## 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 (OL)

11/30/82

#### RESOLUTION OF SC CONTENTION 24/SOC CONTENTIONS 19(c) and (d) --CRACKING OF MATERIALS AND MATERIAL SELECTION

Suffolk County ("SC") Contention 24 and Shoreham Opponents Coalition ("SOC") Contentions 19(c) and (d) allege that LILCO has not taken adequate care in the selection and control of materials used in the construction of safety-related systems and components exposed to the reactor coolant environment. Because of this situation, SC and SOC believe that there is an increased risk of accidents at Shoreham and that increased worker exposure to radiation is likely.

The parties have discussed these issues and have agreed that with the exception of the area of concern described in Item 1 below, the SC and SOC concerns can be resolved, provided that the terms, conditions and actions described in Items 2-9

ATTACHMENT 2

below are implemented. SC and SOC believe that the steps described in Items 2-9 will improve the safety of Shoreham and thus eliminate the need to pursue these matters in the hearing process. Accordingly, upon acceptance of this Agreement by the Licensing Board, and in accordance with the terms specified below, the concerns identified in Items 2-9 below are resolved. The concerns identified in Item 1 are not resolved by this Agreement.

## Item 1. Sensitization of Reactor Internal Components

Subsequent to the prefiling of direct testimony on SC Contention 24/SOC Contentions 19(c) and (d), NRC Board Notification 82-70 identifying a Differing Professional Opinion (DPO) was issued. This DPO was submitted by an NRC Staff member and relates to the potential sensitization of reactor internal components during the fabrication process. It calls into question the material properties of the components produced by the GE process. The parties have been unable to reach agreement on the resolution of these concerns, although efforts to do so are continuing. In the event the parties are unable to resolve the DPO concerns through their ongoing discussions, the parties will promptly notify the Board.

SC and SOC believe that the concerns raised by the DPO are within the scope of SC Contention 24/SOC Contentions 19(c) and (d) and may be litigated in this proceeding; LILCO believes that they are not within the scope of the contentions and are not litigable. The parties intend that the availability of

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this matter for litigation, whether within the context of SC Contention 24/SOC Contentions 19(c) and (d) or as a new contention, shall be governed by the Commission's rules of practice and the applicable law. However, if SC or SOC moves to admit a new contention within two weeks of the Board's ruling on whether the issue is litigable in the context of SC Contention 24/SOC Contentions 19(c) and (d), or within such other time as will have been prescribed by the Board, neither LILCO nor the Staff will raise the issue of timeliness. SC and SOC retain the right to argue that any litigation of this issue must be completed prior to initial criticality. This Agreement is not intended to resolve the concerns raised by the DPO.

#### Item 2. Leak Detection

SC and SOC have identified as a major concern under these contentions the problem of potential failure of type 304 stainless steel ("SS") piping due to intergranular stress corrosion cracking ("IGSCC") in those systems exposed to the primary reactor coolant. NUREG-0313, Revision 1, (hereinafter, "NUREG-0313") specifies that such systems should ether be constructed of materials resistant to IGSCC or that the neat affected zones of the welds or of other sensitized areas should be subjected to post-weld treatment protection by the use of solution heat treatment ("SHT") or corrosion resistant cladding ("CRC"). Under NUREG-0313 standards the 304 material in use on the Shoreham recirculation system is not considered to be a

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"conforming" material and thus is classified as "non-conforming" in the non-treated condition. NUREG-0313 additionally discusses the post-weld treatment process of induction heat stress improvement ("IHSI") but does not accept it on a generic basis and specifies that IHSI will be assessed on a case-by-case basis if proposed by a licensee. Nevertheless, the County recommended that LILCO perform such treatment, and LILCO, unknown to SC, had in fact planned to do so. LILCO does not agree that NUREG-0313 requires post-weld heat treatment. The Parties agree that NUREG-0313 requires augmented In-service Inspection (ISI) for welds classified as "non-conforming."

In SC's and SOC's opinion, but not LILCO's, the Shoreham recirculation system as presently constructed does not fully comply with the NUREG-0313 guidelines, and the potential for failures due to IGSCC is thus greater than desirable. Such failures could result in an increased risk of LOCAs and the repair of such failures could cause increased occupational radiation exposure of the plant staff and contract personnel.

LILCO has subjected all possible and applicable recirculation system welds to the post-weld process of IHSI, and has notified the NRC of the action. The NRC is evaluating qualification of the IHSI process as a conforming process under NUREG-0313 for the Susquehanna plant. LILCO believes that IHSI will be generically approved as a result of this review. If so, those portions of the Shoreham recirculation system that have received SHT or IHSI treatment will be reclassified as

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"conforming" material per NUREG-0313. If the NRC does not approve IHSI, the IHSI welds will continue to be classified as "non-conforming."

