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

August 27, 1982

SNRC-758

Mr. Ronald C. Haynes
Office of Inspection & Enforcement
Region 1
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

Long Island Lighting Company
Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

Dear Mr. Haynes:

On July 21, 1982, in accordance with 10CFR50.55(e), we reported verbally to Region 1 a potential deficiency concerning the application of Teflon materials for electrical connectors and threaded fittings. This letter serves as our thirty-day written report of this deficiency and describes our plans for corrective action. A seven day extension to this letter's due date was granted by Mr. A. Gallo on August 23, 1982.

Description of Deficiency

Section 3.11.5 of the Shoreham FSAR states: "Existing data shows that tetra fluorothylene plastic (Teflon) begins to break down at irradiation exposure greater than 10^4 rads. Therefore, this material has not been used in this type environment, whether normal or accident, when its degradation could affect a safety-related system."

However, we have recently discovered that, contrary to the Shoreham FSAR, Teflon tape was applied to a large number of threaded fittings on safety-related instrument impulse lines and air lines by field personnel without prior engineering review or approval. At the time that we became aware of this usage, we determined that a significant effort would be required to evaluate the scope of Teflon usage and its safety significance. It was for this reason that we verbally advised Region I of a potential deficiency concerning Teflon.

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Concurrent with our discovery of Teflon tape usage, we learned that electrical connectors containing Teflon had been provided by General Electric for use on safety-related SRM and IRM neutron monitoring channels beneath the reactor vessel. As we did not know whether these connectors were approved by General Electric for this application, we also identified these connectors in our verbal report.

Corrective Action

We have subsequently investigated the safety significance of these instances of Teflon usage and have determined that no adverse safety consequence would result during either normal or post-accident conditions.

A mathematical analysis of the Teflon tape application determined that, while its degradation under irradiation does result in the release of fluorine gas, which could potentially affect sensitized stainless steel (welded joints), the quantity released is far below that needed to achieve that concentration in water (1ppm) at which such effects are initiated. This calculation was performed under worst-case assumptions, including short impulse line length (small volume of dilutant) and 10^8 rads exposure.

Further, since impulse lines are static dead heads and Teflon tape is used at the threaded instrument connections, which are at the end of the impulse lines, process pressure would tend to keep fluorine from entering the process piping.

No other potentially significant mechanism for Teflon tape to adversely affect safety in these applications has been found.

General Electric has evaluated the use of the Teflon-containing connectors at our request and determined that there is no safety concern. The effect of integrated radiation dosage on these connectors would be to lower the insulation resistance of the Teflon, which is initially 10^{13} ohm. The resistance would have to decrease to 10^7 ohm to have any effect on SRM/IRM signals, and such an effect, if it were to occur, would appear as noise at the lower end of the SRM/IRM scales. The protective functions provided by these channels occur at the upper ends of their scales.

General Electric further supports its application of Teflon-containing connectors by citing their use on BWRs in this application as far back as 1969, with no reports of insulation failure.

Although we have concluded that no adverse safety consequence could result from the applications discussed above, the following actions are being taken:

1. Teflon tape is being systematically removed from all safety-related instrument lines where an integrated exposure greater than 10^4 rads could occur, with a previously approved sealant material substituted.

2. The SRM/IRM connectors under the reactor vessel are being replaced with General Electric approval by connectors utilizing Rexolite as the dielectric material. Rexolite has an incipient damage threshold of 2.9×10^7 rads as opposed to 10^4 rads for Teflon.

3. A confirmatory review is being performed to assure that no other applications of Teflon material have been made on safety-related systems in high radiation environments without prior engineering review and approval.

4. Administrative controls are being implemented to restrict future usage of Teflon materials by field and operations personnel.

These measures will be completed prior to Shoreham's initial fuel loading.

This letter is our final report to you on this subject. Should any of our confirmatory analyses result in a change to our determination of no adverse safety consequences, we shall promptly notify you.

Very truly yours,

G. K. Rhee for MHM

M. H. Milligan
Project Engineer
Shoreham Nuclear Power Station

GKP/law

cc: Mr. Richard DeYoung, Director
NRC Office of Inspection and Enforcement
Division of Reactor Operation Inspection
Washington, DC 20555

J. Higgins, Site NRC
All Parties