LILCO LONG ISLAND LIGHTING

LONG ISLAND LIGHTING COMPANY

SHOREHAM NUCLEAR POWER STATION

P.O. BOX 618, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

April 11, 1984 SNRC-1036

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

Additional Responses to Staff Questions
Supplemental Motion For Low Power License
Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

Dear Mr. Denton:

This letter furnishes additional responses to the specific topics raised at the March 28 meeting in Bethesda, and in subsequent requests from the staff, stemming from your review of LILCO's Supplemental Motion for a Low Power Operating License.

1. 10 CFR 50 Appendix K Reanalysis

The actual power level and time history of the startup phase of a nuclear power plant is very difficult to predict because of unplanned shutdowns that typically occur during the power ascension test program. However, it is possible to determine the number of hours at a power level corresponding to 5% of core thermal power level. LILCO estimated that 667 hours would be spent at 5% power. This amount of time results in a peak fuel bundle burnup which corresponds to a value less than 200 MWD/metric ton uranium. This fuel burnup (200 MWD/metric ton uranium) was used in an analysis which resulted in the 110 minute allowable time reported in SNRC-1035. General Electric conservatively assumed 200 MWD/metric ton uranium burnup. Therefore, the 110 minute result is conservative with respect to a greater time which could have been calculated by using the estimated burnup.

2. Containment Isolation

The Staff has requested additional information regarding containment isolation in the event of a LOCA with simultaneous loss of all AC power. LILCO has performed an

A001 1/1

evaluation of all containment penetrations to assure adequate isolation without depending on AC power. This review, coupled with additional procedurally closed valves, determined that only two 3/4" valves require prompt closure to preserve containment integrity. In order to ensure containment integrity in a timely manner, an equipment operator will be assigned to the reactor building whenever the reactor vessel is pressurized during phases 3 and 4. His specific assignment, in the event of a station blackout, will be to close two 3/4" valves in the RBCLCW system. This action will prevent an open flow path to the secondary containment in the unlikely event that the RBCLCW system were to be breached inside containment coincident with a LOCA [1]. In any other LOCA event which did not result in breaching the RBCLCW pressure boundary, the RBCLCW system would remain "closed" outside containment and no valve manipulation would be required.

3. <u>Separation of Mobile DG Supply Cables from Station Service Transformers</u>

The staff has requested information on the physical separation of mobile DG supply cables from station service transformers with regard to the potential fire hazard posed by the transformer insulating oil (both Reserve Station Service Transformer (RSST) and Normal Station Service Transformer (NSST)). LILCO has routed the mobile DG cables so as to maximize the separation from both the RSST and NSST. Separation of greater than 20 feet has been maintained except in one area.

Due to the existing physical constraints dictated by building geometry, the routing of the mobile diesel generator supply cables is (at one point) approximately 17.5 feet from the RSST. The cabling is always greater than 20 feet from the NSST. In order to satisfy the intent of the 20 foot separation criteria, a fire barrier will be installed over approximately a 30 foot length where the 20 foot separation does not exist. Both RSST and the NSST have fire detection and automatic deluge fire suppression systems.

[1] This singular event strains credibility in that it not only assumes a LOCA but a LOCA resulting in a "well-aimed" pipe whip or jet impingement damaging the RBCLCW system.

<u>Difference Between East Hampton and Shoreham Gas Turbines, Modifications to Shoreham Gas Turbine</u>

The West Babylon 20MW Gas Turbine (GT) has been relccated to Shoreham's 69 KV Switchyard and will be referred to as the Shoreham Gas Turbine Unit #2. After upgrading, this gas turbine will be virtually identical to the East Hampton GT. Both the Shoreham and East Hampton units are Pratt and Whitney single engine machines, model #FT 4A-8 and FT 4A-9 respectively.

The combustion portion of the engine is an axial-flow turbojet. The low-pressure section is comprised of a front compressor rotor and the second and third stage turbines. The high-pressure section is comprised of the rear compressor rotor and the first stage turbine. The systems are mechanically independent of each other and rotate at different speeds.

The free turbine is not mechanically connected to the gas turbine; it is aerodynamically connected and driven by the gases of combustion. It is governed to rotate at 3600 RPM and mechanically coupled to the shaft of the generator.

The East Hampton unit is a later generation than the Shoreham unit and has additional cooling of the first stage vanes allowing higher operating temperatures thus permitting a higher output of 3 MW.

Major modifications, made at the time of relocation of the West Babylon unit to Shoreham, to increase the unit's overall reliability were as follows:

- The air supply system was replaced with the ACE-507-420 starter pack (essentially the same utilized for the East Hampton GT). This system is a low pressure (500 PSI) system capable of supplying 3 deadline starts. Similar starter packs are operating reliably on other gas turbine units on our system.

