September 15, 1987

50-322

MEMORANDUM TO: Ashok C. Thadani, Assistant Director
Assistant Director for Systems

FROM: Bruce A. Boger, Assistant Director
for Region I Reactors
Division of Reactor Projects I/II

SUBJECT: SAFETY REVIEW OF THE PROPOSED SUPPLEMENTAL CONTAINMENT SYSTEM (SCS) FOR SHOREHAM

As you are aware, the Long Island Lighting Company (LILCo) is preparing to proceed with contractual commitments for the design and construction of the SCS for Shoreham. In a meeting which you attended on July 21, 1987, the staff raised a number of safety concerns about the SCS (see Enclosure 1, Meeting Summary). LILCo has reviewed the meeting transcript and wishes to resolve the staff's concerns and obtain the staff's guidance on design and procedural requirements before proceeding further on the SCS project. By letter dated August 28, 1987 (Enclosure 2), LILCo has responded to some of the staff's questions. LILCo will supplement this letter in October, 1987 to complete its responses.

We request DEST to perform a safety review and prepare an SER on the SCS for Shoreham. The purpose of the review is to assure that the SCS does not degrade overall safety at the Shoreham Station. If the staff's safety concerns can be resolved through this review process, LILCo can perform a 50.59 review based on the staff's SER and document the design features of the SCS in its periodic update of the Shoreham FSAR. On the other hand, if the review indicates that licensing actions in the form of new License Conditions or changes to the Technical Specifications would be required, LILCo would like to be informed of those requirements. Finally, the review should also reflect the staff's guidance (which LILCo has requested) on the various design bases for the SCS.

Ronnie Lo will be coordinating your review activities in this area with those of other groups within NRR and Region I.

/s/

Bruce A. Boger, Assistant Director
for Region I Reactors
Division of Reactor Projects I/II

Enclosures:
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Ronnie Lo will be coordinating your review activities in this area with those of other groups within NRR and Region I.

Bruce A. Boger, Assistant Director
for Region I Reactors
Division of Reactor Projects I/II

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PDI-2/PM
RLo:ca
9/3/87

PDI-2/D
WButler
9/3/87

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

September 15, 1987

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Assistant Director for Systems

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We request DEST to perform a safety review and prepare an SER on the SCS for Shoreham. The purpose of the review is to assure that the SCS does not degrade overall safety at the Shoreham Station. The SER will identify the conditions under which the staff finds the SCS acceptable. Finally, the review should also reflect the staff's guidance (which LILCo has requested) on the various design bases for the SCS. The conclusions of the review will form the bases for LILCo's decisions with respect to the SCS.

Ronnie Lo will be coordinating your review activities in this area with those of other groups within NRR and Region I.

BABoger

Bruce A. Boger, Assistant Director
for Region I Reactors
Division of Reactor Projects I/II

Enclosures:
As stated

Enclosure 1

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON D C 20555

July 28, 1987

Docket No.: 50-322

LICENSEE: Long Island Lighting Company

FACILITY: Shoreham Nuclear Station, Unit - 1

SUBJECT: SUMMARY OF MEETING WITH LILCO ON JULY 21, 1987 REGARDING THE DESIGN OF A SUPPLEMENTAL CONTAINMENT SYSTEM (SCS)

At the request of Long Island Lighting Company (LILCo), a meeting between the NRC staff and the management of LILCo was held in Bethesda, MD, on July 21, 1987. The purpose of the meeting was for the staff to receive a briefing from LILCo on its plan to design and construct a Supplemental Containment System (SCS) for the Shoreham Nuclear Station. The discussions in the meeting were transcribed and a copy of the transcript is provided as Enclosure 1.

The principal speakers included LILCo's Vice President, Mr. John Leonard and Dr. Thomas Murley who led the staff in discussing the safety aspects of the SCS. The meeting was also attended by Mr. Gregory Minor, representing Suffolk County, N.Y., which is a party intervening in the licensing proceedings of the Shoreham plant. A list of attendees, along with the viewgraphs used in LILCo's presentation are included in Enclosure 1. The following summary notes the salient points of the discussion. The associated pages of the transcript are shown in parentheses.

The primary purpose of the SCS is to provide a mechanism to relieve the pressure in the wetwell airspace for a class of low probability/high consequence severe accidents which could challenge the structural integrity of the containment (9). The Shoreham containment design pressure is 48 psig and the ultimate structural pressure is approximately 130 psig (10). The pressure setpoint of the rupture disc in the vent path leading to the Filtra Building of the SCS will be set at 60 psig. This setpoint is chosen to ensure the integrity of the drywell floor seal (12). The Filtra Building will be similar to the Swedish installation at the Barseback plant. It consists of a steel-lined concrete structure with a volume of 10,000 cubic meters containing about 14,000 kg of quartzite-type gravel material as the filter medium (22). The design basis for the SCS is QA Category I to the Containment Pressure Boundary (CPB) and QA Category II beyond the CPB. The mechanical design basis is ASME III, Class 2 up to the CPB and ASME III, Class 3 beyond the CPB (31,88).