LILCO has additionally provided to SC and SOC consultants:

- (1) An 8-page listing of all recirculation system welds, showing the IHSI applicability of each;
- (2) Isometric sketches of the system showing weld locations; and.
- (3) A list of PSI Class 1 Relief Requests which identifies 10 recirculation and RHR system welds for which full PSI and ISI capability does not presently exist due to geometry or access problems (see SNRC-759, Attachment 1 hereto).

SC and SOC consultants have reviewed this documentation, have discussed the matter with LILCO personnel, and have personally viewed the location and configuration at the facility of typical and significant welds. SC and SOC consultants and LILCO have agreed on the following facts:

The Shoreham recirculation system contains
120 SS 304 welds of interest. This includes
9 welds that are technically a part of the
RHR or RWCU systems but which are tied into
the recirculation system.

- (2) Of the 120 welds, 24 have already received SHT. SC and SOC agree that these welds are acceptable.
- (3) LILCO has treated 74 of the welds with IHSI, and SC and SOC agree that these welds are acceptable.
- (4) A total of 22 welds will not receive the post-weld treatment that SC and SOC believe is needed (included in the 22 welds are 3 RHR system welds). The reasons for not treating these welds are piping configuration, weld geometry and/or lack of physical access for IHSI equipment. SC and SOC consultants have reviewed the LILCO data and agree that IHSI is not practical on these joints. SC, SOC and LILCO further agree that internal application of CRC is not practical for these joints and that removal of the radial beams to improve the access is not a practical solution.

Accordingly, in SC's and SOC's view, but not LILCO's, there appear to be 22 welds that will not fully comply with NUREG-0313. Nevertheless, LILCO agrees to install an augmented leak detection system in accordance with terms identified below for welds meeting the criteria discussed below. Two levels of crack detection for welds already exist at Shoreham. The first level involves the Drywell Leak Detection Systems described in Section 5.2.7 of the FSAR. The second level involves augmented inservice inspection to be conducted in accordance with NUREG-0313 and committed to by LILCO in its acceptance of NUREG-0313 guidance (see SNRC-566). SC and SOC have expressed the view that a third level of detection may be appropriate for certain "high risk" welds, that is, those welds from among the 22 welds described above, with the highest potential for undetectable cracking.

Three factors should be considered in determining "high risk" welds. The first consideration should be whether the weld has received any post-weld treatment.

The second consideration is the stress level in the weld. Research indicates that for cracking to be initiated in the BWR environment, a weld must be exposed to a tensile stress above the yield stress. GE has developed a formula called the Stress Rule Index (SRI) which evaluates the weld for this condition. The formula predicts the potential for initiation of cracking if the SRI exceeds 1.0. Field experience to date has shown this rule to be conservative for the 140 cracking incidents where the SRI has been calculated (out of a population of 292 known cracking incidents). In all cases evaluated by CE, the SRI was succeeds 1.2 for welds that actually cracked in operating plants. It is LILCO's position that welds having a SRI less than 1.2 -- and certainly a SRI less than 1.0 -- lack a

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technical basis for being considered "high risk." SC and SOC, however, do not agree with this proposition because of the fact that the SRIs have not been quantified for all cracking incidents and because there is a degree of uncertainty in the SRI quantification.

The third important variable for "high risk" categorization is inspectability of the weld. Some of the 22 welds are not now totally inspectable (See Attachment 1).

LILCO proposes to do the following about a third level of leak detection for "high risk" welds at Shoreham:

(1) LILCO will systematically identify "high risk" welds, which would be those that meet the following criteria:

- (a) no post-weld treatment;
- (b) a SRI greater than 1.0, which is to be verified by an independent third party analysis; and
- (c) less than 90% inspectability.

In applying these "high risk" criteria, the following procedures will be used:

(a) The weld SRIs shall be initially calculated for LILCO by GE in accordance with GE's SRI methodology. Included in the quantification shall be identification of the error bands. LILCO will also make arrangements for a third party independently to quantify the SRIs and the error bands. The third party shall be either Sol Levy Associates or Failure Analysis Associates, or shall be

selected from a list of potential candidates mutually agreed upon by LILCO and SC and SOC. LILCO shall make fully available to SC and SOC all the calculations, methods, assumptions, and results. If requested by SC or SOC, appropriate LILCO and/or GE and third party representatives will be available to discuss these results with SC and SOC consultants. The SRI acceptance criteria will require that the welds' SRI must be shown to be less than 1.0 assuming the most conservative use of the error bands. All obligations of LILCO set forth in this paragraph will be completed prior to March 1, 1983 or two months after commencement of fuel load, whichever is later. In no event will they be completed later than June 1, 1983. (b) The 90% inspectability will be judged based upon the PSI or the ISI completed results. This means that the percentages currently achieved in the PSI program will govern the "high risk" classification until such time as a different percentage is determined to be actually achieved in the ISI program approved in the future.

