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)	)	

MOTION FOR SUMMARY DISPOSITION
OF SC CONTENTIONS 20a(i)-(ii)

1. Suffolk County (SC or County) contentions 20a(i)-(ii) were ruled by the Board to be adequately particularized, Tr. 64, and read as follows:

> 20a. Intervenors contend that the Applicant has not adequately demonstrated that the Shoreham nuclear system meets the requirements of 10 CFR, Part 20.1(c), Standards for Protection Against Radiation with regard to provisions relevant to maintaining occupational radiation exposure as low as is reasonably achievable (ALARA). Demonstration of compliance is inadequate in the areas of:
>
> i. Plant and equipment design has not been shown to be optimumly [sic] developed for minimization of radiation exposure during maintenance of the plant by:
>
> (1) Selection of low cobalt materials.
> (2) Separation or isolation of various components and piping systems.
> (3) Provisions for flushing or decontamination.

> (4) Equipment layout and arrangement for ease and automation of maintenance and refueling.
>
> ii. Provisions in the system design to facilitate future plant decommissioning.

SC's Amended Petition to Intervene at 24 (Sept. 16, 1977).

2. These contentions raise no genuine issues of fact for the reasons set out in ¶¶ 3-7 below.

3. SC alleges that the Applicant has failed to demonstrate that the occupational exposure at Shoreham will comply with 10 CFR § 20.1(c). That regulation requires an applicant to:

> make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable.

The NRC's definition of "as low as is reasonably achievable" indicates that this regulation does not set an absolute standard, but rather that it involves weighing the economics of an improvement against the benefits. As indicated in ¶¶ 4-6 below and in the attached affidavits, many very costly features have been included in the Shoreham design to ensure that the occupational exposure during operations and decommissioning will be kept to a practical minimum. Therefore, Shoreham complies with 10 CFR § 20.1(c).

4. During the operating life of the plant, occupational exposure will be minimized by (a) reducing the radioactivity levels from crud, (b) putting shielding around certain components that are expected to have high radiation levels, (c)

using various methods to reduce exposure associated with the frequent operation and maintenance of certain components, (d) designing refueling operations so that they can be conducted under water, (e) redesigning certain components to avoid the need for repairs, and (f) using a radiation monitoring system to assess radiation levels constantly and to optimize maintenance procedures. Affidavit of Foroohar Boorboor on 20a(i) at ¶¶ 2-9. Occupational exposure during the operating life of a plant is expected to start out at 100 man-rem/year and then rise slowly to a maximum level of about 500 man-rem/year. The reductions in occupational exposure resulting from these design features is demonstrated by the fact that throughout its life Shoreham's occupational exposure will be less than the average value at operating BWR's during the 1974-76 period. Id. at ¶ 10.

5. SC attempted to support contention 20a(i) by making several arguments in its Particularized Contentions at 20-2 to 20-4 (Nov. 30, 1978) and SC's Response to Applicant's Second Set of Interrogatories at 33-34 (Jan. 31, 1978). These arguments raised no genuine issues of fact for the following reasons:

a. The County noted that FSAR § 12.1, which discusses some of the steps taken to minimize occupational exposure at Shoreham, is expressed in terms of "as low as practicable" (ALAP) instead of "as low as is reasonably achievable" (ALARA). SC's Particularized Contentions at 20-2. This

difference in terminology has no substantive bearing on this contention because the Commission made it clear when § 20.1(c) was changed from ALAP to ALARA that the revision was made simply to conform the NRC's terminology to that used by the International Commission on Radiological Protection 40 Fed. Reg. 58847 (Dec. 19, 1975).

b. SC criticized FSAR § 12.1 as "focus[ing] almost exclusively on procedural control of occupational radiation exposure." SC's Particularized Contentions at 20-2. This criticism is unfounded because over half of FSAR § 12.1 is devoted to design features that reduce occupational exposure. Moreover, FSAR § 12.3 contains additional discussion regarding the design features of radiation protection equipment.

c. The County claimed that FSAR § 12.1 is deficient because allegedly:

> little recognition is given to the fact that currently operating nuclear power plants are finding that 75% or more of annual occupational radiation exposure is accumulated during periods of plant shutdown.

