 engine circuit breaker causing it to trip. The 402 trip was followed by a trip of engine 401 on reverse power (as indicated by a relay flag). Throughout this process, engine 404 successfully picked up and carried the entire load of 2100 kw. Engine 403 was manually synchronized to the bus about one minute later. Engines 401 and 402 were available for resynchronization but were left in the standby mode to maximize loading on engines 403 and 404.

2. <u>20 MW Gas Turbine Test</u>

Following the GM EMD diesel test, the plant electrical systems were realigned to permit a test of the ability of the 20 MW gas turbine to supply emergency loads in the event of a loss of offsite power. A loss of power to the RSST was initiated by the system operator opening breaker OCB 640 at Wildwood. The proposed technical specifications included in the Staff's safety evaluation report (SER, Supp. No. 5) call for requiring the gas turbine to start in "2 to 3 minutes" and for operators to perform switching necessary to supply an emergency bus in "5 to 10 minutes." Both acceptance criteria were met in the test. The gas turbine output breaker closed in two minutes and thirty-one seconds of its start signal, and an RHR pump was at rated flow within three minutes and fifty seconds of the loss of power initiation.

Station Procedure TP 24.307.08, which is the six month surveillance test, was utilized for the 20 MW gas turbine test.

Q.8. You indicated that two of the EMD diesels tripped when an attempt was made to reset diesel 403. Please explain.

A. (Gunther and Schiffmacher) Under actual emergency conditions, the 403 engine would not have been manually reset since ample power was available from the three diesels that had synchronized with the bus.

A minor wiring modification is being made to the annunciator reset circuitry to eliminate the possibility of a diesel trip as a result of resetting a unit fault prior to starting a unit. Temporary lifting of leads determined that the source of the engine 402 trip problem was in the reset circuitry. Also, to preclude a repeat of the failure of the 403 engine to synchronize automatically, a second minor modification will be completed that increases the time available for the engines to synchronize. Both of these modifications had been previously identified as a result of preoperational testing but had not been implemented at the time of the demonstration. These modifications were scheduled to be completed prior to turning the EMDs over to the plant staff.

Q.9. You testified previously about the procedures for implementing some of LILCO's commitments to shut down the plant in the event certain situations occurred which could threaten the reliability of offsite power. Have instructions now been issued for plant shutdown in the event of loss of interconnections with other utilities?

A. (Gunther) Yes. A standing order has been issued to instruct the operator to proceed to a cold shutdown condition whenever two of the four interconnections to the New York Power Pool and New England Power Exchange are unavailable. This commitment was described in the te-timony of William Museler. System operators have been directed to notify the Shoreham watch engineer immediately whenever the above conditions are experienced.

Q.10. Has the procedure for tying the 20 MW gas turbine to the necessary emergency power supplies been completed?

A. (Gunther) The GM EMD diesel procedure requires the reactor operator to perform certain switching operations to power the emergency buses that are different from normal operating procedures. Therefore it was appropriate to develop new procedures. Use of the 20 MW gas turbine, on the other hand, requires no different operator actions. The steps in reenergizing the RSST are the same no matter what is the source of power to the RSST. Therefore, no separate procedure is required; the normal operating procedure for restoring an emergency bus from the RSST is available and would be used.

Q.11. You have testified that normally the EMD diesel generators will be connected into the 4 KV buses on the secondary side of the NSST and that power will be routed through the normal switchgear room. Will there be alternative procedures for supplying power from the EMD diesels?

A. (Gunther) The emergency procedure for the restoration of AC power using the GM EMDs uses the NSST supply breakers to the emergency buses so that power to the RSST via the 20 MW gas turbine is still available. It is possible, however, to supply power to an emergency bus by routing power through the RSST supply breakers. Operators are required to be extremely familiar with the plant electrical system and are aware that these alternate means of supplying power are available.

These alternatives have been discussed with the operators in training. In addition, provisions have been made to supply power directly from the EMD diesels to the emergency switchgear.

Q.12. Please describe the alternative rou.ing arrangements to the emergency switchgear.

A. (Schiffmacher) Capability will exist to connect the EMD switchgear to the plant emergency switchgear. This will be accomplished by a cable connection from the EMD switchgear to Emergency Switchgear Room 102. The EMD feed to the normal switchgear room will be disconnected, thereby creating an independent routing of power from the EMD diesel generators to an emergency switchgear room.