(2) LILCO will perform an engineering review of the Techmark/Nutec Leak Detection System. Although the system appears promising, it has not yet been tested for reliability in a BWR containment. An earlier hardwired version of the system has been installed in the secondary containment at North Anna Units 1 and 2, and is being installed at Fermi Unit 2.

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The Techmark System is currently being evaluated under an EPRI-sponsored effort, of which Phase One has already been completed. The EPRI contractor for the program is Acton Environmental Testing Corporation (AETC) of Acton, Massachusetts. Phase One of the program developed an on-line functional test of the system. This test was conducted on March 1, 1982. Phase Two of the program will proceed with environmental qualification of the system in accordance with IEEE-323. This test is scheduled for the fall of 1982. After results of these two phases are completed, EPRI will evaluate what additional testing (e.g., in situ) may be required.

LILCO proposes to monitor the EPRI program and use its results to perform a Shoreham-specific evaluation as to whether the Techmark System's reliability is such that it could meaningfully augment the two existing levels of leak detection at Shoreham. The evaluation will consider: (a) environmental qualification (limited to early warning system, normal operating environment); (b) reliability of the system to detect pipe leakage only; (c) electrical system reliability to avoid spurious alarms; and (d) the design and installation of a Shoreham-specific system. The EPRI program should provide sufficient information to address all the above points except (d); if the program does not provide such information, LILCO will pursue other means of obtaining these data. LILCO will complete the Shoreham-specific study in time to permit installation of the system, if appropriate, at the first refueling

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outage. LILCO will promptly provide SC and SOC with the results of the EPRI study and the Shoreham-specific study referenced in this paragraph. LILCO will also promptly advise SC of its conclusions regarding "qualification" of the system for power reactor application. If, in LILCO's view, the system is not adequate, LILCO will advise SC and SOC of the technical basis for this position and of additional efforts needed or underway to suitably improve the system for subsequent use at Shoreham.

(3) If the results of the investigation in (2) above indicate that the Techmark System is "qualified," LILCO will install the Techmark System on all welds established as "high risk" in accordance with (1). If not initially "qualified" but if additional efforts subsequently result in "qualification" of the system, LILCO will install the system on the "high risk" welds at the next regularly scheduled refueling outage. This system, if installed, will be used as additional operator information, not as a Limiting Condition for Operation in the Technical Specifications.

# Item 3. ISI Accessibility

In its pre-filed testimony SC identified as a second concern the fact that all welds are not fully accessible for ISI. This concern is also expressed in SOC Contentions 19(d). The welds for which this is true have been discussed in Item 2 above. LILCO has identified 10 recirculation and RHR welds of

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concern (see Attachment 1). None of the 10 currently meet the 90% criteria in the PSI program, but LILCO believes that six of the 10 will be able to meet the 90% ISI inspectability criterion. The remaining four are currently projected to be 21%, 64%, 63% and 65% inspectable for the ISI program.

LILCO has committed to attempt prior to fuel load to improve the inspectability of the ten welds referred to in the preceding paragraph by using new calibration standards where applicable and practicable. SC and SOC accept this commitment to resolve the ISI accessibility concern expressed in SC Contention 24 and SOC Contentions 19(d) subject to the implementation of the augmented leak detection commitment in Item 2. No later than 20 days prior to commencement of fuel load or by January 15, 1987, whichever is earlier, LILCO will report in writing to SC and SOC regarding its implementation of this commitment and the technical basis for any actions taken or decisions that no actions are necessary.

In addition, LILCO will classify, in accordance with NUREG-0313, as "service sensitive" and accordingly, subject to augmented inspection as defined in NUREG-0313, those welds meeting the following criteria:

(1) Be larger than four inches in diameter;

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- (2) Not have received post-weld treatment (SHT or IHSI); and
- (3) Have a SRJ greater than 1.0, or ISI UT inspectability of less than 90%.

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## Item 4. Pipe Replacement

SC identified as a concern the potential problem of large scale replacement of failed SS 304 pipe after operation, which the County believes may create significant radiation levels. SC recommended that a contingency plan be developed by LILCO to prepare for such eventualities.

LILCO has provided the following data to SC for review:

- A description of the Pooled Inventory Management (PIM) program presently being implemented by GE;
- (2) LILCO'S PIM notes, indicating that LILCO expects piping to be considered in PIM;
- (3) A discussion of the BWR Owners' Group Remedy Development Center established at Charlotte, North Carolina. Piping replacement tools and methods are being developed at this facility.

