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 O.L.

DIRECT TESTIMONY OF MARC W. GOLDSMITH

ON BEHALF OF SUFFOLK COUNTY REGARDING

SUFFOLK COUNTY CONTENTION NO. 2 - DIESEL GENERATOR RELAYS

April 13, 1982

SUMMARY OUTLINE OF SUFFOLK COUNTY

CONTENTION 2 TESTIMONY*

Suffolk County contends that LILCO has failed to demonstrate adequate means to avoid dirt accumulation in relays located in the diesel generator rooms. Such dirt accumulation, if allowed to persist, could render the diesels inoperable in a loss-of-offsite power event.

The testimony demonstrates that dirt accumulation represents a serious concern for diesel generator reliability. The NRC has specifically acknowledged the problem in NUREG/CR-0660.

LILCO has been cited in the past for permitting dirt accumulation by the NRC. LILCO has now moved to address the problems by committing to various fixes designed to limit dirt accumulation. LILCO has failed, however, to propose and implement maintenance procedures which would ensure over the life of the plant that the potential for dirt accumulation is minimized. LILCO must prepare and implement such procedures, plus effect the other fixes noted in the testimony, before compliance with GDC 17 can be found.

Exhibits*

1. March 9, 1982 letter from LILCO to the NRC Staff.

---

*/ ASLB Memorandum and Order, March 15, 1982, p. 30.

April 13, 1982

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 O.L.
(Shoreham Nuclear Power Station, Unit 1)	)	

DIRECT TESTIMONY OF MARC W. GOLDSMITH

REGARDING SUFFOLK COUNTY CONTENTION 2 -

DIESEL GENERATOR RELAYS

Q Please state your name, address and occupation.

A My name is Marc W. Goldsmith, and my business address is 400-1 Totten Pond Road, Waltham, Massachusetts. I am the President of Energy Research Group, Inc.

Q Would you please describe your professional training and experience, with particular emphasis on those aspects which establish your qualifications in the assessment of diesel generator problems?

A A more complete statement of my qualifications is being separately provided to the Board. To summarize, however, I received a Bachelors of Marine Engineering degree from the State University of New York Maritime College at Fort Schulyer in 1968, a Masters Degree in Nuclear Engineering and a Degree of Nuclear Engineer from the Massachusetts Institute of Technology in 1972. In the time period between 1968 and 1970, I alternated between engineering on U.S. merchant ships and graduate school, earning a U.S. Coast Guard second engineers license during the process. I was a consultant to the New England Coalition on Nuclear Pollution from 1970 through 1972. I was employed by United Engineers and Constructors, Inc., an architect/engineering firm, from 1972 to mid-1975 as both a research engineer and a senior licensing engineer. While at United Engineers and Constructors my responsibilities included licensing and design of both nuclear and fossil fuel power plants. In 1975, I took my current position as President of Energy Research Group, Inc. Since that time my professional work has consisted primarily of performing and managing various technical, economic, environmental, and policy assessments of energy technologies with a primary emphasis on nuclear. I am a Registered Professional Nuclear Engineer in the State of California. I have been a member of the American Nuclear Society as both a student and a full member since 1968.

Related to my testimony, I have held U.S. Coast Guard licenses as a second and third assistant engineer for both steam and motor (diesel) vessels and have taken additional courses in diesel engine maintenance. I have worked at sea as both a second and third assistant engineer and have had responsibility for ship board emergency diesel generator operations.

Q Would you please state the contention on which you are testifying?

A The contention reads as follows:

> Suffolk County contends that Shoreham's onsite emergency generating system does not meet 10 CFR 50, Appendix A, GDC 17, because of the high probability of system failure due to accumulation of dirt in relays located in the diesel generator rooms.

Q What is the purpose of your testimony?

A The purpose of my testimony is to discuss concerns as to the reliability and operability of the Shoreham emergency onsite diesel generator system to provide power during a loss-of-offsite power event. It is also to summarize those procedures that LILCO has indicated a willingness to employ in response to the concerns to assure the highest possible reliability of the Shoreham onsite emergency diesel generators, and to outline the additional step relative to the long term maintenance that is still considered necessary.

Q What are the specific concerns relative to the reliability and operability of the Shoreham emergency onsite diesel generating system?

A The Shoreham onsite emergency diesel generating system has been classified as safety-related by LILCO. FSAR, Table 3.2.1-1, at 11. This is appropriate because the diesels must be a reliable source of power in the event offsite power is lost. GDC 17 specifically requires a highly reliable onsite power source. My concern has been that LILCO had not taken certain steps necessary to ensure the reliability of this power source.

