U.S. NUCLEAR REGULATORY COMMISSION
Region I

Report No. 50-322/85-10

Docket No. 50-322

License No. NPF-19

Licensee: Long Island Lighting Company

175 East Old Country Road

Hicksville, New York 11801

Facility: Shoreham Nuclear Power Station

Inspection At: Shoreham, New York

Inspection Conducted: January 28-31, 1985

Prepared by: Gene Kelly
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Summary:

A special inspection by a region-based project engineer (24 hours) of allegations related to the design, inspection and testing of the Shoreham Nuclear Power Station was conducted. The allegations were made by a former LILCo Operational Quality Assurance (OQA) inspector (Mr. George Henry) and presented in a January 17, 1985 newspaper article published in The Suffolk Times which provided the basis for the inspection.

The newspaper article cited Mr. Henry as expressing essentially eight technical problems: (1) the backup TDI diesels are not reliable; (2) lack of redundancy in off-site power circuitry for the plant; (3) a critical check valve has problems which need to be corrected; (4) a valve in the emergency core cooling system (HPCI) would not operate properly and it could result in a serious accident; (5) there are defects in fuel rods; (6) a catch-basin at a vehicular decontamination area after an accident is not lined with fiberglass; (7) plant staff in an emergency cannot be relied upon for evacuation advice because of mistakes in plotting prevailing wind during a drill; and (8) people (e.g., inspectors from LPL hired on a contract basis) who are strict on enforcing quality standards are laid off by LILCo.

Summary (Cont'd.)

Based on information cited in the article and on-site inspections, interviews and evaluations, there was no new information identified that would affect prior conclusions regarding engineering problems or construction defects. Items 3, 4 and 5 were found to be accurate descriptions of situations or conditions which did occur, but were properly documented by LILCo and appropriately dispositioned. Item 1 was the subject of prior NRC enforcement, special inspections and an agency task force evaluation; specific diesel testing problems in 1982 were the genesis of other NRC actions that were taken to assess both testing and reliability. Item 2 may be the subject of a misunderstanding; there is no single switch through which all offsite power is routed, although the temporary backup diesel generators, but not the gas turbine or the designated emergency diesels, are associated with a single switch. The catch basin in item 6 refers to mitigating features for automobile decontamination after an accident at the plant that could release airborne contaminants off-site in an uncontrolled manner; the detailed provisions and features of the decontamination facility are under evaluation. Item 7 refers to a practice drill held in 1982. Based on our review of the specific concern cited, the problem was identified during a practice drill, and appropriate corrective measures were taken at the time in response to the comments of the drill observers. The specific example regarding the use of contractors in enforcing quality standards in item 8 was pursued based on the available records; pending the availability of more detailed information, the actions taken in the matter of LPL appear reasonable, due to the completion of work, and not indicative of problems with enforcing quality standards.

DETAILS

1. Principals Contacted

D. Crocker, Onsite Emergency Preparedness Coordinator
R. Gauthier, Lead Power Engineer (S&W)
G. Gisonda, Regulatory Affairs Supervisor
J. Kelly, Quality Assurance Division Manager
J. Leonard, Jr., Vice President - Nuclear Operations
A. Muller, Quality Control Division Manager
J. Reilly, Operations Manager (GE)
W. Schiffmacher, Manager - Electric System Operations

2. Background

This inspection addresses allegations made by a former LILCo quality control inspector (George W. Henry) in a newspaper article written by Karl Grossman of the Suffolk Times on January 21, 1985.

Mr. Henry was a QC inspector assigned to LILCo's Operational Quality Assurance (OQA) Section from July 1981 until August 15, 1983. He was certified as a Level II mechanical/electrical inspector in accordance with ANSI Standard N45.2.6 on July 27, 1982.

His principal duties involved: review of procurement documents (estimated to be 50% of his work activity) material receipt inspections in the warehouse (15% of time); review and comment upon selected Station Procedures and logs (15%) and participation in OQA audits and witness of startup activities (20%). All of the alleger's work was subject to the review and approval of a OQA Engineer. None of his assigned duties involved construction (he was assigned to OQA, not Field Quality Control); moreover, at the time of his Level II certification, plant construction was approximately 95% complete and less than 25% of all plant systems remained to be turned over from the LILCo Startup Group to the Operations staff. He observed maintenance, preoperational testing, and repair/rework activities; performed OQA surveillance; and originated "violations" (as alleged) in the form of LILCo Deficiency Reports (LDRs) for deficiencies found during conduct of his assigned duties.