The main concerns raised by the staff during the meeting were related to assurance that no potentially unsafe conditions will be introduced by the SCS. The following is a highlight of some of the staff's concerns and questions:

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- How will the activation of filtered venting be considered in conjunction with the unfiltered venting procedure in the EOP (18).

- Analyses to quantify the reduction of public risk (24).

- Analyses on the releases from the SCS in new accident sequences where the containment is recoverable (25, 26, 41-43, 50).

- Response of the SCS to a short duration pressure pulse in the containment (38).

- Analyses of accident sequences which could lead to pump cavitation and core damage because of the pressure relief, although the containment integrity is maintained (44, 52-54).

- Concerns about the potential of the containment approaching a negative pressure in the event that the containment spray is activated (81-83).

LILCo intends to review the transcript and respond to the staff's concerns which are not limited to those highlighted above. LILCo would wish to obtain the resolution of the safety concerns and staff guidance on design requirements prior to committing major design and construction contracts (104). The schedule for project completion is 36 months following the award of the design contract.

Ronnie Lo, Project Manager
Project Directorate PDI-2
Division of Reactor Projects I/II

Enclosure:
As stated

cc w/o enclosure:
See next page

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

JOHN D. LEONARD, JR.
VICE PRESIDENT - NUCLEAR OPERATIONS

AUG 28 1987

SNRC-1367

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Request for Concurrence with the Proposed
Supplemental Containment System (SCS) Plan and
Response to Staff Concerns
Shoreham Nuclear Power Station
Docket No. 50-322

Gentlemen:

LILCO has reviewed the transcript of the July 21, 1987 meeting with the Staff concerning the proposed Supplemental Containment System (SCS) for Shoreham. The purpose of our review was to identify and respond to those concerns raised by the Staff during the presentation, that were over and above those specifically highlighted in the Staff's letter to LILCO dated July 28, 1987.

In accordance with the results of the review, attached are formalized LILCO responses to the Staff's questions. The pages of transcript associated with each Staff question are shown in parentheses. Currently, it is our intent to respond to those additional questions highlighted in the July 28 letter in October. The October submittal date is governed by the scheduled completion date of the currently on-going PRA analysis, the results of which will be used to respond to the highlighted questions.

In order for LILCO to proceed in a deliberate manner with the design and construction of the Supplemental Containment System, it is necessary to determine the appropriate criteria to which it should be built. We have determined that that portion from the primary containment to the two containment isolation valves, rupture disk, and associated controls, should be treated as safety related and built in accordance with Shoreham's Category I standards. We have also determined that the part of the

Supplemental Containment System which is downstream of the isolation valves and rupture disk should be built to standards appropriate with a Category II designation. This has a significant impact on the cost of this system.

For LILCO to proceed on a deliberate basis with the engineering of the Supplemental Containment System, we request your concurrence in these two broad, general categories, with the understanding that the Staff reserves the right to review and comment upon the detailed design submittal which will be forwarded to you as the design is finalized.

Should you desire to discuss our request further, or require any additional information, please do not hesitate to contact my office.

Very truly yours,

John D. Leonard, Jr.
Vice President - Nuclear Operations

JDL/lac

Enclosures

cc: W. Russell - Region I Administrator
R. Lo
C. Warren

## Attachment

### NRC Staff Concerns

1. Why does Shoreham need a vent (FILTRA) that will not accomplish the same purpose as venting? (10)

   Response: The purpose of the Supplemental Containment System (SCS) is to improve upon the venting capability already installed at Shoreham. The SCS provides an engineered passive primary containment wetwell airspace vent with the ability to control releases for post accident management. Existing venting capabilities, including those currently available through the implementation of the EPG Revision 4 guidelines, have limitations in their ability to mitigate certain types of severe accidents. What the SCS does is to increase the venting capability to cope with those accidents currently within the existing venting abilities plus additional severe accident scenarios. The SCS has the added benefit of also being able to filter the releases, significantly reducing the extent of radioactive particulate that could be released to the atmosphere during a severe accident.