The specific concerns arise from past power plant experience that indicate the importance of minimizing the accumulation of dirt in on-site diesel generator electrical relay systems to assure starting or smooth operation of the diesel generators. As noted in the NRC Task Force Report, NUREG/CR-0660, most diesel generator failures to start have resulted from an accumulation of dirt in relays located in the diesel generator rooms. A failure of the diesel generator to start when required during a loss-of-offsite power incident may prevent adequate core cooling leading to the potential for a core melt accident.

Title 10 of the Code of Federal Regulations, Part 50, Appendix A General Design Criterion number 17 entitled "Electric Power Systems" requires that an onsite electric power system shall be provided to permit functioning of structure, systems, and components important to safety:

> The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.
>
> The onsite electric power supplies including the batteries and the onsite electric distribution system shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.

Therefore GDC number 17 requires the onsite system to be sufficiently capable of protecting the core and the coolant boundary during any of the postulated accidents. Failure to prevent accumulation of dirt in the relays would prohibit or

prevent the starting of the diesels in a timely manner and that would violate Criterion 17.

LILCO was cited for a violation of dirt in relays during an inspection conducted on October 24-27, 1978 by NRC. (U.S. NRC LTR. to A. Wofford, LILCO, 11/29/78, Inspection 78-16). During construction, LILCO failed to keep trash, litter and excess materials away from relays such that they would affect the quality of components. It was found that the energized safety-related 4160 volt switch gear 1R22* SWG103 in the 103 emergency switch gear room, elevation 25 feet, of the control room building did not comply with the requirements of procedure CSI13.I. There was an accumulation of dirt inside the energized switch gear equipment which could create conditions that would adversely affect the quality of the component and the equipment operation.

Q Is your concern for dirt accumulation applicable to other aspects of plant operation or is it particularly focused on the diesels?

A Diesel generators are more susceptible to dirt being brought in through the ventilation systems than other portions of the plant. The high velocity and large volumes of air drawn in through the intake can also draw in loose dirt and dust. The ventilation and combustion air intake for each diesel generator room is through a common intake hood. The air flow is separated through different ducting into the intake of the diesel generator and into the control and relay areas. Air is filtered prior to entering the diesel generator, but air entering the diesel generator room is not filtered. Therefore, the suction created by the air intake 45,000 CFM could cause dirt or other debris to be sucked into the intake and distributed into the diesel generator room during diesel generator operation. In the original design the diesel generator relays are exposed to dust and thus there is a high potential that this dirt will accumulate inside these diesel generator relays. These same conclusions were drawn by the

Nuclear Regulatory Commission Task Force in NUREG/CR-0660. In that report, several recommendations were made to minimize the impact of accumulations of dirt in the relays located in the diesel generator rooms. I am presenting this testimony to ensure that these recommendations are properly implemented at Shoreham. The recommendations that are of particular interest are as follows:

(1) All contactors and relays should have dust tight enclosed electrical contacts of the bifurcated type as manufactured by Struthers-Dunn or equal.

(2) All contactors and relays for the diesel generator equipment should be enclosed in dust tight steel cabinets having fully gasketed doors and other openings. Other equipment which may have louvers for ventilation, etc. such as the static exciter cabinets should also have dust-tight gasketed doors and filter-equipped louvers in sufficient number for proper cooling and protection of the field, flasher contacts.

(3) Ventilating air for the diesel generator room should be taken from about 20 feet above the adjacent ground surfaces because of dust blown about by wind and/or passing vehicles.

At Shoreham, the installed class I intake hoods for the diesel generators were originally approximately 10 feet above the ground. Two alternatives have been suggested concerning the intake location: (1) moving the air intakes to 20 feet above the ground; and (2) converting the area underneath the diesel generator air intakes into concrete or crushed stone to limit the dust directly underneath the intake.

In addition to the foregoing concerns about the design of the diesel area to minimize dirt and dust accumulation, there also is concern that the outside area surrounding the diesel generator intake hoods must be kept clean and free of debris

and dust such that for the life of the plant this potential problem would be continually monitored and dust minimized. A procedure should be generated that assures that the diesel generator air intake area be kept clean throughout the life of the plant.

Q Would you discuss LILCO's responses to those concerns the County has previously raised?