The above information was provided by Mr. Henry's former supervisor, and was based in part on a peer review of his work activities which was documented in an interoffice memorandum (J. Rose to A. Muller) dated November 7, 1983. That review included a sampling of 500 repair/rework requests and all LDRs originated by OQA during the period January-August 1983.

3. Allegations

3.1 TDI Diesel Reliability

Mr. Henry indicated in the article that the "backup diesels could not be counted on to function properly" and that he "would not trust them to shut the reactor down". The article indicated that he was present when the diesels were tested in August 1983 and "wrote several violations" which pointed to problems with the units.

3.1.1 Findings

Emergency Diesel Generator (EDG) 102 failed on August 12, 1983 due to a fractured crank shaft after approximately 1 3/4 hours of testing at the 3900 kW overload rating. The test was to demonstrate load carrying capability following the replacement of all eight cylinder heads with a newer design due to previously experienced leaks in the cooling water area. Inspection Report 50-322/83-28 documents NRC followup and review of that failure.

Mr. Henry was apparently present on the backshift (3 pm-midnight) and observed diesel testing during the time of EDG 102 crankshaft failure at approximately 5:15 p.m. on August 12, 1983. No record of repair/rework or LDR documentation originated or processed by the alleger, and associated with the crankshaft failure, could be found. However, two LDRs originated by Mr. Henry were found which covered EDG 103 testing performed in June 1983 (PT 307.004-C-1, test run #6):

-- LDR-1417, 6/20/83; Turbocharger Lube Oil Pressure Low; closed 11/23/83.

-- LDR-1424, 6/22/83; Failure to Shutdown from Control Room; closed 7/26/83.

Both of these LDRs were reviewed and found to receive proper LILCo Startup and Engineering evaluations and OQA approval and closeout.

Another LDR related to the installation of new cylinder heads (under repair/rework request 43-1000) for all three engines was reviewed and signed by Mr. Henry.

-- LDR-1545, 8/3/83; Cylinder Head Stud Fitup; closed 2/18/84.

That LDR was dispositioned "accept-as-is", with justification provided by an August 3, 1983 letter (McHugh to Rudikoff) from TDI to LILCo which clarified proper cylinder head stud length, thread fit and engagement. The LDR received appropriate review and approvals, and was closed out by OQA.

3.1.2 Conclusion

No evidence was found of nonconforming or deficient diesel conditions, identified in LDRs by Mr. Henry, which were contributing factors in the August 12, 1983 EDG 102 crankshaft failure.

NRC Region I staff was closely monitoring the diesel preoperation test program and associated mechanical problems. Escalated enforcement action associated with acceptance of a preoperational test at less than the full-load carrying capability was taken in April 1983. Consequently, the qualification and test program for the diesels was an issue addressed in numerous published reports prior to the crankshaft failure. A meeting had been held on June 30, 1983 at the Region I office to discuss that status, including corrective action for known problems such as: turbocharger bearings, piston modifications, cylinder head replacements, and vibrational problems. A summary of that meeting was issued by Region I on July 27, 1983. Since the crankshaft failure, a Recovery Test Program was developed and implemented by LILCo, and an NRC Task Force has studied the acceptability of TDI design. The qualification of these engines as emergency power sources at Shoreham is currently under litigation with an ASLB.

In summary, no new information was identified which would be relevant to the evaluation of TDI engines by either the NRC or the appropriate Shoreham ASLB. All of the "violations" (LDRs) identified by Mr. Henry while he was working as a Quality Assurance Inspector at Shoreham have been satisfactorily dispositioned.

3.2 Offsite Electrical Power Redundancy

Mr. Henry indicated in the article that "there is only one switch through which offsite electricity would come". This was based on "documents mapping the electric grid to Shoreham". This was cited as being indicative of a lack of redundancy or backup.

3.2.1 References

-- LILCo Drawing No. F-48570-7, September 25, 1982; One Line Diagram, 69 kV Switchyard

-- FSAR Figure 8.2.1-1, Revision 24, December 1981; Main One Line Diagram

-- LILCo Supplemental Motion for Low Power Operating License, filed on March 20, 1984; Affidavit of William G. Schiffmacher; pp 3-19 and Exhibits A through C

-- Technical Specification 3/4.13.1, Alternate AC Sources

-- January 29, 1985 (SNRC-1140) LILCo letter to NRC

-- Board Notification 85-009 dated February 1, 1985.

