

REPORT NO. 50-322/86-01

DOCKET NO. 50-322

LICENSE NO. NPF-36

LICENSEE: Long Island Lighting Company
P. O. Box 618
Shoreham Nuclear Power Station
Wading River, New York 11792

INSPECTION AT: Wading River, New York

INSPECTION CONDUCTED: January 1 - 31, 1986

INSPECTORS: John A. Berry, Senior Resident Inspector
Clay C. Warren, Resident Inspector

APPROVED:

Jack Strosnider
J. R. Strosnider, Chief, Reactors Projects
Section 1B, Division of Reactor Projects

3/1/86
Date Signed

SUMMARY: Routine, resident monthly inspection and activities related to the Reactor Water Level Reference Leg Replacement Outage.

This inspection involved 140 hours of inspection by the Senior Resident Inspector and Resident Inspector.

Five open items were closed as a result of this inspection. No unacceptable conditions were identified.

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DETAILS

1. Status of Previous Inspection Items

1.1 (Closed) 85-08-01, Leakage Reduction Program

NRC Inspection Report 85-43 detailed the licensee's corrective actions for the Leakage Reduction Program that were made as a result of NRC Inspection 85-08. The item was left open pending completion of revisions to two procedures. The inspector verified that these procedure revisions have now been completed. This item is closed.

1.2 (Closed) 50-322/85-42-01, Check Valve Failures

This item related to failures of swing check valves manufactured by the Anchor/Darling Valve Co. The licensee's actions in this matter were reviewed at a Licensee/NRC Management Meeting at the Shoreham site on January 28, 1986. Details of that meeting may be found in Section 6.0 of this report. This item is closed.

1.3 (Closed) 85-36-02, RHR Bolt Failure

This item related to the failure of bolts on the minimum flow bypass valve for RHR Loop B. The licensee's actions in this matter were reviewed at a Licensee/NRC Management Meeting held at the Shoreham site on January 28, 1986. Details of that meeting may be found in Section 6.0 of this report. This item is closed.

1.4 (Closed) 85-43-01, Personnel Errors

This item related to personnel errors which had occurred over the past months at Shoreham. The licensee's actions in this matter were reviewed at the January 28, 1986 Management Meeting. Details of this meeting may be found in Section 6.0 of this report.

This item is closed. The effectiveness of the licensee's actions will be monitored as part of the routine resident inspection activities.

1.5 (Closed) 50-322/85-42-02 & 50-322/85-42-03, Violations Involving Maintenance Activities on RHR Pump 'B' Suction Valve and Station Equipment Clearance Permits

NRC Inspection Report 50-322/85-42 detailed two violations of NRC requirements by the licensee relating to inadequate procedural controls and procedural violations in completion of Station Equipment Clearance Permits. The licensee was required to respond to these violations and indicate 1) the corrective actions taken and results achieved, 2) corrective actions which will be taken to avoid further occurrence, and 3) the date(s) when full compliance will be achieved.

The licensee responded to the subject notices of violation on January 31, 1986, (Ref: SNRC-1231, J. D. Leonard, Jr. (LILCO) to Dr. T. E. Murley (NRC), dated January 31, 1986). The inspector reviewed the licensee's immediate and long term corrective actions and found these planned actions adequate to prevent reoccurrence. No unacceptable conditions were identified. These items are closed.

2. Review of Facility Operations

2.1 Operational Safety Verification

The inspector toured the control room daily to verify proper shift manning, use of and adherence to approved procedures, and compliance with Technical Specification Limiting Conditions for Operation. Control Panel instrumentation and recorder traces were observed and the status of annunciators was reviewed. Nuclear instrumentation and reactor protection system status were examined. Radiation monitoring instrumentation, including in-plant Area Radiation monitors and effluent monitors were verified to be within allowable limits, and observed for indications of trends. Electrical distribution panels were examined for verification of proper lineups of backup and emergency electrical power sources as required by the Technical Specification.

The inspector reviewed Watch Engineer and Nuclear Station Operator logs for adequacy of review by incoming watchstanders, and for proper entries. A periodic review of Night Orders, Maintenance Work Requests, Technical Specification LCO Log, and other control room logs and records was made. Shift turnovers were observed on a periodic basis.