Id. Most of the occupational exposure at operating plants occurs when the plant is shutdown because that is the only time that many areas are accessible for maintenance and testing. Most of the design features and procedures discussed in FSAR § 12.1 will reduce the radiation levels during maintenance and testing. See Affidavit of Foroohar Boorboor on 20a(i) at ¶ 2. Therefore, contrary to SC's assertion, the focus of this section is primarily on reducing occupational exposure during shutdown periods.

d. SC criticized the Shoreham design for not including shielding for numerous large components that are located in the drywell, which is the area surrounding the reactor inside the containment. This argument is unfounded for the following reasons: First, the largest potential source of radiation in the drywell is the reactor, which is surrounded by the massive biological shield. Second, the biological shield and the features that minimize exposure from crud prevent the components in the drywell from becoming major sources of radiation. Id. at ¶¶ 3-4. Third, limited space and the need to have adequate accessibility to the components in the drywell prevent installing permanent shielding in that area. And fourth, other methods, such as the use of portable shielding and radiation control procedures, are available to minimize occupational exposure. Id. at ¶ 5.

e. SC cites NUREG-0312, "Interim Technical Report on BWR Feedwater and Control Rod Drive Return Line Nozzle Cracking" (July 1977), to suggest that the repair work discussed in that report, if required at Shoreham, would violate the ALARA requirements of 10 CFR § 20.1(c). The nozzle cracking discussed in NUREG-0312 will not be a problem at Shoreham because the design changes recommended by the Staff on pages 15 and 26 of NUREG-0312 have already been implemented. These changes include installation of a tighter fitting thermal sleeve in both feedwater nozzles and removal of the cladding from the inner surface of the nozzles. FSAR NRC Request and

Response 112.16. And the control rod drive return line has been eliminated after a system evaluation demonstrated adequate performance without it. Affidavit of Foroohar Boorboor on 20a(i) at ¶ 7.

6. During decommissioning, numerous plant design features and special techniques will be used to maintain occupational exposure as low as is reasonably achievable. Affidavit of Foroohar Boorboor on 20a(i) at ¶¶ 2-6. Based on the best currently available technology, the occupational dose from decommissioning Shoreham is estimated to be 400 man-rem. Id. at ¶ 4. This value is less than the occupational exposure that will be received each year during the latter half of Shoreham's operating lifetime. See Affidavit of Foroohar Boorboor on 20a(i) at ¶ 10. Furthermore, LILCO will monitor the decommissioning of plants older than S oreham to learn other techniques and technological breakthroughs that may be used to further reduce occupational exposure at Shoreham. Affidavit of Foroohar Boorboor on 20a(ii) at ¶ 4.

7. SC alleged that decommissioning the containment structure will be a difficult task that will contribute substantially to occupational exposure. SC's Particularized Contentions at 20-3. Actually very little exposure will be received during this operation because the containment structure itself will be only slightly radioactive and most of the radioactive equipment within it will have been removed before the containment is demolished. Thus, if the containment structure is

dismantled, this operation will be much like demolition of any heavily reinforced concrete structure. Affidavit of Foroohar Boorboor on 20(a)(ii) at note 1.

8. For the above reasons, SC contentions 20a(i)-(ii) raise no genuine issues of fact. Accordingly, under 10 CFR § 2.749, they are ripe for summary disposition in favor of the Applicant. We request that disposition.