3.2.2 Findings

The sources of AC power available to Shoreham were described in detail in LILCo's March 20, 1984 Supplemental Motion for a Low Power Operating License, in an affidavit by William Schiffmacher, Manager of Electrical Engineering. Mr. Schiffmacher was contacted and explained to the inspector the four separate 138 kV circuits and three separate 69 kV circuits which feed Shoreham, on two separate and independent rights-of-way. The reliability of the LILCo offsite distribution system is enhanced by at least 8 offsite gas turbines with "blackstart" capability. In addition, a dedicated 20 MW gas turbine has been installed at the Shoreham site (in the 69 kV switchyard) for deadline, blackstart backup power to the reserve station service transformer (RSST) via the 69 kV bus. Finally, a block of four 2.5 MW General Motors EMD mobile diesel generators are directly connected to the plant's 4.16 kV bus network. This arrangement of offsite power was litigated before the ASLB and found to be acceptable in the Board's Decision issued on October 29, 1984.

The inspector could identify no single switch through which offsite power is supplied. This is physically impossible due to: (1) separate rights-of-way; (2) two different transmission voltages; and (3) independent feeds, by the 69 and 138 kV buses, to the normal station service (NSS) and RSS transformers, from which are fed the plant's 4 kV bus network.

The inspector walked down all breakers in the 69 kV switchyard using Single Line Diagram F-48570-7. The following breaker positions and functions were verified:

Breaker	Type	Function	Normal Position
640	DE-Ion Grid OCB Type GO-4-B	Isolates Yard	Closed
623	ABS-D3183 Type MO-10	RSST Supply	Closed
613	ITE Type MO-10 ABS-W4136	Gas Turbine Supply	Closed

These supply/isolation breakers are associated only with the 69 kV bus, one of 2 separate and independent offsite sources to Shoreham which feeds the RSST. No single switch exists through which both sources of offsite power are routed.

Onsite, proposed by LILCo as a temporary and alternate source of emergency power (should offsite power be lost), are the four 2.5 MW mobile diesel generators which directly supply the plant's 4 kV bus network. These are an additional source of emergency power should both the NSS and RSS transformers (ie. offsite power) as well as the three TDI diesels be lost or not available. At power levels up to 5%, two of the four mobile diesels would be needed, within 30 minutes, to supply power to emergency loads. All four are fed, through a single supply breaker (11B), to the 4.16 kV switchgear bus number 11. However, this is not an independent offsite source of power - rather, it is an alternate emergency source for low reactor power operation (up to 5% rated) and is backed up by the 20 MW gas turbine.

On January 25, 1985 the NRC staff determined that there did exist the possibility of a single equipment failure (breaker fault) that could disable both alternate sources of AC power (e.g., the 20 MW gas turbine and the four 2.5 MW mobile diesel generators). However, this situation does not involve the supply of "offsite power"; in fact, for this scenario it is assumed that all offsite power is lost. This issue was the subject of Board Notification 85-009 dated February 1, 1985 which states that an acceptable resolution (racking out of the subject breaker), meeting the single failure proof criterion, has been developed.

3.2.3 Conclusion

The inspector could not identify any single switch or breaker through which offsite electrical power was supplied. Given the separate 69 kV and 138 kV circuits, fed from various independent transmission facilities, the existence of such a switch is a physical impossibility.

This is based on consideration of: (1) the three 69 kV circuits which feed the Wildwood substation; (2) the four 138 kV circuits which feed the 138 kV Shoreham switchyard; and (3) their respective tie-in to the RSS and NSS transformers.

Shoreham's offsite electrical power distribution network was litigated before an ASLB. A decision in favor of LILCo's testimony was issued by that Board on October 29, 1984.

3.3 Fuel Rod Defects

Defects which could lead to serious consequences were alleged to exist in the new fuel rods. Mr. Henry stated that he was involved in fuel rod inspections which found problems with "zirconium cladding, gouges, and improper spaces for water flow". Those problems were alleged to "lead to hot spots ... and a breakdown in the rod itself ... if the rod becomes distorted and is not being cooled".

3.3.1 References

-- SP No. 58.001.01, Revision 7, July 21, 1982; Receipt, Inspection and Channeling of Unirradiated Fuel;

  - Procedure Step 8.1.6, New Channel Receipt
  - Appendix 12.1, Fuel Inspection Check List

-- NRC Inspection Report Nos. 50-322:

  - 82-15, Detail 7 (p. 12), issued August 30, 1982
  - 82-34, Detail 13 (p. 71), issued January 3, 1983
  - 83-03, Detail 3 (p. 3), issued February 15, 1983
  - 83-33, Detail 10 (p. 44), issued November 20, 1984

-- LILCo Field Audit No. FA-1519; September 3, 1982

-- LILCo Deficiency Report (LDR) Nos. 0771, 0783 through 0817, 0911 and 1588

3.3.2 Findings

Initial Fuel Receipt

OQA coverage of new fuel receipt and handling was maintained round-the-clock during July-August 1982. Detailed procedural controls, based on GE specifications, were provided in SP 58.001.01 and its Appendix 12.1 checklist. A

total of 26 LDRs were originated by OQA during the initial receipt and channeling of all 560 new fuel bundles. LILCo Field Quality Assurance Division audited (FA-1519) the OQA surveillance of those activities, and found OQA to be in general compliance with applicable procedures and instructions. There has also been NRC Region I inspection coverage of LILCo's receipt and handling of new fuel with no problems or discrepancies noted.

