UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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| In the Matter of | ) | |
| | ) | |
| LONG ISLAND LIGHTING COMPANY | ) | Docket Number 50-322 |
| | ) | |
| (Shoreham Nuclear Power Station, Unit 1) | ) | |

# NRC STAFF TESTIMONY OF ROBERT J. GIARDINA REGARDING DIESEL GENERATOR RELAYS

Suffolk County Contention 2

# OUTLINE OF TESTIMONY

Suffolk County Contention 2 asserts there is a high probability of emergency generating system failure at Shoreham because of the probability of accumulation of dirt in relays located in the diesel generator room. Contrary to this assertion, the accumalation of dust, dirt and deliterious materials on electrical equipment in the diesel generating room at Shoreham has been minimized by the Applicant's having met General Design Criteria 17 of Appendix A, 10 C.F.R. Part 50 and the recommendations of NUREG/CR-0660. With respect to NUREG/CR-0660, Applicant meets those recommendations by taking such measures as providing dust tight enclosures for electrical equipment, insuring that the air supply to the diesel generating room is sufficiently dust free, and providing for concrete dust control by sealing or painting diesel generator room concrete floors and walls.

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NRC STAFF TESTIMONY OF
ROBERT J. GIARDINA ON SUFFOLK COUNTY CONTENTION 2

Q. Please state your name and position with the NRC.

A. My name is Robert J. Giardina. I am employed by the U.S. Nuclear Regulatory Commission as a Mechanical Engineer (Reactor Systems) in the Division of Systems Integration. A copy of my professional qualifications is attached.

Q. What is the purpose of your testimony?

A. The purpose of this testimony is to respond to Suffolk County Contention 2, which reads as follows:

> Intervenor contends that Shoreham's onsite emergency generating system does not meet 10 C.F.R. 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 room.

Q. Has the Staff made any recommendations to improve diesel generator reliability with regard to accumulation of dust, dirt and other deliterious material on electrical equipment associated with the starting

of the diesel generators (e.g., auxiliary relay contacts, control switches, etc.)?

A. Yes. NUREG/CR-0660, Enhancement of Onsite Emergency Diesel Generator Reliability," makes specific recommendations for increasing the reliability of nuclear power plant emergency diesel generators. These recommendations were based on a comprehensive study of diesel generator operating experience at nuclear power plants and on consultations with major diesel generator manufacturers. Recommendations on protecting electrical equipment from dust, dirt and deliterious material were made in the following two areas:

1. dust and dirt in diesel generator room
2. concrete dust control

Q. What are the recommendations made in NUREG/CR-0660 with regard to the above mentioned subject areas:

A. The recommendations made for controlling dust and dirt in the diesel generator rooms are the following:

1. All contactors and relays should have dust tight enclosed electrical contacts of the bifurcated type.

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

3. Ventilating air for the DG room should be filtered and taken about 20 feet above the adjacent ground surface because of dust blown

about by wind and/or passing vehicles. The piping for the room ventilation air should be separate from that used for the engine combustion air.

4. Engine combustion air should preferably be supplied through piping directly from outside the building through properly filtered intake openings located at least 20 feet from ground level.

5. Room ventilation air, hot cooling system air, and/or engine exhaust gas should not be permitted to circulate back into the DG room, fuel storage room, or into any other part of the power plant building.

6. Where construction work is being done adjacent to an operating power plant, the practice of wetting down the ground periodically to minimize the blowing about of dust and dirt should be adopted.

The recommendations in NUREG-CR-0660 for concrete dust control are that the floors in all rooms of the DG units which house any electrical contactors, relays, circuit breakers or other devices having electrical contacts which are part of the DG systems, should be painted with concrete or masonry type paint.

Q. Is Shoreham meeting these recommendations and are they being implemented in a manner acceptable to the Staff?

A. Shoreham is a single unit plan and therefore recommendation 6 is not applicable since that recommendation applies only to multi-unit plants where at least one reactor is in operation. Shoreham meets and/or exceeds, or meets the intent of, the rest of the recommendation in NUREG/CR-0660 with regards to accumulation of dust and dirt on electrical equipment associated with the starting of the diesel generators.