Q.13. What is the purpose of this emergency tie-in?

A. (Schiffmacher) In the event that the normal switchgear room is unavailable for the routing of power from the EMD diesels to the plant emergency systems, this emergency tie-in could be used. Added assurance of the availability of AC power would be achieved, for example, because the emergency switchgear room is seismically qualified. Since the EMD diesels can be expected to operate after a seismic event as described in the testimony of Messrs. Christian, Meligi and Weisel, this alternative tie-in of the EMDs to the emergency switchgear room assures the availability of AC power even after a seismic event.

Q.14. Will the raceway for the cable used in the emergency tie-in procedure be seismically supported?

A. (Schiffmacher) It will either be supported in a way that will survive a seismic event or installed after a seismic event.

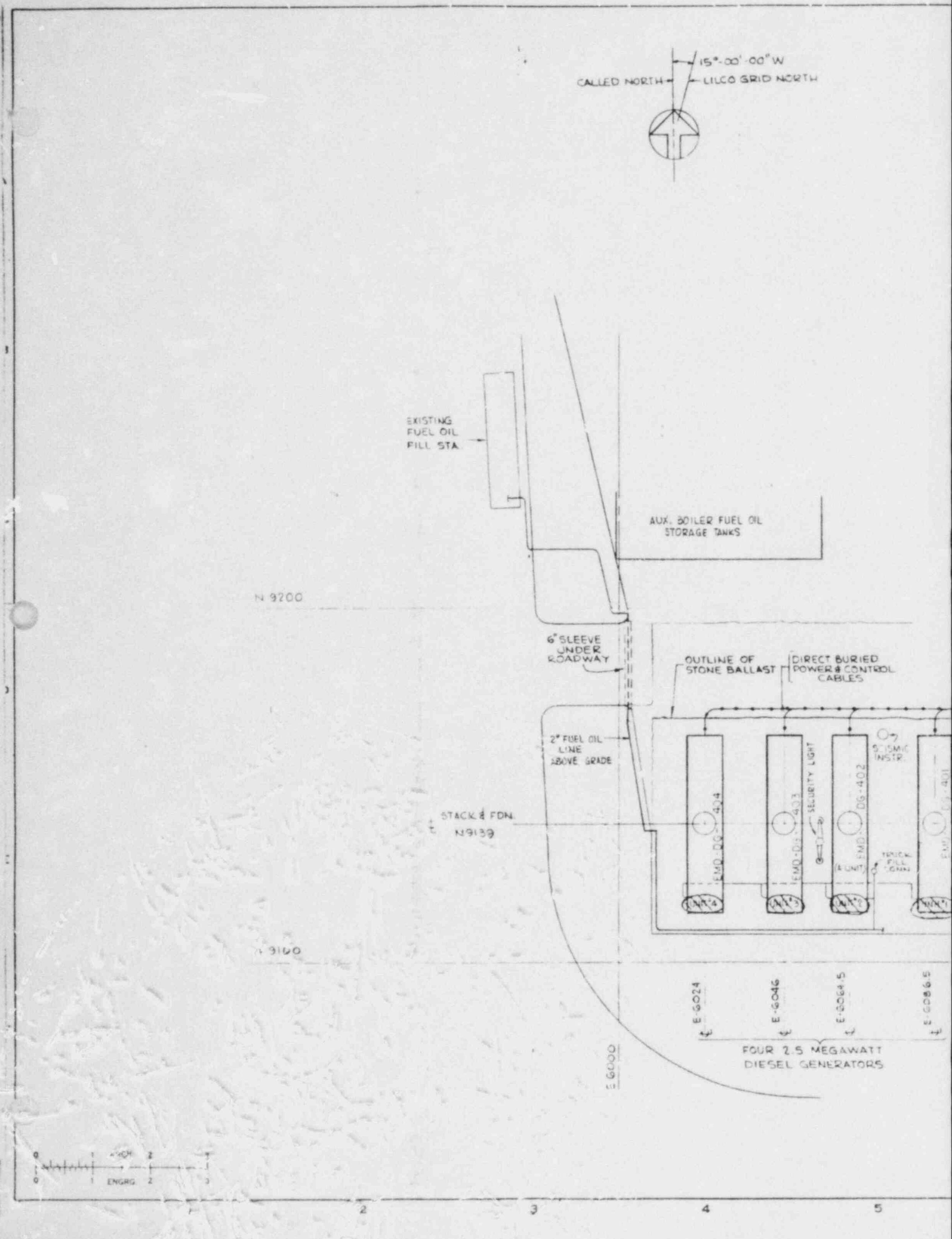
Q.15. What is the status of this emergency tie-in for the EMDs?