All LDRs associated with new fuel receipt and initial inspection and channeling were reviewed during this inspection. None were found to be representative of fuel rod defects, nor were any left uncorrected or improperly dispositioned such that fuel rod performance would be affected. Half (13) of the LDRs were written for scratches which were found on the upper and lower tie-plates of the fuel channels (not the rods themselves). These were all dispositioned "accept-as-is" by the GE representative (J. Whitman) present onsite for fuel handling operations, based on the fact that the scratches were in a "non-functional" area of the tie-plate (ie. not load-bearing or a significant stress area). An example is LDR No. 0788 which detailed a scratch (½" inch long and 1/16" wide) found on the lower tie-plate of assembly LJH-874. The assembly was channeled, a hold-tag was attached, and the condition dispositioned accept-as-is since it was described to exist in a "non-functional" area. Clarification of that disposition was provided by the GE Operations Manager on January 29, 1985, following his verification with GE's Fuel Division in Wilmington, NC.

Five of the LDRs involved channel spacer or fastener damage which required replacement or return to General Electric:

LDR No.	Dates Originate-Closed		Condition	Disposition
0783	8/13/82	10/21/82	1/64 inch spacer dent	Replace spacer and reinspect
0790	8/18/82	10/8/82	Channel 83464 damage during unpacking	Returned to GE unused
0798	8/19/82	10/8/82	Channel fastener damaged during installation	Replaced with spare

LDR No.	Dates Originate-Closed		Condition	Disposition
0801	8/20/82	10/12/82	Gouge in top of channel greater than .006 inches	Returned to GE unused
0802	8/20/82	10/8/82	Gouge in bottom of channel greater than .004 inches	Returned to GE unused

Two instances (LDR Nos. 0789 and 0911) were identified where channel fastener bolts jammed during installation. The bolt in one case was broken-off by a GE representative during removal - that upper tie-plate was replaced, reinspected and accepted. The other instance was similarly dispositioned. Another LDR (0787) involved a bent upper tie-rod finger spring which was replaced. LDR-0771 was originated to clarify the serial numbers of metal shipping containers (MSC) which were contained in the outer wooden shipping containers (WSC). There were 2 MSC in each WSC. This was the only LDR found to be originated by Mr. Henry.

Re-Inspection for Fretting

LDR-1588 was originated on August 19, 1983 and described "fretting" of 0.0035 inches found on rod H8 at two spacer locations on bundle LJH738. This condition was identified after a 10% sample (53 bundles) of assemblies were inspected as a result of a similar problem experienced with WPPSS Hanford 2 fuel. The condition was dispositioned as acceptable based on three letters:

-- GE to LILCo (DRJ 83-118) dated 9/26/83

-- LILCo NED Memo (NFD-83-156) dated 10/27/83

-- S. M. Stoller Corp. letter to LILCo dated 11/29/83

The condition was evaluated by GE as having no impact on fuel performance (design stress margin), and was believed to be associated with shipment from the fabrication site to the plant. LILCo commissioned the S. M. Stoller Corp. to perform an independent study of the extent and effect of the clad-spacer wear experienced. It was concluded that a clad thickness reduction of up to 0.006 inches in fretted areas would result in no significant change in material

properties and no significant local stress concentration. Also, the random sample was determined to be sufficient, based on a probabilistic analysis performed by GE which used the results of LILCo's sample, such that a full core re-inspection was not done. Therefore, the maximum wear depth found (0.0035 inches) on the Shoreham fuel rods was acceptable for use, and no additional fuel rod de-channeling or re-inspections were recommended. LDR-1588 was closed on December 27, 1983.

3.3.3 Conclusion

None of the 26 initial LDRs resolved by LILCo OQA described uncorrected problems involving improper spacing or other conditions which would affect cooling water flow through a bundle or impair rod heat transfer. Approximately half of the documented deficiency reports involved minor tie-plate scratches which were acceptable as-is and do not affect fuel performance. Five LDRs described gouges, dents or other channel damage (not on the fuel rods) which resulted in replacement or return (unused) to General Electric.