The inspector also observed and reviewed the adequacy of access controls to the Main Control Room, and verified that no loitering by unauthorized personnel in the Control Room Area was permitted. The inspector observed the conduct of Shift personnel to ensure adherence to Shoreham Procedures 21.001.01, "Shift Operations" and 21.004.01, "Main Control Room - Conduct for Personnel".

2.2 Plant and Site Tours

The inspector conducted periodic tours of accessible areas of plant and site throughout the inspection period. These included: the Turbine and Reactor Buildings, the Rad Waste Building, the Control Building, the Screenwell Structure, the Fire Pump House, the Security Building, and the Colt Diesel Generator Building.

During these tours, the following specific items were evaluated:

- Fire Equipment - Operability and evidence of periodic inspection of fire suppression equipment;
- Housekeeping - Maintenance of required cleanliness levels;
- Equipment Preservation - Maintenance of special precautionary measures for installed equipment, as applicable;
- QA/QC Surveillance - Pertinent activities were being surveilled on a sampling basis by qualified QA/QC personnel;
- Component Tagging - Implementation of appropriate equipment tagging for safety, equipment protection, and jurisdiction;
- Personnel adherence to Radiological Controlled Area rules, including proper Personnel frisking upon RCA exit;
- Access control to the Protected Area, including search activities, escorting and badging, and vehicle access control;
- Integrity of the Protected Area boundary.

No unacceptable conditions were identified.

3. Licensee Reports

3.1 In Office Review of Licensee Event Reports

The inspector reviewed Licensee Event Reports (LERs) submitted to the NRC to verify that details were clearly reported, including accuracy of the cause description and adequacy of corrective action. The inspector determined whether further information was required from the licensee, whether generic implications were involved, and whether the event warranted onsite follow-up. The following LERs were reviewed.

<u>LER Number</u>	<u>Title</u>
* 85-57	RBSVS Initiation due to technician error
* 85-58	NSSS Isolations due to I&C technician error
* 85-59	Loss of 'B' RPS due to the EPA Breaker being found in the "OFF" position

* These events are discussed in NRC Inspection Report 50-322/85-43.

No unacceptable conditions were identified.

4. Monthly Surveillance and Maintenance Observation

4.1 Maintenance Activities

The inspector observed the performance of various maintenance activities throughout the inspection period. During this observation, the inspector verified that; maintenance activities were conducted within the requirements of the plant's administrative procedures and technical specifications, proper radiological controls were implemented and observed, proper safety precautions were observed, and that activities which have the potential to impact plant operations are properly coordinated with the control room.

Activities related to the reference leg replacement outage maintenance and modification work were observed by the inspector. See Section 8.0 for details of these activities.

No unacceptable conditions were identified.

5. Review and Followup of I&E Notices, Bulletins and Generic Letters

5.1 I&E Notices

The inspector reviewed notices issued by the Office of Inspection and Enforcement during the inspection period. Review was to determine; if the subject of the notice was applicable to the Shoreham Nuclear Power Station, and if followup of the licensee's action was required by the inspector.

The following I&E Notices were received and reviewed during the inspection period:

- 86-01 Failure of Main Feedwater Check Valves Causes Loss of Feedwater System Integrity and Water-Hammer Damage
- 86-02 Failure of Valve Operator Motor During Environmental Qualification Testing
- 86-03 Potential Deficiencies in Environmental Qualification of Limitorque Motor Valve Operator Wiring
- 86-04 Transient due to Loss of Power to Integrated Control System at a Pressurized Water Reactor Designed by Babcock & Wilcox

I&E Notices 86-01 and 86-04 related to events at Pressurized Water Reactors, and therefore do not apply to Shoreham. The licensee's actions on the information in Notices 86-02 and 86-03 will be reviewed as part of future inspection activities.

5.2 Generic Letters

Generic letters 86-01, Safety Concerns Associated With Pipe Breaks in BWR Scram Systems, and 86-02, Technical Resolution of Generic Issue B-19-Thermal Hydraulic Stability were received and reviewed during the inspection period. Both Generic letters were informational in nature, and no action by the licensee is required.