Respectfully submitted,

LONG ISLAND LIGHTING COMPANY

F. Case Whittemore

F. Case Whittemore

W. Taylor Reveley, III
Hunton & Williams
P. O. Box 1535
Richmond, Virginia 23212

DATED: February 5, 1979

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NUCLEAR REGULATORY COMMISSION

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LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322
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AFFIDAVIT OF FOROOHAR BOORBOOR ON 20a(i)

Foroohar Boorboor, being duly sworn, states as follows:

1. I am Lead Radiation Protection Engineer in the Licensing Division of the Nuclear Engineering Department of Long Island Lighting Company. A statement of my professional qualifications is attached.

2. Most of the occupational exposure occurring during Shoreham's operating lifetime will be received during periods when the plant is not operating. This is because many areas of the plant are only accessible for maintenance and testing when the plant is shutdown. FSAR §§ 12.1 and 12.3 describe, in detail, numerous features in the Shoreham design that will keep occupational exposure at Shoreham as low as is reasonably achievable in accordance with 10 CFR § 20.1(c).

3. "Crud," which is small particles in the primary system water, is a potential source of occupational exposure.

When the water containing these particles circulates through the core, the neutron flux may transform atoms of certain elements in the particles into radioactive isotopes. This makes the particles radioactive. If the radioactive crud tends to settle out and deposit in certain locations in the primary system, it can cause occupational exposure. This is minimized by the following:

a. Crud is removed from the primary system water by a full flow condensate demineralizer that treats all primary water before it returns to the reactor vessel. The demineralizer is equipped with an ultrasonic resin cleaner, which permits more frequent regeneration of the resin beds. This keeps the resin beds at a high level of effectiveness as crud filters. FSAR § 12.1.3.1.2.

b. The primary system is also designed with the following features to keep the crud in suspension until it reaches the condensate demineralizer: (1) Butt welds, which do not leave a place for crud to accumulate, are preferable to other weld configurations that tend to collect crud. Therefore, butt welds are used in the primary system on all piping above 4 inches in diameter and on most lines above 2-1/2 inches in diameter. (2) Long radius elbows are used where practical to discourage crud accumulation. (3) Piping systems are designed with high flow velocities, which retard settlement of particulate matter. Id.

c. In the event that crud does cause a significant increase in the radioactivity levels in certain areas of the plant, these levels can be reduced by decontamination. This would be accomplished by using the flushing taps that are located at numerous points in the primary system to introduce deionized water or a decontamination solution into any areas with accumulated crud. FSAR at 12.1-12.

4. The Shoreham design minimizes occupational exposure by placing shielding around certain components that are expected to have high radiation levels. The most important shield is the biological shield around the reactor itself. This minimizes occupational exposure by decreasing direct exposure and by reducing neutron irradiation of components, such as those in the drywell, which otherwise would become major sources of radiation. Other components that are shielded include the condensate demineralizer, pipes running to and from the demineralizer, tanks containing radioactive fluids, main steam lines, moisture separator reheaters, and the evaporators. FSAR §§ 12.1.2, 12.3.1.

5. Some components, such as those in the drywell, can not be shielded because of limited space and the need for proper accessibility to the components. Occupational exposure during maintenance and testing in the drywell area is minimized by the biological shield, the design features discussed in ¶ 3 above that reduce exposure from crud, the use of portable

shielding, and radiation control procedures, such as those discussed on FSAR pages 12.1-12a to -13 and 12.5-8 to -10.

6. Numerous other features are incorporated into the Shoreham design to minimize occupational exposure during the operation and/or maintenance of certain components that would otherwise be large contributors to occupational exposure. For example, reach rods permit remote operation of valves located in high radiation areas. The solid waste system is designed so that it can be operated remotely to a large extent. Shielded access is provided for ventilation filter trains and certain equipment is located in shielded cubicles with access openings to permit equipment removal for maintenance. Pumps that require frequent maintenance are located in low radiation areas. Valves requiring periodic calibration and/or maintenance are placed where they are easily accessible and dose rates are below 5 mrem/hr. FSAR §§ 12.1.2, 12.3.1.