The coverage of new fuel receipt and handling by OQA was found to be thorough and well-documented. All 560 bundles were inspected per procedures and a statistically based sample inspection for fretting was performed. Observed defects were identified and properly dispositioned in OQA LDRs.

One instance of documented damage to a fuel rod was found. "Fretting" of 0.0035 inches was found at two spots where spacers come in contact with the zirconium cladding, and was dispositioned acceptably based on GE clad stress analyses and an independent engineering evaluation by S. M. Stoller.

3.4 Velan Check Valve

It was alleged that a critical check valve in the hydrogen recombing system did not seat properly, and was sent back to the manufacturer (Velan Corporation) for rework and returned to LILCo "worse than before". It was decided the "60,000 dollar" valve would not be sent back for additional work, and was kept because of "the rush to get Shoreham into operation".

3.4.1 References

-- NRC Inspection Report Nos. 50-322:

82-34, Detail 13.3 (p. 71) issued January 3, 1983

83-33, Detail 2 (p. 10) issued November 20, 1984

-- LDR No. 0781; originated August 24, 1982, closed April 26, 1983

-- Velan Field Service Report to LILCo (J. Kuhner to D. Borska) dated September 23, 1982

-- LILCo Receipt Inspection Reports of 24-inch Swing Check Disc (Serial No. 2208) dated August 6, 1982 and April 26, 1983

-- LILCo Purchase Order No. 364883 issued to General Electric

-- Technical Specification 3.4.3.2.d and Table 3.4.3.2-1

-- LILCo Receipt Inspection Report of 24-inch Swing Check Disc (Serial No. 2837); inspected August 6, 1982

-- Repair/Rework Request E11-296, September 23, 1982

-- Velan Certificate of Compliance for Disc Serial No. 2837 dated August 5, 1982

-- LILCo Drawing No. NFSK-20B Sheet 2 (Revision 8); RHR System P&ID

3.4.2 Findings

The statement that the valve in question is part of the hydrogen recombiner system, could not be corroborated in that: (1) Inspection Report 50-322/83-33 addressed an allegation related to the only check valves in that system (6-inch Velan Serial Nos. 218 and 455), neither of which were sent to Velan for repair; (2) the original purchase price for each of those valves was 1,525 dollars; and (3) neither are containment isolation valves for which leakage or seating is critical.

During initial containment isolation valve local leak rate testing (LLRT) performed during July-December 1982, low pressure coolant injection (LPCI) testable check valve AOV-81B was disassembled for inspection and repair/rework. The valve is a 24-inch Velan swing check, located inside the drywell (inboard isolation valve) where the LPCI injection line ties in to the "B" reactor coolant recirculation loop. Valve AOV-81B is normally seated against reactor coolant pressure during plant operation, and is critical in the sense that its failure/leakage could contribute towards an "inner-system" loss of coolant accident in the Reactor Building. The original purchase price of that valve (1976 quote) was 62,280 dollars.

Disc Repair

Disc serial number 2208, which had been installed in valve AOV-81B, was sent to General Electric on July 27-31, 1982 for seat repair which consisted of grinding-out and local weld repair of a crack in the stellite seating surface. General Electric, in turn, sent the valve disc to Velan to complete that repair (re-stellite seat). Non-destructive testing of the completed repair showed the stellite seating surface to be defect free; however, the base metal indicated some minor surface indications which were eliminated by grindouts in the presence of Stone & Webster and GE inspectors on August 2-4, 1982. Disc serial number 2208 was then shipped back to the Shoreham site.

LILCo OQA Receipt Inspections were performed on August 6, 1982 by Mr. Henry for two 24-inch Velan swing check valve discs (Serial Nos. 2837 and 2208). While disc 2837 was found to be satisfactory (and is presently installed in LPCI check valve AOV-81B), the other disc 2208 which had been sent to Velan for repair was rejected. Mr. Henry noted unsatisfactory "physical damage and properties, workmansnip, and weld preparations". He also originated LDR-0781 on August 24, 1982, which described the condition as "gouges noted in the base metal and on the side of the stellite seat".

LDR-0781 was reviewed by Stone & Webster Site Engineering Office (SEO) and dispositioned "accept-as-is" on September 24, 1982. LILCo Startup concurred in that disposition on September 28, 1982. Final OQA closeout was dated April 26, 1983, and was based on an April 13, 1983 memorandum from Startup to OQA (Nicholas to Muller) which referenced a Velan Field Service Report dated September 23, 1982. The Velan service representative (J. Kuhner) examined disc 2208 with SEO personnel and confirmed the two minor grindouts in the base metal area of the disc "at 6 and 9 o'clock positions". These were stated to be acceptable and, as previously noted by Velan, not within the stellite seating surface. The disposition of LDR-0781 stated that:

> "The gouges do not affect the structural integrity or the seating surface of the disc".