6. Licensee/NRC Management Meeting Held on January 28, 1986 at the Shoreham Nuclear Power Station

Two meetings were held at the Shoreham site on Tuesday, January 28, 1986 between licensee and NRC Management to discuss issues related to Personnel Errors and Check Valve/Mounting Bolt issues. Details of these meetings are discussed below.

6.1 Meeting on Personnel Errors

9:00 a.m. - Offices & Services Building Conference Room

Attendees

NRC

- * W. F. Kane, Deputy Director, Division of Reactor Projects, Region I
- * H. R. Kister, Chief, Projects Branch No. 1, DRP, Region I
- * J. R. Strosnider, Chief, Reactor Projects Section 1A, Region I
- * J. A. Berry, Senior Resident Inspector, Shoreham, DRP, Region I
- * R. Caruso, Project Manager, NRR
- * J. Wiggins, Chief, Materials & Processes Section, Division of Reactor Safety, Region I
- * C. Warren, Resident Inspector, Shoreham, DRP, Region I

LILCO

- * J. D. Leonard, Jr., Vice-President, Nuclear Operation
- * W. E. Steiger, Plant Manager
- * D. Terry, Maintenance Division Manager
- J. Scalice, Operations Division Manager
- J. Schmidt, Radiological Controls Division Manager
- B. McCaffrey, Assistant to the V. P.-Nuclear
- * R. Grunseich, Operational Compliance Engineer
- * L. Britt, Nuclear Licensing & Regulatory Affairs Division Manager

* Also present at the afternoon meeting on Check Valve and Mounting Bolt issue.

The purpose of this meeting was to review and discuss the licensee's investigation of, and actions related to the personnel errors which had occurred over the previous months (see NRC Inspection Report 50-322/85-43 for background on this issue).

Subsequent to discussions between the Senior Resident Inspector and Plant Management Staff on December 20, 1985, the licensee initiated an in-depth analysis into all Licensee Event Reports (LERs) and Report of Abnormal Occurrence (RACs) which had been the result of errors by personnel. This analysis covered the period from fuel load to present. The purpose of the analysis was to attempt to identify root causes and similarities among the events.

The analysis was divided into three parts. Initially, all events which occurred were reviewed against a questionnaire which was designed to establish potential causes or mitigating factors associated with the event. The questionnaire dealt with issues such as; Staffing/Schedule, Training and Experience, Supervision, Procedures, and Physical Characteristics. This questionnaire was completed for every event by a Supervisor or Foreman. Supervisors and Foreman were expected to review the questionnaires with the personnel actually involved in the event, and personnel were encouraged to expand as necessary upon questions and to include comments which would assist in determining root causes and solutions.

After completion of the questionnaire by Supervisors and Foreman, all questionnaires were submitted to the Division Managers for review and evaluation. This review included the assignment of personnel responsible for identified corrective actions, and a schedule for corrective action implementation. Where appropriate, assignment of short term actions to prevent reoccurrence prior to corrective action implementation were made. The Division Managers were also responsible for determination of the results of previous corrective actions, and an analysis of why they were ineffective if it was so determined. Division Manager evaluations were forwarded to the Plant Manager.

The Review of Operations Committee (ROC) then reviewed all recommended actions prepared by the Division Managers and reviewed by the Plant Manager. ROC also reviewed the questionnaire results for trends and root causes.

The Plant Manager presented the results of this review at the meeting. It was determined from the review that no specific root cause of the errors could be identified. No trends were noted in areas such as overtime, experience level, or procedural deficiencies. It was noted that one-half of the events involved three plant systems; Reactor Building Standby Ventilation, Reactor Water Cleanup, and Reactor Vessel Level. Other indicators showed some correlation with the time of the shift, but this was not dominant enough to indicate it as a root cause.

The review did discover certain areas where improvements could be considered. These included:

1. Improvement in the lifted lead and jumper program
2. Standardization of Station Equipment Clearance Permits
3. Allocation of work to avoid periods late in the shifts or just prior to scheduled meal breaks.