A LILCO responded to the NRC, in a letter dated March 9, 1982 to Mr. Robert A. Gilbert, that the following would be done relative to diesel generator relay dust accumulation:[1/]

1. That LILCO would use crushed stone below the Diesel Generator Room air intakes. Elevation at the base of the wall is 24 feet. Elevation of the intakes is 31 feet 6 inches. An engineering and design change report was written to change the grass cover to crushed stone.

2. The diesel generator control panels which are NEMA 12 were modified to provide dust filters on the louvers required for cooling. In addition, where panels have control switches, meters or indicating lights mounted through them, this has been done in a dust tight manner and the cabinets have gasketed doors which are mechanically latched closed. The diesel generator relays do not have bifurcated contacts.

3. In addition, the major ventilation system, which is a 35 thousand cubic feet per meter (45,000 CFM maximum)

1/ The pertinent portions of the March 9, 1982 LILCO letter are attached hereto as Exhibit 1.

ventilation system only operates when the diesel generator is in operation. The normal ventilation system is provided by a separate 1350 cubic feet per meter exhaust fan with intake by infiltration. These design changes were made in response to NRC questions resulting from the referenced NUREG report.

Q What would satisfy the concerns you have expressed relative to diesel generator relays?

A The concerns relative to design would be met by the addition of filtered louvered gasketed panels and the addition of the crushed stone below the diesel generator room air intakes. The concerns relative to the long-term maintenance and housekeeping would be satisfied by a commitment to meeting maintenance procedures relative to diesel generator air intakes filters etc., that would minimize dirt accumulation over time. In addition, it is important that Reg. Guide 1.39, "Housekeeping Requirements for Water Cooled Nuclear Power Plants," be applied to both the diesel generator room and the area surrounding the diesel generator air intakes. LILCO has not committed, to our knowledge, at this time to apply Reg. Guide 1.39 requirements to the areas surrounding the diesel generator air intakes and I am not aware of any procedures designed to ensure that proper maintenance of these areas is accomplished.

LILCO should be ordered by the Board to demonstrate that the appropriate maintenance procedures exist and to assure that diesel generator relays will be operable when called upon to ensure the continuous availability of electric power for emergency functions.

EXHIBIT 1

March 9, 1982 letter from

LILCO TO THE NRC Staff

LONG ISLAND LIGHTING COMPANY
SHOREHAM NUCLEAR POWER STATION
P.O. BOX 618, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

Return to SC #2 File

March 9, 1982

Mr. Robert A. Gilbert, Project Manager
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Diesel Generator Relays
Shoreham Nuclear Power Station - Unit 1

Dear Mr. Gilbert:

This will confirm information given to Bob Giardina by Al Greenfeld on March 5, 1982 and March 8, 1982:

Treatment of ground under Diesel Generator Room Air Intakes

It is planned to use crushed stone below the Diesel Generator Room Air Intakes. Elevation at base of the wall is 24.0 ft. (see drawing FY3D attached). Elevation of air intakes is 31'-6". An E&DCR has been written to change the grass cover to crushed stone.

Are there filters in the combustion air and room ventilation intakes?

A 35,000 CFM ventilation system, which opens only when the diesel operates, has a filter for the combustion air intake but not for room ventilation. When this ventilation system is not operating, its inlet and outlet dampers are closed and room ventilation is provided by a separate 1350 CFM exhaust fan with intake by infiltration.

Are relays with bifurcated contacts used? Are they enclosed, dust tight?

The Diesel Generator Relays do not have bifurcated contacts. Bifurcated contacts are usually limited to relays with low voltage/low current signals, and are not designed to have a deliberate wiping action. Generally they are not found in standard, general

purpose industrial relays. The relays at Shoreham are in cabinets with gasketed doors, which are mechanically latched closed. The Diesel Generator control panels are NEMA 12, modified, that is louvers required for cooling are protected by dust filters and, where panels have control switches, meters or indicating lights mounted through them, this has been done in a dust tight manner.