A. (Schiffmacher) The conceptual design of modifications necessary to accomplish tie-in has been completed and its feasibility has been verified. Attachment 1 to this Supplemental Testimony is a drawing showing the planned location of this tie-in. For purposes of illustration, the area affected by this tie-in is enclosed by squiggly lines.

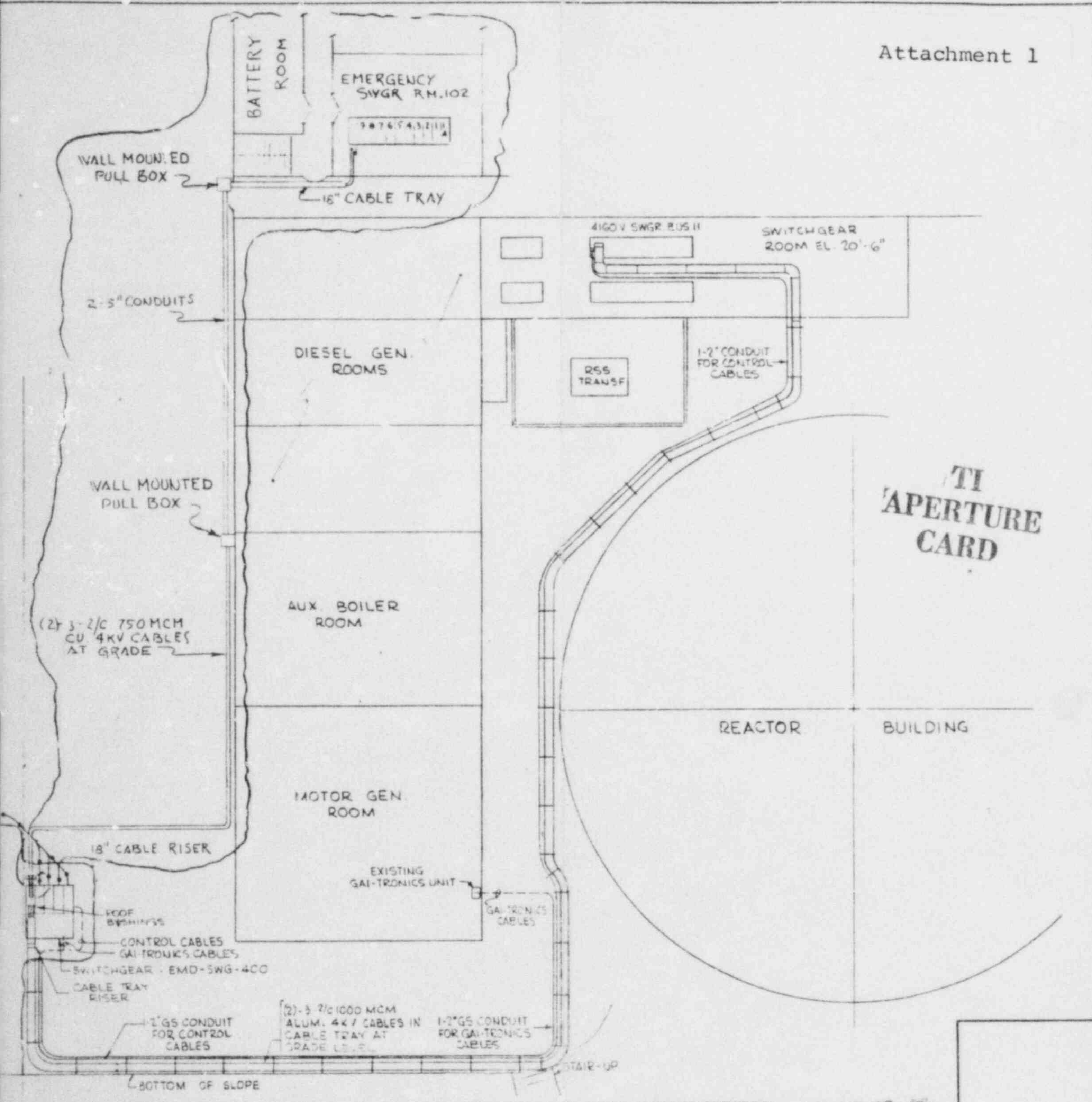
LILCO has not completed all engineering details or the construction. That additional work can be accomplished in approximately 4 weeks. Because this connection would only be used during low power testing if the TDI diesel generators are unavailable, and since the modifications can be accomplished quickly, LILCO believes it more prudent to await a decision on its Application for Exemption before implementing the modifications. If the requested exemption, resulting in a low power license, is granted, LILCO will have selected portions of these modifications completed prior to commencing Phase III of the low power testing program. Other elements of the modification will be installed after a seismic event if this tie-in is needed.