The Plant Manager stated that the tracking of personnel error related events would continue, and that continued evaluations would be made to identify areas for improvement. The Plant Manager also discussed ten (10) areas where immediate actions for improvement would begin. These were:

1. A review of the results of this study with all personnel to increase the awareness of the situation and to emphasize the importance of attention to detail.
2. An investigation into alternate methods of installing Lifted Leads and Jumpers to try and make surveillance activities easier to perform, and less prone to error.
3. Standardization of commonly and frequently performed Station Equipment Clearance Permits to eliminate potential errors of omission.
4. An investigation into ways to improve work scheduling.
5. Identification of, and possible improvement in Surveillance procedures which have a high potential for error due to intricacy.
6. A formalized training program in Technical Specifications for non-licensed personnel to increase their awareness.
7. A request to the Nuclear Engineering Department to accelerate studies into improvements in the Reactor Pressure Vessel Level System and a change in Reactor Building Standby Ventilation System setpoints.
8. A formalized quarterly management review of all RACs/LERs.
9. A formalized ROC review of RACs/LERs and presentation of results to plant personnel.
10. A revision to the Station Procedure on Abnormal Occurrences to include the event questionnaire discussed above.

The review of the personnel errors by the licensee was determined by NRC management to be comprehensive, and the proposed corrective actions appropriate. The NRC emphasized the need for Senior Licensee Management involvement in ensuring that all plant personnel understand the importance of minimizing errors. The licensee's short and long term corrective actions will be closely monitored by the NRC Inspectors to ensure their effectiveness, and will be discussed in future inspection reports as appropriate.

6.2 Meeting on Check Valves and Mounting Bolts

2:00 p.m. - Offices & Services Building Conference Room

Attendees

In addition to those attendees indicated in Section 6.1, the following personnel attended this meeting:

LILCO

E. Youngling, Manager, Nuclear Engineering Department
J. Riggert, Manager, Nuclear Systems Engineering Division
T. Bennett, Nuclear Systems Engineer
C. Scarlet, Nuclear Systems Engineer
G. Kennelly, Nuclear Systems Engineer

The purpose of this meeting was to discuss the licensee's findings and resolutions concerning failures of HPCI and RCIC Anchor/Darling swing check valves, (LER 85-04 - See NRC Inspection Reports 50-322/85-42 and 43 for background on these issues) and RHR motor operated valve mounting bolt failures. (See NRC Inspection Report 50-322/85-36 for background on this issue).

The licensee presented a briefing on the background of events related to these issues and detailed the licensee's efforts to determine the cause of the failures and corrective measures taken.

HPCI Check Valve Failures

The licensee had previously determined that the failure mechanism in both HPCI check valves was a lack of any locking mechanism on the hinge support capscrews, which allowed the capscrews to back out during operation. This failure mechanism then allowed the disc/hinge mechanism to fall below the valve seat and subsequently pass into the system piping.

A review of documentation supplied with the failed valves (assembly drawings) did not show any locking mechanism, however generic Anchor/Darling Tech Manual Drawings show a lockweld on the capscrews. Communication by the licensee with Anchor/Darling verified that some

type of locking device is required. The licensee and Anchor/Darling determined that lockwiring is sufficient and the failed valves were repaired in this manner.

As a preventative measure the licensee subsequently inspected all Anchor/Darling check valves of the same type and installed the lockwire modification to all valves without locking devices.

The final resolution to this problem is replacing the Anchor/Darling swing check valves used in the HPCI exhaust line with lift check valves. LILCO has committed that this modification will be made during the first refueling outage.

In conjunction with the HPCI check valve repair effort, the licensee instituted efforts to locate all unaccounted for valve parts. A complete sweep of the suppression pool by divers recovered all parts with the exception of one roll pin. The roll pin itself is physically larger than the ECCS pump section strainers, therefore the licensee believes there is no path to the reactor vessel for the missing roll pin.

RCIC Check Valve Failures

The failure mechanism for the RCIC exhaust check valve was mechanical failure of three bolts which secured the hinge support ring to the valve body. Metallurgical analysis of the failed parts shows the failure to be related to the oversize holes drilled in the bolt heads for lockwire.

As previously noted in inspection report 50-322/85-42 the licensee had decided to replace the RCIC exhaust check valves during the source outage. It was during this replacement that the damaged valve was discovered. Replacement of the RCIC exhaust swing check valves was completed during the outage with lift type check valves. The change of valve type will prevent any similar occurrence in the future.