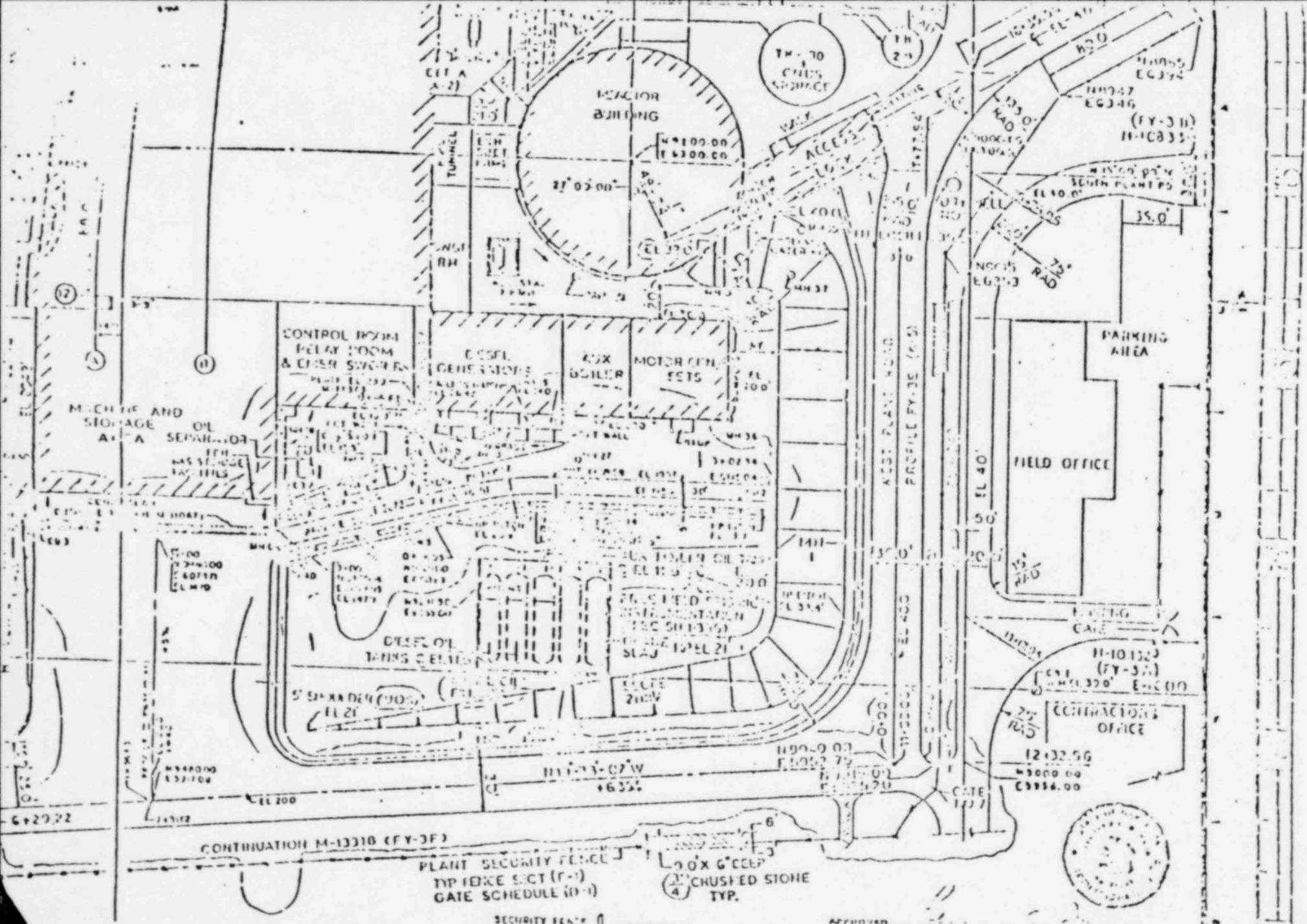
Very truly yours,

Original signed by

J. L. Smith
Manager, Special Projects
Shoreham Nuclear Power Station

RWG:mp

Attachment


REACTOR BUILDING
CONTROL ROOM
RELAY ROOM
& CABLE SPREAD
DIESEL GENERATORS
AUX BOILER
MOTOR GEN SETS
MACHINE AND STORAGE AREA
OIL SEPARATOR
DIESEL OIL TANKS
FIELD OFFICE
PARKING AREA
CONTRACTORS OFFICE
GATE
CONTINUATION M-13318 (FY-3F)
PLANT SECURITY FENCE
TYP FENCE SECT (F-1)
GATE SCHEDULE (D-1)
6.0' X 6" DEEP
CRUSHED STONE
TYP.
RADWASTE BLDG
3.0'
CONC CURB
FIN GRADE OF ROAD
D-D (1-2)
SECURITY FENCE POST
STEEL SHEET PILING
C-C (E-7)
PLAN
FY-30
GRADING, ROADS & WALKS SH.-1