7. There has also been redesign of certain components that have required repairs at other plants. This saves any occupational exposure that otherwise would be accumulated during the repairs. For example, the original Shoreham design was revised to avoid cracking at the feedwater and control rod drive return line nozzles. The redesigned feedwater nozzles have tighter fitting thermal sleeves and the cladding from the inside surfaces has been removed. FSAR NRC Request and Response 112.16. And the control rod drive return line was

eliminated after a system evaluation demonstrated adequate performance without it.

8. Refueling equipment and procedures are designed to permit refueling operations to be accomplished under water, thus minimizing occupational exposure. Such underwater operations include the following: removal and transfer of reactor internals to the dryer separator pool for storage, transfer of spent fuel from the reactor to the spent fuel storage pool, and loading of spent fuel into shipping casks.

9. Furthermore, Shoreham is equipped with a radiation monitoring system that will help the plant operating staff maintain radiation exposures as low as is reasonably achievable. This system, which includes redundant computers, will provide continuous surveillance of all airborne, area, process, and effluent radiation monitors. FSAR §§ 12.3.4.1-.5. The detailed knowledge of radiation levels in all plant areas obtained from the monitoring system will permit optimizing maintenance procedures to reduce radiation exposure.

10. The occupational exposure during Shoreham's initial 3 years of operation are estimated to average close to 100 man-rem/year. It will then increase to 400-500 man-rem annually in about the twelfth year of commercial operation. During the remainder of the plant's life, it is expected to remain near, but not exceed 500 man-rem/year. FSAR § 12.4.3. These estimates, which take into account the design features discussed in ¶¶ 3-9

above, demonstrate the benefit of those features when compared to the average occupational exposure of 575 man-rem/year at BWR's during 1974-76. See NUREG-0323, "Occupational Radiation Exposure at Light Water Cooled Power Reactors, 1976" Table 1 (1978).

11. For the above reasons, occupational exposure during Shoreham's operating lifetime will be kept as low as is reasonably achievable in accordance with 10 CFR § 20.1(c).

Foroohar Boorboor

Subscribed and sworn to before me
this 2nd day of February, 1979.

Notary Public

My commission expires: _____

MARY JO TERRILLION
Notary Public, State of New York
No. 30-4603827
Qualified in Nassau County
Commission expires Mar. 30, 19 80

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AFFIDAVIT OF FOROOHAR BOORBOOR ON 20a(ii)

Foroohar Boorboor, being duly sworn, states as follows:

1. I am Lead Radiation Protection Engineer in the Licensing Division of the Nuclear Engineering Department of Long Island Lighting Company. A statement of my professional qualifications is attached.

2. There are many factors that will have the combined effect of keeping the occupational exposure as low as is reasonably achievable during Shoreham's decommissioning. These include many operational design features, the choice of decommissioning method, and the use of special decommissioning techniques. Each of these are discussed in the following paragraphs.

3. Many of Shoreham's design features that result from the requirement of 10 CFR § 20.1(c) to keep occupational exposure as low as is reasonably achievable during the operational life of the plant also reduce occupational exposure during decommissioning. For example, the extensive efforts to minimize exposure from radioactive crud will reduce the radiation levels present at the end of the plant's useful life. The shielding placed around components that are expected to have relatively high radiation levels will also reduce the decommissioning crew's exposure. The design features that permit refueling operations to be conducted under water will allow the highly radioactive reactor vessel internals to be cut under water. See ¶ 5 below. The radiation monitoring system which is so important to minimizing exposure during plant operation and maintenance, will provide the same function during decommissioning. Also, the containment structure[1] and filter systems will minimize the exposure of those working outside the containment.