LER 85-045-00 and inspection report 85- detailed the events leading to the discovery of broken RHR valve actuator mounting bolts and bolts constructed of the wrong material.

RHR Mounting Bolt Failures

The licensee's efforts to determine the cause of the RHR mounting bolt failures led to the conclusion that the failures were fatigue related and that these failures were accelerated by the use of carbon steel studs and capscrews rather than the high strength alloy steel as required.

In an attempt to identify the extent of the problem, the licensee instituted an inspection program of all HPCI, RHR and Core Spray system motor operated valves (MOV) to ensure use of proper materials and adequate tightness of all MOV operator mounting bolts in these systems. Results of this inspection showed nine additional RHR valves with loose operator mounting bolts, which were subsequently replaced with new mounting bolts.

The failed bolts were sent offsite for independent analysis and the failure mechanism in all cases was fatigue failure. All failed bolts were installed in valves on lines with high vibration characteristics. A design evaluation is underway to evaluate methods of reducing vibration.

The licensee is testing a random sample of MOV's throughout the plant to determine the extent of this problem. If the random sample shows an extensive problem to exist, then testing will continue and include a broader spectrum of MOV's.

When asked whether the mounting bolts were being checked for proper torque, the licensee stated that no torque values were available for these operator mounting bolts.

The licensee's review of the specific equipment failures was pursued in a thorough and rigorous manner. However, NRC is concerned that the full scope of the problem has not yet been addressed and that a broader spectrum of plant MOV's should be inspected to determine the full extent of this problem. The licensee committed to readdress this issue, and will discuss their resolution with the inspectors. NRC Region I expects that this resolution will be a full scope inspection of all valve mounting bolts in safety systems.

7. Reactor Pressure Vessel Water Level Reference Leg Replacement Outage

On January 9, 1986 the licensee began a scheduled maintenance/modification outage to replace Reference Leg piping in the RPV Water Level System, and to complete installation of the under the vessel Corium Ring.

The modification to the RPV Water Level System was initiated to prevent reoccurrence of level deviations which had occurred during the 5% Test Program. (See NRC Inspection Reports 50-322/85-35, 85-36, & 85-43 for background on this issue).

The completion of the Corium Ring is an integral part of the source-term analyses for the plant, and is taken credit for in the Shoreham specific Probabilistic Risk Assessment performed for the plant. The final completion work involved the installation of blocks at four locations where ventilation holes exist in the reactor pedestal.

In addition to the modification activities scheduled, the licensee also planned to perform all 18 month surveillance procedures which could be done to bring the surveillances current to June 1, 1986. Other maintenance activities were also scheduled on the Diesel Generators, Circulating Water System, and various valves.

The first cut in the Reference Legs was made on January 15, 1986, and removal of the lines commenced. The new reference leg piping was installed by January 20, 1986. Recalibration of instrumentation began, and that effort continued through the end of the inspection period. Support work, insulation work and excessive flow check valve surveillance also continued.

Work on the Corium ring during the inspection period consisted mainly of preparation under the vessel, and concrete work in the shop.

Other activities during the period included repairs to the 'A' Circulating Water Tunnel inlet and inspection of swing-check valves.

No unacceptable conditions were identified.

8. Resident Inspector Assignment

On January 27, 1986 Mr. Clay Warren reported to the Shoreham site for duty as the Resident Inspector. Mr. Warren is assigned to the U. S. NRC-Region I Shoreham Resident Inspector's Office and will report to Mr. John Berry, Senior Resident Inspector.

Prior to his appointment with the NRC, Mr. Warren was employed as a SRO Licensed Shift Supervisor at Gulf State Utilities' River Bend Nuclear Plant.

9. Management Meetings

At periodic intervals during the course of this inspection, meetings were held with licensee management to discuss the scope and findings of this inspection.

Based on NRC Region I review of this report, and discussions with licensee representatives, it was determined that this report does not contain information subject to 10 CFR 2.790 restrictions.

The inspectors also attended entrance and exit interviews for inspections conducted by region-based inspectors during the period.