- The original fuel control system was replaced with the Hamilton Standard SPC-2A fuel controller. The SPC-2A is a reliable controller that offers the unit broader range of protection. Similar controllers have been operating reliably on other units on LILCO's system. This controller is also utilized on the East Hampton GT.

- The battery system was replaced with a new 125 V, 150 ampere hour battery and a new 50 amp charger.

Installation, Maintenance, Testing and Reliability

EMD-DG's

Morris-Knudsen (M-K) were contracted to perform service and maintenance on all of the EMD D/G units during their 17 years of service at Lynn, Mass. M-K has provided field service reports for 1978 through 1983 for the four units purchased for Shoreham. The field service reports describe the maintenance or service performed on each unit and the operating hours recorded at the time of service.

The installation of these units at Lynn, Massachusetts and at Shoreham were supervised by M-K. Following the installation of the DG's at Shoreham they will be tested by LILCO Plant Staff under the direction of M-K. The testing to be performed will ensure the capability of these units to start deadline and pick up safety related loads in the plant.

Between the years of 1971-1981 all the EMD D/G units had been either overhauled or repowered, therefore; it has been concluded that New England Power's (NEP) availability data is representative for all of these DG's. The average probability of engine unavailability determined using the NEP outage data is .051 (total outage hours/total unit hours). NEP's service contract with M-K included 18 days per year of scheduled maintenance for each diesel engine, yielding an unavailability probability of .049 for a single engine. Therefore, the unavailability probability of .051 is judged to be a reasonable value and demonstrates a high reliability for the engines now in place at Shoreham.

It is conservatively assumed that the total unavailability of a single diesel engine is equal to the starting failure probability plus the average outage probability. Therefore, using the above estimated value, the total reliability per demand is equal to:

$$1 - (Pa + Ps) = 1 - (0.051 + 0.014) = 0.935$$

The overall reliability for a single unit is estimated to be 93.5%.

Gas Turbine

The 20 MW GT was relocated from the West Babylon substation to the Shoreham 69KV switchyard. The unit was completely disassembled and reassembled under the supervision of the LILCO Internal Combustion Division and an outside consultant - Glassman Associates. Tests were performed to verify operability of all subsystems during the installation phase. Subsequent to its installation at Shoreham, the unit has been started and loaded to its full output capability. A deadline blackstart test was carried out and voltage to the Reserve Station Service Transformer was restored within 3 minutes.

Future testing of the unit will consist of an operational base load test of at least 13 MW every two weeks during phases III and IV. In addition, a simulated black start test will be performed monthly.

Maintenance inspections of the Shoreham GT unit while at West Babylon consisted of a hot section inspection every 700 hours. Oil samples were taken annually and sent to a consultant for evaluation. Every two weeks a complete check list of items was inspected. This inspection included battery, charger, air pak, fuel control and starting system.

Description of EMD DG's

These units were manufactured by Electro-Motive Division of General Motors Corporation (Model No. 20-645E4B); each has a weatherproof metal enclosure. The history of each follows:

Engine No.	Hours At UTEX	Hours At Repower	Total Hours on Current Engine (After UTEX or Repower)	Total Hours On Diesel/ Gen. Set
5	6,030	12,932	345	13,277
6	6,552	-	6,281	12,833
7	6,163	13,153	120	13,273
8	8,070	-	4,965	13,035

From this data it can be seen that the engines have relatively low operating hours as compared with a useful life of 40,000 hours, with engines 5 and 7 having very low hours since their last major overhaul.

The UTEX engine is basically a rebuilt engine.

The starting system consists of dual starting electric motors, both of which engage on a start signal. These starting motors are powered from a 112 volt, 420 ampere hour battery with a 50 amp charger on float. The battery was replaced on February 24, 1978, wit' a new Exide 56 cell battery, with a 112 volt, 420 ampere hour rating (eight hour rating).

LILCO will perform an IEEE 450 battery capacity test with a duty cycle representative of that expected by the battery during operation. A 90% capability will be demonstrated.

Battery loading is as follows:

AMPS	Duration
2250	.25 sec.
950	5 sec.
950 → 0	2 sec.

The following is a list of computed battery voltages which resulted from specific currents for specific time durations.

AMP	TIME	VOLTS/CELL
2250	5 sec.	1.0
2130	15 sec.	1.0
1700	90 sec.	1.0
950	300 sec.	1.0

Each DG unit has its own 130 gallon day tank which is filled via one of two redundant fuel transfer pumps located in one of the units. The fuel oil transfer pump is AC powered and is gravity fed from a mobile 9,000 gal. tank. Each engine is equipped with its own engine driven fuel pump and manual fuel priming pump. The governor is a Woodard governor. The units operate as one isochronous unit distributing load evenly between all operating units.