2. Has LILCO looked at the possibility of the drywell head remaining intact at 130 psig, the ultimate capacity? (10)

   Response: In support of the 1983 Shoreham Probabilistic Risk Assessment (PRA), the drywell head was analyzed to determine its ultimate structural capacity along with other structural elements of the primary containment. The results of this analysis showed that the drywell head reaches a general yield state at approximately 130 psig. At this pressure, relaxation of the O-ring seal between the drywell head flanges was found to be negligible. Containment structural integrity is being considered in the current PRA efforts, the results of which will be provided in the October submittal.

3. Has the omega seal (connecting the drywell floor with the containment wall) been analyzed for failure at high temperature? (12)

   Response: The omega seal (drywell floor seal) has been analyzed to ensure its ability to function during the DBA-LOCA conditions of 48 psig and 340°F. The functional and environmental material testing programs for the drywell floor seal are detailed in subsection 3.8.1.7.2 of the USAR. The drywell floor seal has not been specifically analyzed at the higher temperatures associated with those

accidents outside of the design basis of the plant. However, the design basis for the SCS has been established assuming that drywell to wetwell bypass exists.

4. Is LILCO planning to contract with a Swedish company for the SCS project or simply planning to buy the rights to the design, including the calculations? (22,23)

   Response: LILCO is presently engaged in contract negotiations with SwedPower, who will provide us with the technology, design documents, research data and licensing support for the FILTRA structure and the auxiliary building. The balance of plant (BOP) engineering, which represents the scope of work from the primary containment penetration out to the auxiliary building, will be competitively bid to an architect-engineer.

5. Do the dissimilarities of Barseback and Shoreham make a big difference in terms of copying the design? (32)

   Response: Through design discussions with SwedPower, LILCO has evaluated the ability to utilize the Barseback design to meet Shoreham's design criteria. We have concluded it is feasible to adapt the Barseback FILTRA design to Shoreham.

6. What is the pressure at the vent top? (35)

   Response: Pressure relief capabilities located at the top of the Shoreham vent structure are comprised of two discharge lines. The high capacity (large diameter) discharge line is equipped with relief valves set at approximately 45 psig, and a rupture disc to maintain the nitrogen atmosphere and protect the relief valves from the outside environment. It should be noted that the incorporation of the relief valves is still under consideration.

   The low capacity discharge line (small diameter) is equipped with a remote manual valve and rupture disc which actuates at approximately 4 psig. This low capacity line is normally valved off (locked) and is only used in long term recovery to depressurize the FILTRA.

7. What is the seismic design category of the SCS? (45)

Response: The SCS is an added safety measure which is neither required nor relied upon to meet the plant design basis. Accordingly, LILCO has classified the SCS as QA Category I up to the containment interface (i.e., the two safety-related isolation valves and rupture disk) and QA Category II for the balance of the system. However, in view of the significance of the SCS in mitigating severe accidents beyond the design basis of the plant, the main process system of the SCS (i.e., passive filtering and venting) will be designed to the seismic loading criteria established for the licensing basis of the Shoreham plant.

Thus, those structures, systems, and components whose failure may affect the critical functions of the SCS will, in general, be designed to seismic Category I loads and criteria as specified in the Shoreham USAR and other applicable documents. Using this definition, Seismic Category I requirements will be followed as a guide for the design of the FILTRA structure, auxiliary building, and all structures and components directly associated with the primary vent path. In addition, the main process system and, in particular, the FILTRA and auxiliary building shall be designed for the effects of tornado loading.

8. Discuss inspection and testing requirements for the SCS (46, 94)

Response: An appropriate preoperational test program will be developed for the SCS. Testing will include routine equipment checkout and various power and logic circuit checks. Special tests beyond these requirements will be formulated at a later date.

9. Discuss the isolation valves with respect to operator actions. (48)

Response: The design philosophy of the SCS is that the activation is a passive function requiring no operator action. Accordingly, the normal position of the containment isolation valves in the main process piping is the open position. System logic is such that if flow is detected in the discharge line with pressure less than the containment design pressure, the containment isolation valves will close. In the other case where the containment pressure rises to a point beyond a 55 psig permissive and flow

is detected, system logic will cause the containment isolation valves to remain open. The logic will be sealed in such a way that the valves will not close should the pressure subsequently fall below the 55 psig permissive. The isolation valves upstream of the rupture disc can be operated by remote manual control in the control room. Procedures will be developed to instruct the operator when to open or close the valves.

The containment isolation valves in the smaller drywell vent line leading to the FILTRA structure are normally closed and can be manually activated from the control room operator for long term venting. Procedures will also be developed to instruct the operator in the use of these valves.