Re-inspection was documented by Mr. Henry via Receipt Inspection Report dated April 26, 1983 (with a note that it superceded the earlier inspection), and LDR-781 was closed.

Current Valve Status

LPCI AOV-81B has had at least four LLRTs performed since October 1982. The valve does not have disc 2208 installed; rather, disc serial number 2837 is installed. Leakage data recorded for penetration X-6B, which is a three-valve arrangement that includes AOV-81B (as well as MOV-81B and MOV-37B) are as follows:

Date	Measured Leakage (scfd)
10/25-26/82	32.84
5/4/83	19.92
1/21/84	6.72
1/23/84	31.92

The individual limit administratively imposed on this valve is 115 standard cubic feet per day (scfd), and is based on a set fraction of the total Technical Specification limit for all Type B and C penetrations of 4045 scfd. In addition to the LLRT limit, there is a more restrictive limit placed upon LPCI valve AOV-081B by plant Technical Specifications of 1.0 gpm reactor coolant system leakage.

The inspector observed disc serial number 2208 on January 30, 1985. The disc is currently stored in the site warehouse, with an "Accept" tag, and is a usable spare part. The two surface grindouts were observed to be not on the stellite seating surface.

3.4.3 Conclusion

The alleged critical check valve sent back to Velan for repair was confirmed to be LPCI testable check valve E11* AOV-81B. The valve's original disc (serial number 2208) was repaired by GE and Velan, and while initially rejected during receipt inspection, was later dispositioned as acceptable for use. Disc 2208 is currently not installed, and is a qualified spare part stored in the Shoreham warehouse. The two minor surface grindouts are not on the stellite seating surface, and are an acceptable condition.

3.5 HPCI Valve Stroke Time

It was alleged that a "below standard" valve in the high pressure coolant injection (HPCI) system did not meet "opening and closing criteria" which could result in a serious accident. Mr. Henry stated that he had written an inspection report rejecting that valve, and that his supervisor criticized that report and "dispositioned it with a date several months hence, meaning the valve was approved in the future".

3.5.1 References

-- GE Design Specification Data Sheet for High Pressure Coolant Injection System (Document No. 22A1362AC)

  • Requirement 4.5.12, Vacuum Breaker Isolation Valve (MPL No. E41-F079); Revision 6, June 11, 1974 and Revision 12, January 13, 1984

-- GE Preoperational Test Specification (Document No. 22A2271AU)

  • Acceptance Criterion B6.5.4.f

-- GE Field Deviation Disposition Request (FDDR) KS-01-1159, dated January 20, 1984

-- S&W Specification No. 253, Valve Data Sheets dated August 3, 1977 (pp. 5-21 and 28)

-- Engineering and Design Coordination Reports (E&DCR):

  - F-41799; requested June 30, 1982, approved July 14, 1982

  - F-41799A; requested November 1, 1982, approved November 8, 1982

  - L-0413; requested February 14, 1984, approved February 17, 1984

-- LILCo Inter-Office Correspondence (Barnett to Kammeyer) dated September 30, 1982

-- GE Letter to Stone & Webster (Lebre to Gauthier) dated February 10, 1982

-- Stone & Webster Letter to LILCo, LIL-24109, (Holden to Project Engineer) dated August 25, 1983

-- Shoreham FSAR Section 6.3.2.2.1, Table 6.2.4-1 and Figure 6.2.4-2

-- Shoreham Technical Specification Table 3.6.3-1

-- ASME Section XI Inservice Testing, Valve Summary and Trend Data Sheets for System E41 (HPCI), Valve MOV-049

-- Shoreham Station Procedure No. 24.202.03-1, Revision 4, HPCI Valve Operability Test Data Sheet

-- Shoreham Preoperational Test Package PT 202.001-1 (HPCI), C&IO Data Sheets (pp. 114-116.c), Test Exception Nos. 11 and 16

-- LILCo OQA Audit Finding 82-36-37; issued August 26, 1982, approved September 7, 1982

-- LILCo Corrective Action Request (CAR) No. 040; originated October 25, 1982, response November 8, 1982, approved March 27, 1984

-- OQA Surveillance Plan No. 83-27 (submitted 5/28/83) and 83-28 (submitted June 30, 1983)

-- NRC Region I Inspection Report Nos. 50-322:

- 81-20, Detail 2.a (unresolved item 81-14-02), issued December 9, 1981

- 83-05, Detail 2.2.4 (unresolved item 82-15-01), issued March 30, 1983

- 83-03, Detail 2 (unresolved item 83-03-01), issued February 15, 1983

- 80-14, Details 11.b and c (unresolved items 80-14-05 and 06), issued October 8, 1980

3.5.2 Findings

Functional Requirements

HPCI motor-operated valve (MOV)-049 is a 2-inch Velan check valve which serves as an outboard containment isolation valve for the HPCI turbine exhaust vacuum breaker line. The valve has no HPCI system functional requirement - its only safety related function is to isolate containment within 36 seconds after HPCI is no longer required (ie. drywell pressure greater than 1.69 psig and reactor steam dome pressure less than 110 psig). The valve is normally open during plant operation, and automatically closes upon the above coincident conditions. The 2-inch vacuum breaker line, in which MOV-049 is situated, connects the 18-inch HPCI turbine exhaust line directly with the suppression chamber vapor space. The line prevents water from the suppression pool from being drawn up into the turbine exhaust line, and also prevents condensed steam from remaining in the turbine exhaust line (if HPCI had been secured) which could cause hydraulic damage (if HPCI were re-initiated).

Original Stroke Time Criteria

Technical Specification Table 3.6.3-1 lists 1E41*MOV-049 as a primary containment isolation valve with a maximum isolation time (closing) of 36 seconds. The valve's actual stroke time has been documented, at various times during the preoperational test program, in a range of from 15.39 seconds (March 16, 1984 inservice testing) to 18.15 seconds (October 27, 1981 C&IO test). The opening time has no current operational limit imposed since the valve is normally open during operation and has no functional requirement to open within any set time. The valve was originally procured from Velan under Specification SH1-253, and the associated valve data sheet detailed the required open/close times as: "By vendor (Mfg. Std.) ±10%".

The standard applied by LILCo Startup personnel during Checkout and Initial Operation (C&IO) testing, which preceded preoperational HPCI system testing (on at least 3 separate occasions), was the General Electric Design Specification for HPCI which at that time (Revision 6) required the vacuum breaker motor operated isolation valve to:

> Open and/or close against a differential pressure of 200 psi at a minimum rate of 12 inches per minute

However, that time requirement was based on the assumed use of a gate valve, and was a general industry standard as such. The corresponding rate for motor-operated globe valves is 4 inches per minute, or 15 seconds per inch of travel.

Since MOV-049 is a globe valve with an actual stroke (or travel) of 3/4-inch, the prescribed closing time used for C&IO testing was less than 11.25 seconds. The opening time was prescribed with an approximate 20% tolerance on that limit, or 13+0% seconds.

Preoperational Test Results

C&IO testing of MOV-049 performed on October 27, 1981, indicated that the valve opened in 18.0 seconds and closed in 18.15 seconds. Those values were reviewed and verified by LILCo Startup personnel on June 28, 1982, as part of HPCI Preoperational Test Package PT-202.001-1, and test exception numbers 11 and 16 were written.

E&DCR F-41799 was initiated on June 30, 1982 to resolve those preoperational test exceptions, and a solution was approved on July 14, 1982 for LILCo Startup representatives to "...inspect, clean, repack valve, verify proper motor rpm, and retest". If the valve's stroke times were still not satisfactory, then the Stone & Webster Site Engineering Office (SEO) was to be contacted.

Current Stroke Time Criteria

Following the recommended repairs to MOV-49, the retest on September 22, 1982 found strokes times still in excess of prescribed limits; namely, 16.3 seconds for both open and closing. SEO was contacted by memorandum dated September 30, 1982, requesting disposition of the unsatisfactory stroke times. The Stone & Webster SEO reply dated November 1, 1982 stated:

> In accordance with Boston Engineering, operating time for MOV-49 has been changed to 18 seconds. A revision to FSAR and Tech Specs to reflect this change is in process.

In order to properly resolve the: (1) preoperational test exceptions; (2) E&DCR-41799; and (3) acceptable valve operating times, another E&DCR-41799A was initiated on November 1, 1982, to verify the revised 18.0 second limit for MOV-49. That E&DCR clarified the stroke time requirement for MOV-049 as 18 seconds +20% on November 5, 1982 and was approved by the S&W Project Engineer on November 8, 1982, by reference to a previous GE to S&W letter which concurred in an acceptable closing time of 18 seconds (+20%). A later E&DCR L-0413 revised that time to 18 seconds +10%. The August 25, 1983 S&W letter, upon which that E&DCR was based, approved the maximum allowable time currently in Technical Specifications of 36 seconds - doubling the normal limit of 18 seconds, after consideration of HPCI functional requirements, environmental qualification, radiological and other conditions.