Q. In what manner does Shoreham meet recommendations 1 and 2?

A. Shoreham meets recommendations 1 and 2 by providing dust tight cabinets having fully gasketed doors and other openings. In addition, electrical equipment cabinets which have louvers for ventilation/cooling purposes are provided with filters on the louvers. Controls and relays designed with bifurcated contacts are generally limited to low voltage, low current circuits. The electrical relays and controls associated with the Shoreham diesel generators do not utilize bifurcated contacts since the control system is designed to operate at higher voltages and currents than normally associated with bifurcated type contacts.

Q. How have recommendations 3 and 4 been met at Shoreham?

A. A common intake structure with separate piping for the diesel generator room ventilation system and combustion air intakes is provided for each individual diesel generator. The intake openings are located on the west side of the diesel generator building at an elevation of 31 feet. The plant grade elevation in this area is 24 feet and gradually slopes to the roadway. A hard-surfaced roadway at a plant elevation of 20 feet is located approximately 30 feet from the west wall of the diesel generator building. The area between the DG building and roadway is covered with crushed stone, which will minimize dust generation in the area. The diesel engine combustion intake air opening is about 11 feet above the roadway. Even though these openings are less than the recommended height of 20 feet above grade, the design was found acceptable because the accumulation of dust in the DG room will be minimized for the following reasons:

a. The diesel engine combustion air intake is piped from the opening directly to the diesel engine.

b. The diesel generator room ventilation system ductwork is separate and independent from the combustion air intake system.

c. The diesel generator combustion air intake system is provided with filters to remove airborne particulate matter.

d. The diesel generator room ventilation system is not provided with filters. However, the system design minimizes the amount of dust entering the room during normal plant operation in that the ventilation supply system only operates when the engine is operating. Dampers in the ventilation system intake isolate the diesel generator room from the outside environment when the diesel generator is on standby. Ventilation during diesel generator standby conditions is provided by a small 1350 CFM exhaust fan with a natural supply from the rest of the diesel generator building.

e. The paved roadway is far enough from the DG building so that any dust that may be stirred up by occasional passing traffic will not be of sufficient magnitude to be drawn into the diesel generator rooms when the equipment is in operation.

f. The electrical cabinets in the DG room meet recommendations 1 and 2.

g. Upon completion of construction, the diesel generator rooms will be thoroughly cleaned, and any debris, surplus material, dirt, and packing materials properly disposed. The diesel engine generator set will be wiped clean and all spilled lubricants removed, and minor paint damage will be touched up. All equipment access and construction

temporary openings will be closed and terminal box and other protective covers installed. The generator, exciter, and control panel will be cleaned to remove accumulated dust and dirt.

h. Access to the diesel generator rooms will be controlled for security purposes during plant operation. This control will minimize traffic within the rooms, thereby reducing the potential for subsequent generation of dust.

i. The Shoreham Station will comply with Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Power Plants," (March, 1973) during plant operation.

Q. How has recommendation 5 been met?

A. The Shoreham design meets recommendation 5. The diesel generator room ventilation exhaust and diesel engine combustion exhaust systems are located on the east side of the diesel generator building, while the diesel generator room ventilation supply system is located on the west side of the diesel generator building, a horizontal distance of approximately 58 feet between the openings. This distance is more than sufficient to preclude recirculation of the room ventilation exhaust back into the room ventilation supply system. In addition, the diesel engine combustion exhaust system discharge for each engine is located at least 60 feet above the diesel generator room ventilation supply system. This difference in elevation is more than sufficient to prevent recirculation of combustion gases into the ventilation supply system.

Q. Has the recommendation for concrete dust control been met?

A. Shoreham meets the recommendation for concrete dust control by thoroughly cleaning and sealing with an appropriate paint or sealant all

diesel generator room concrete floors and walls to a height of 8 feet above the floor. This exceeds the recommendation of NUREG/CR-0660 which only recommends that the floors be painted.