4. LILCO's use of the best available decommissioning technology will also reduce total occupational exposure and the

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1/ If the containment structure is dismantled, it will not present a major source of occupational exposure because (a) it becomes only slightly radioactive over the life of the plant and (b) most of the radioactive equipment will have been taken out prior to its removal. Therefore, dismantling the containment structure will be similar to demolition of a heavily reinforced concrete structure.

cost of decommissioning. When Shoreham's operating license application was being prepared, three decommissioning methods were under consideration by the industry. These methods are the following: mothballing (leaving the plant largely intact), entombment (removing the most radioactive equipment and sealing it in the reactor vessel, but leaving the structure intact), and dismantling (removing everything to one foot below grade). Environmental Report § 5.9. Based on the information available at that time, which included data obtained during the decommissioning of several test reactors, entombment appeared to be the preferable technique. Subsequently, the Atomic Industrial Forum completed a study which showed that dismantling could be accomplished more cheaply and with less occupational exposure than previously estimated if the plant were first mothballed or entombed, and then left in that condition for 100 years before dismantling. The occupational dose to decommission Shoreham by this method would be approximately 400 man-rem. AIF/NESP-009SR, "An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives" at 3, Table SR-3 (1977). The AIF's approach to dismantling is the best currently available method of decommissioning. More technological advances can be expected from experience gained during the decommissioning of plants older than Shoreham. LILCO will continue to follow such advancements to ensure that the best available technology is

used at Shoreham.

5. Occupational exposure will also be minimized by the use of special decommissioning techniques that often make use of certain operational design features of the plant. The flushing taps, through which decontamination fluids will be introduced into the plant during its operational life, will also be used to decontaminate the plant during decommissioning. Underwater equipment has been developed for removing and cutting the reactor vessel internals. This technique results in substantially less exposure than in-air cutting because the water (a) has very good shielding properties and (b) prevents the spread of radioactivity.

6. Another technique used to minimize occupational exposure is to erect a contamination control envelope (CCE) with its own absolute filtered exhaust system around the source of radioactivity, such as a cutting operation. The CCE exhaust system prevents the spread of radioactivity by collecting radioactive gaseous and particulate material. For example, if the dismantling method is used, the reactor vessel will have to be cut up. This will be accomplished in a CCE composed of the existing vessel cavity and the biological shield, which will be sealed at the top by a structural steel plate. The exhaust system will maintain a negative pressure in the CCE so that no unfiltered out-leakage will occur.

7. For the above reasons, occupational exposure during Shoreham's decommissioning will be kept as low as is reasonably achievable in accordance with 10 CFR § 20.1(c).

Foroohar Boorboor

Subscribed and sworn to before me
this 2nd day of February, 1979.

Mary Jo Terrillion
Notary Public

My commission expires: _____

MARY JO TERRILLION
Notary Public, State of New York
No. 30-4603827
Qualified in Nassau County
Commission expires Mar. 30, 19 80

QUALIFICATIONS OF FOROOHAR BOORBOOR

My name is Foroohar (Jeff) Boorboor. My business address is Long Island Lighting Company, 175 East Old Country Road, Hicksville, New York. I am the Company's Lead Radiation Protection Engineer and report to the Manager of the Licensing Division in the Nuclear Engineering Department.

I received a Bachelor of Science degree in nuclear engineering and science from Rensselaer Polytechnic Institute in 1970, and a Master of Science degree in nuclear engineering and science from Rensselaer in 1971. I have completed training courses in nuclear power plant design, and I have certificates of completion from the Co-op Program of Rensselaer, the Advance Reactor Division of Westinghouse Electric Corporation, the Massachusetts Office of Emergency Preparedness, as well as Harvard University's Radiation Protection and Emergency Planning Programs.

From 1971 to 1974, I was employed by Stone & Webster Engineering Corporation as Lead Nuclear Engineer in the radiation protection group. I was with General Atomic Corporation as a Senior Safety Analyst in the Safety and Reliability Branch from 1974 to 1975. Since 1975 I have been employed by the Long Island Lighting Company.

I am a licensed professional engineer and a member of the American Nuclear Society (including Standard Committee 18.1 on "Radioactive Source Terms, Radioactive Effluents, and Radiation

Monitors for Light Water Reactors"), the Health Physics Society, the Operating Reactor Health Physicists Group, and the EEI Health Physics Task Force.