10. Could the step to lower the water level in ATWS procedures be eliminated? (56)

Response: The SCS will allow greater flexibility for the operator to cope with higher power levels in an ATWS situation. With this additional benefit, there is no need to eliminate the step in the ATWS procedures that directs the operator to lower water level. At this time, LILCO anticipates that the basic philosophy in dealing with an ATWS will remain the same.

11. Has LILCO looked at the radial displacement of the containment at 60 psig? (58)

Response: Radial displacement considerations have currently not been evaluated since only a conceptual piping layout has been developed. However, as part of the detailed piping design, stress analyses will be performed to evaluate the effects of radial displacement of the containment. This process will ensure that the SCS piping system will accommodate any displacement and prevent excess stress on both the pipe and containment.

12. Provide a clarification of the valves in the FILTRA building, including controls on the valves. (62) (87)

Response: The FILTRA is designed to accommodate flow through a high capacity discharge line (30 inch diameter), but is also equipped with a low capacity discharge line (12 inch diameter). The normal flow path is through the high capacity line with its corres-

ponding main isolation AOV maintained in the open position. The low capacity discharge line is primarily used for the depressurization of the FILTRA during post accident recovery activities. Hence, the main isolation AOV in this line is normally closed. However, since these valves are remotely operable, the operator does have the capability of manipulating these valves to alter the flow path through the low flow capacity line should conditions necessitate such action. Procedures will be developed to instruct the operator in the use of these valves.

13. Will the SCS have a flow element on the system for normal type operation? (64)

Response: Flow measuring devices will be incorporated in the design of the SCS. The current design configuration incorporates flow measuring devices in the vicinity of the containment isolation valves that interplay with the valve logic as previously discussed in question 9. Additional flow measuring devices will be included in both the high and low capacity discharge lines to monitor any releases to the environment.

14. Are there provisions for makeup water to the suppression pool in ATWS sequences? (67)

Response: The volume of water in the suppression pool, reactor, and condensate storage tank are significantly larger than the FILTRA itself can condense. In any accident, many hours of steam production would have to occur before experiencing any significant depletion of water inventory. There is no new system needed to make up inventory as a result of the SCS installation.

15. Has any evaluation been done on the possibility of a water and steam mixture going through the vent as a result of the containment sprays? (70)

Response: Two phase flow in the vent line due to containment spray operation is not considered to be significant. The containment sprays are located in the drywell, which is sealed off from the wetwell airspace, where the vent opening is located. Therefore, contribution from these sprays is not of significance.

The wetwell airspace sprays operate at a low flow rate (about 500 gpm). This will create some suspended liquid in the wetwell airspace, but not of the proportions as from the drywell sprays. The possibility of a steam/water mixture flowing through the vent line consistent with the above design conditions will be evaluated in the design of the BOP system.

16. Has LILCO evaluated ATWS sequences above 8 percent, especially 20 percent power level? (70)

Response: The PRA currently being performed by LILCO will evaluate the full spectrum of ATWS power levels and their consequences. Realistically, the ultimate steam flow capacity of the FILTRA is significantly above 8%.

17. Does the amount of steam condensed determine when the vent relief valves would lift? (76)

Response: As previously discussed, the FILTRA is maintained in a nitrogen inerted environment. As a result, the initial relief valve lift will depend upon the volume available to accomodate non-condensables (primarily nitrogen) within the system. The amount of steam alone cannot be used to make the determination when or if they will lift. The PRA will develop a timeframe for this phenomena in more detail and will be provided in the October submittal.

18. What are the chances of activating the system and not activating the vents? (78)

Response: It is anticipated that there are some severe accident scenarios in which the event is terminated quickly, resulting in negligible releases from the FILTRA vent. For these scenarios, initial pressurization and release from the FILTRA is due to the nitrogen atmosphere within the FILTRA. As a result, it is anticipated that the nitrogen and only a small fraction of noncondensibles would be released to the atmosphere. Subsequent repressurization of the FILTRA structure would be long term and probably not sufficient to reactivate the discharge line relief valves. These events are currently being assessed in the PRA, the results of which will be discussed in the October submittal.

19. Discuss the testability and surveillance of the FILTRA system. (89)

    Response: The specifics of these programs have not yet been developed, however, appropriate equipment preventative maintenance will be performed as a minimum.

20. How will the relief valve logic handle a steam spike where the pressure drops off rapidly? (87)

    Response: There is no logic currently anticipated to control the activation of the relief valves within the SCS. Operation of these valves is due entirely to the pressurization rate of the FILTRA structure. Operation of the containment isolation valves is controlled by the system logic previously discussed in question number 9. During the development of the safety related logic, consideration of potential steam spikes will be evaluated against the accuracy and response times of the logic instrumentation. The inclusion of time delays in the logic will be considered.