The diesel generator pack is being installed by LILCO Construction under the supervision of Morris-Knudsen (M-K). M-K will be contracted to supervise maintenance of the units when placed in service. M-K is the maintenance contractor of record.

Bi-weekly testing of all four (4) units will include starting and synchronizing to the Plant's 4KV distribution system and loading to at least 50% of their rating.

The emergency starting sequence follows:
Since automatic deadline start is an emergency mode of operation, a start signal is given simultaneously to all 4 units. However, since only one cranking battery is available for all 4 units, a stepping switch selects one unit at a time for cranking. After the first unit has started or has cranked for a preselected period, the switch steps to apply cranking power to the next unit. The starter selector stepping switch provides 3 starting attempts to each unit before locking out any particular unit for failure to start. The first unit to start and reach synchronous speed has its breaker automatically closed onto the mobile diesel 4KV bus. The other 3 units are automatically synchronized onto this 4 KV bus where all four units float until the operator closes the circuit breaker to the Plant 4 KV Bus 11 and emergency buses and commences to pick up load. Each generator is equipped with a set (3) of series booster current transformers (CTS) which enable each generator to handle 12.5 MVA of in-rush for the starting of motors. The four DG's are capable of operating and will operate in parallel as one isochronous unit.

Description of Shoreham 20MW Gas Turbine (Reliability, Starting System, Control, Fuel System)

1. The Shoreham GT Unit #2 is a Pratt and Whitney Model #FT 4A-8 Power Pack Gas Turbine.

2. The operational availability of the East Hampton Gas Turbine for the years 1981, 1982 and 1983 are 97.9%, 98.5 and 98.5% respectively. Operational availability is defined as the ratio of the number of hours the unit is available for service to the total number of hours in the period. Starting reliability for the same unit in 1982 and 1983 are 100% and 96% respectively. In 1982 there were 33 starting attempts with 33 successful. In 1983 there were 51 attempts with 49 successful.

3. The starting system on the Shoreham GT is the ACE-507 Series Air Starting System. This is essentially the same system as the East Hampton GT. It contains a 20 HP, 230 Volt motor, one 275 ft^3 air cylinder and one 1000 PSI 3 stage compressor.

4. The unit contains a new 125V, 150 ampere hour battery with a new 50 amp charger. The battery provides control power for the sequencer, breakers and the DC fuel pump.

5. There are a total of 33 Gas Turbine Units on the LILCO System: 13 General Electric Frame 5 units, 4 General Electric Frame 7 units, 2 Pratt & Whitney Power Packs and 14 Pratt and Whitney Twin Packs. The number of jet engines on the system totals 47. The 14 P&W Twin Packs contain 2 jet engines per unit.

6. The overall starting reliability of the LILCO gas turbine fleet exceeds 90%.

7. The original fuel system on the Shoreham gas turbine was replaced with a Hamilton Standard SPC-2A fuel controller, which is the same as that utilized for East Hampton.

8. The starting sequence of the gas turbine following a loss of power in the 69 KV switchyard is as follows:

   a. Breaker 640 trips and motor operated disconnect switches 616 and 617 open.

   b. The breakers of Shoreham GT's units 1 and 2 trip open.

   c. GT Unit #2 shifts to isolated precise mode and starts via its DC fuel pump.

   d. When the unit reaches 3550 RPM, its main breaker closes. The unit reaches 3600 RPM, and begins powering the RSST via the Air Break Switch #623.

e. Once the unit breaker closes, the AC fuel pump starts. As the pressure builds on the discharge side of the AC fuel pump, the DC fuel oil pump trips automatically. The AC fuel pump supplies fuel over the full operating range of the machine.

LILCO trusts that the above information is responsive to your requests. Should you have any questions please contact this office.

Very truly yours,

R A Kubinak

R. A. Kubinak
Manager, Nuclear Operations Support Department

RWG:ck

cc: C. Petrone
All Parties Listed in Attachment I

ATTACHMENT I

Lawrence Brenner, Esq.
Marshall E. Miller
Elizabeth B. Johnson
Glenn O. Bright
Dr. Peter A. Morris
Atomic Safety and Licensing
Board Panel
U. S. Nuclear Regulatory
Commission
Washington, DC 20555

Dr. George A. Ferguson
Administrative Judge
School of Engineering
Howard University
2300 6th Street, N.W.
Washington, DC 20059

Bernard M. Bordenick, Esq.
David A. Repka, Esq.
U. S. Nuclear Regulatory
Commission
Washington, D. C. 20555
*For Federal Express
7735 Old Georgetown Road
To Mailroom
Bethesda, MD 20814

Mr. James Dougherty
3045 Porter Street
Washington, DC 20008

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

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

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

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

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

Fabian Palomino, Esq.
Special Counsel to the Governor
Executive Chamber, Room 229
State Capitol
Albany, NY 12224