In addition, LILCO and SC consultants have discussed the major piping replacement program currently underway at the Nine Mile Point, Unit 1 plant. It is anticipated that this experience will provide valuable experience and input for possible future programs.

SC agrees to resolution of this concern based on LILCO's agreement to:

 Participate in the PIM or equivalent pooled inventory program;

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(2) Sponsor inclusion of piping materials in the program;

- (3) Participate in and encourage on an ongoing basis, applicable developments in the Group Remedy Development Center; and
- (4) Closely follow the plan and implementation of the large recirculation pipe replacement program currently underway at Nine Mile Point, Unit 1.

LILCO will advise SC of its implementation of its Item 4 commitment no later than 20 days prior to commencement of fuel January 3 load or by Hovember 15, 1982, whichever is earlier.

#### Item 5. Regulatory Guide 1.31

SC and SOC identified as a concern the potential degradation of SS 304 welds due to the fact that the latest revision of Regulatory Guide 1.31 was not in use during the construction of Shoreham piping systems. In response to this concern, LILCO has provided the following information to SC and SOC consultants:

(1) A summary report by GE, dated November 26, 1975, covering delta ferrite measurements of GE responsibility welds at five plants constructed per the GE methods. This report verifies acceptable experience with the GE procedures used at Shoreham. (2) Delta ferrite measurement data taken by LILCO at Shoreham on weld samples as specified by NRC's MTEB 5-1. Results reported showed that for the G-41 and P-21 systems, the 43 welds tested were found acceptable.

Based on review of the above information, SC and SOC are satisfied that this concern has been resolved.

## Item 6. Weld Sensitization Tests

SC and SOC identified the desirability of utilizing the electrochemical potentiokinetic reactivation method ("EPR") as a check to ensure that weld sensitization was not excessive. Subsequent to the filing of testimony on SC Contention 24/SOC Contentions 19(c) and 19(d), LILCO has identified the locations of the non post-weld treated joints and has demonstrated to SC and SOC consultants' satisfaction that EPR is not a practical method for the welds in question. SC and SOC therefore agree that this concern is resolved.

## Item 7. Cobalt and Carbon Levels

SC and SOC identified a need for LILCO to verify the suitability of carbon and cobalt levels in the RCPB materials and thus to demonstrate minimization of sensitization and of radiation level buildup. Subsequent to the filing of testimony on SC Contention 24/SOC Contentions 19(c) and (d), LILCO has documented that cobalt levels in alternate piping materials are commonly no lower than in SS 304. SC and SOC consultants agree. LILCO has also provided to SC and SOC a compilation of carbon content in IHSI treated recirculation piping spools. SC and SOC consultants have reviewed those data and find that no unusually high percentages exist. In view of LILCO's performance of IHSI on all applicable welds, SC and SOC agree that this concern has been satisfied.

## Item 8. Furnace Sensitized Materials

SC and SOC identified as an additional materials failure concern the potential failure of furnace sensitized materials in the RCPB and of reactor internal components. LILCO has provided SC and SOC consultants with a copy of GE specifications 21A9242, "Reactor Pressure Level," and 21A3319, "Standard Requirements for Core Structure." These documents verify that furnace sensitized materials are not utilized at Shoreham and that internals are required to be solution heat treated. Based on these data, SC and SOC agree that furnace sensitized materials are not an issue at the Shoreham reactor.

#### Item 9. Commitment to NUREG-0619

SC also identified as a concern LILCO's failure to commit unequivocally to comply with NUREG-0619 by installing the triple sleeve sparger and a low feedwater flow controller before fuel load. LILCO has now installed these components and has committed to demonstrate, during startup tests, the compliance of the low flow controller with NUREG-0619 requirements.

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SC therefore agrees that the NUREG-0619 issues have been resolved, subject to satisfactory test of the controller. LILCO agrees to take appropriate corrective action prior to fuel load if the controller does not prove to be acceptable under the NUREG-0619 criteria. LILCO will provide SC with the results of the startup test of the low flow controller as soon as the data become available. LILCO will also provide SC with information on what corrective action is required, if any, as soon as possible, but no later than the first refueling outage.

Counsel for' LONG ISLAND LIGHTING COMPANY

Counsel for SHOREHAM OPPONENTS COALITION

for ounsel

SUFFOLK COUNTY

Counsel for NUCLEAR REGULATORY COMMISSION STAFF

Join him 30 Dated: October 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)

#### CERTIFICATE OF SERVICE

I hereby certify that copies of the Statement of Suffolk County Concerning Sensitization of Reactor Internals Issue -- Halapatz Concerns, were, on January 21, 1983, served upon the following by first class mail, postage pre-paid, or by hand or telecopier and Federal Express, as indicated.

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