Q. What are your conclusions with respect to Suffolk County Contention 2?

A. Based on the facility design and equipment and systems designs at Shoreham and the implementation of administrative controls and procedures, the Staff has found that the accumulation of dust, dirt and deliterious materials on the electrical equipment located in the diesel generator room has been minimized. Therefore, the probability of failure of the onsite emergency generating system due to the accumulation of dust, dirt and deliterious material is extremely remote. In the Shoreham SER, NUREG-0420 (April, 1981) the Staff previously found that the diesel generators installed at Shoreham met the requirements of General Design Criteria (GDC) 17 of Appendix A, 10 C.F.R. Part 50. However, to assure long term reliability of the diesel generator, the Staff also required compliance with NUREG/CR-0660 with regards to accumulation of dust, dirt and other deliterious material on electrical equipment associated with starting of the diesel generators (e.g., auxiliary relay contacts, control switches . . . etc.). The Staff previously concluded in NUREG-0420 (April, 1981) and now reaffirms that the Shoreham Station standby diesel generators are in conformance with the NUREG/CR-0660 recommendations on dust and dirt in the DG rooms and meet the requirements of GDC 17, and therefore are acceptable.

Robert J. Giardina
Professional Qualifications
Power Systems Branch
Division of Systems Integration
Office of Nuclear Reactor Regulation

I am a Mechanical Engineer (Reactor Systems) in the Power Systems Branch in the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission. In this position I perform technical reviews, analyses, and evaluations of reactor plant features pursuant to the construction and operation of reactors.

Education

I received a Bachelor of Science Degree in Mechanical Engineering from Drexel University in 1971. In 1974 I received from Drexel University a Master of Science Degree in Mechanical Engineering with specialization in the areas of Thermal and Fluid Sciences and a Master of Science Degree in Engineering Management with specialization in the area of Research and Development and Engineering Management (Corporate Level). The research paper for the Engineering Management Degree was entitled, "Technology Assessment." Since 1974 I have taken a number of courses on PWR and BWR System Operation, Reactor Safety, System Reliability, Fault Tree Analysis, and Fire Protection, as well as Basic and Advanced (Wood Badge) Scout Leader Training.

Experience

My experience includes eight years of Engineering in the design, manufacture, and testing of Shipboard Mechanical Systems and Components at the Philadelphia Naval Shipyard. These systems and components included cooling water systems, propulsion systems (turbine and diesels), fire protection systems, hydraulic systems, and ventilation systems.

I joined the Auxiliary Systems Branch of the Commission in 1974. As a member of the Auxiliary Systems Branch, I performed safety evaluations on spent fuel pool expansions as well as provided input to or revised the Environmental Impact Statement on Spent Fuel Storage, the Regulations on Independent Spent Fuel Storage Facilities (10 CFR Part 72) and Regulatory Guides and Standard Review Plans on Spent Fuel Storage (on and off-site). I was actively involved in the investigation of the steam generator feed water hammer problem and was a member of the Commission's Water Hammer Task Force. I also performed safety evaluations of the auxiliary systems of various plants which included the diesel generator auxiliary systems.

In 1979 I transferred to Power Systems Branch of the Commission, where my responsibilities include the review and evaluation of the diesel generator auxiliary systems. I am responsible at the present time for reviewing the diesel generator auxiliary systems, communication, lighting, main steam, and turbine bypass systems, turbine generator and main condenser for all plants.

Since joining the Branch, I have or am presently performing safety evaluations with respect to NUREG/CR-0660 "Enhancement of Onsite Emergency Diesel Generator Reliability" on OL applications and operating plants as well as safety evaluations for my areas of review responsibility on CP and OL applications. I have provided input to or revised the Standard Review Plans for the Diesel Generator Auxiliary Systems, Communication, Lighting, Main Steam and Turbine Bypass Systems, Turbine Generator, Main Condenser, A-C Power Systems (Onsite) and General Agenda-Station Site Visits.

I have successfully passed the test for and was awarded the certificate of Engineering-In-Training.

Organizational Memberships

I am a member of Pi Tau Sigma - National Honorary Mechanical Engineering Fraternity, the American Management Associations, and the American Society of Mechanical Engineers. I am an active member in the Boy Scouts of America (Ex-Scoutmaster, Assistant Scoutmaster, Member District Training Staff, O/A Committee Advisor, District Camporee Staff, and Assistant Contingent Leader, American Contingent Australian Jamboree [1979-1980], Safety Officer - 1981 National Jamboree); I have earned the following awards (Woodbridge, Scouters Key and Key Three Award), and I am a Vigil Member in the Order of the Arrow, of that organization.