Q.16. Has installation of the EMD diesel generators been completed?

A. (Gunther and Schiffmacher) Yes, the installation is complete. This includes the engines themselves and their tie-in to the normal switchgear bus 11, and the manual disconnect switch located on the low side of the Normal Station Service Transformer (NSST). As of July 10, 1984, several minor modifications remain to the annunciator logic and the automatic synchronizing circuitry. Upon completion of this work, final acceptance testing of the diesels will be performed per approved station procedures. Turnover to the plant operating section is expected by August 1, 1984.


15°-00'-00"W
CALLED NORTH
LILCO GRID NORTH
EXISTING FUEL OIL FILL STA.
AUX. BOILER FUEL OIL STORAGE TANKS
N 9200
6" SLEEVE UNDER ROADWAY
OUTLINE OF STONE BALLAST
DIRECT BURIED POWER & CONTROL CABLES
2" FUEL OIL LINE ABOVE GRADE
SECURITY LIGHT
SEISMIC INSTR.
EMD-DG-404
EMD-DG-403
EMD-DG-402
STACK & FDN. N9139
TRUCK FILL CONN.
N 9100
E-6024
E-6046
E-6064.5
E-6086.5
FOUR 2.5 MEGAWATT DIESEL GENERATORS
E 6000
INCH
ENGRG
2
3
4
5

Attachment 1



REFERENCE DWGS:

F-50238 - FOUND. & GRADING PLAN
F-50239 - FUEL OIL PIPING ARR'G'T
F-50241 - PWR & CONT. CABLE PLAN SH.1
F-50242 - PWR & CONT. CABLE PLAN SH.2
F-50243 - SECT. & DETAILS SH.1
F-50247 - SECT. & DETAILS SH.2
F-50248 - BLOCK DIAG.
F-50249 - CONDUIT & CABLE SCHEDULE
F-50244 - PLAN & DET. INST. 4KV DISC. SW. IN CALVERT BUS-NSS
F-50245 - SECTION A-A
F-50250 - RELAY FUNCTIONAL DIAG.
F-50251 - SWGR. UNIT 11-1B AC & DC ELEM. DIAG.
F-50272 - 2.5MW DIESEL GEN. OUTLINE PLAN & ELEV
F-50273 - 2.5MW DIESEL GEN. CABLE CONNECTIONS

L 3017

S&W 13.12-CO2

NO	DATE	W.O.	DESCRIPTION	BY	CKD	APPD
3	7-11-84	-632	ADD ALTERNATE FEED TO RM 102	EVV		
2	4-25-84	44430-632	ADDED COMPONENT NUMBERS	TK	JC	
1	4-6-84	44430-632	REV CABLE TRAY RUN & ADDED 2" CONDUIT FOR CONTROL CABLES	WR	JC	
0	3-28-84	44430-632	ISSUED FOR CONSTRUCTION	RM	JC	

ALTERNATE AC POWER SUPPLY
DIESEL GENERATOR POWER BLOCK
GENERAL ARRANGEMENT PLAN

SHOREHAM NUCLEAR PWR. STA.
SHOREHAM, N.Y.

LONG ISLAND LIGHTING COMPANY
OFFICE OF ENGINEERING
175 EAST OLD COUNTRY ROAD
HICKSVILLE, NEW YORK

DWN S. DUGAN
DATE 3-18-84
WO 44430-632
F-50240-2
CABINET NO. 24

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