OQA Audits

Concurrent with LILCo Startup's efforts to resolve an acceptable stroke time for MOV-049, OQA performed an audit of the HPCI preoperational test package, and issued finding 82-36-37 on August 26, 1982. Startup's response to that finding on September 3, 1982 referred to E&DCR F-41799 and the preoperational test exceptions. That response was

approved by OQA on September 7, 1982; however, OQA Corrective Action Request (CAR) No. 40 was later originated on October 25, 1982 when review of the retest of MOV-049 (approved by Startup on 9/22/82) still showed unsatisfactory closure time.

The Startup response to CAR-040 on November 8, 1982 was two-fold: (1) the CAR should not have been issued since OQA had already approved the proposed corrective action (ie. retest and contact of SEO if still greater than 13 seconds); and, (2) the approval of the 16- second test results was appropriate since the 18-second time had already been authorized by General Electric's February 10, 1982 letter to S&W.

Six months later, during an OQA Surveillance No. 83-27 (by Mr. Henry) of outstanding CARs, CAR No. 040 was noted on May 28, 1983 as "outstanding...not closed" and checked on the Surveillance Plan as unsatisfactory with respect to corrective action. Mr. Henry's supervisor (the Manager of OQA) wrote a caustic note to the alleger - on the submitted plan sheet (but unapproved) - which stated that CAR-040 was dispositioned on "11/9/83". This was explained to the inspector as an error and was meant to be dated 1982 to reflect the Startup response to CAR-040. The note further stated that he (Mr. Henry) should "not play games on QA documents" and should rewrite the Surveillance Plan sheet. A copy of that (unapproved) plan was placed in Mr. Henry's personnel file. The rewritten sheet for Surveillance 83-27 had:

-- the unsatisfactory notations crossed out, and checks placed in the satisfactory boxes regarding corrective action.

-- asterisks next to the crossed out "unsats", which were explained on the sheet below as "see CAR surveillance 7/83 #83-28".

-- final OQA approval on July 18, 1983.

Surveillance No. 83-28 was submitted by OQA on June 30, 1983 and approved by the Manager of OQA on July 18, 1983. It was performed as part of the normal weekly OQA surveillance of outstanding CARs, and followed-up the response to CAR-40 involving a draft Technical Specification change (then proposed as 22 seconds) to properly reflect the approved (18 second) stroke time for E41-MOV-049.

The final closeout of this entire issue occurred with the review and approval of CAR-040 on March 27, 1984.

Independent NRC Inspection

Various NRC open items related either directly (or were similar) to the problems experienced in defining an acceptable stroke time for MOV-049. All have been satisfactorily resolved, and they include:

Item	Report In Which Closed
81-14-02	81-20 (page 3)
80-14-05	82-13 (page 2)
82-15-01	83-05 (page 8) and 84-27
83-03-01	83-23 (page 5)

Also, during this inspection, LILCo Operations Staff stroked MOV-049 on January 29, 1985, and the inspector independently timed the valve as closing in 14.60 seconds and opening in 16.85 seconds. Further review of IST data, collected on five occasions since March 25, 1983, shows an average closing time of 15.3 seconds - that same IST procedure lists a limiting value of 18.7 seconds for closure. The limit was established on October 23, 1984 and is based on a mean value of previous stroke times (plus some standard deviation). The valve would be tagged out, and HPCI considered as inoperable, if quarterly stroke tests exceed the 18.7 second closure time.

Finally, a comparison of similar valve applications in the HPCI turbine exhaust vacuum breaker lines at Limerick and Susquehanna found their Tech Spec isolation times to be comparable to Shoreham's, but larger in valve size and different in valve type:

Plant	Size	Type	TS Isolation Limit
Limerick	4-inch	Gate	40 seconds
Susquehanna	3-inch	Gate	15 seconds

3.5.3 Conclusion

There was difficulty or confusion on the part of LILCo Startup during preoperational testing of HPCI as to what were acceptable open/close times for MOV-049. That time was later authorized by Stone & Webster and GE to be nominally 18.0 seconds (+10%). The maximum isolation time listed in Technical Specifications is double the nominal value, or 36 seconds, and is acceptable since:

-- MOV-049 serves no HPCI system functional requirement.

-- Containment leakage past MOV-049 would be contained within the HPCI turbine exhaust piping.

-- For a design basis reactor recirculation line rupture, suppression pool air space pressure is predicted to peak at approximately 35 seconds after the drywell pressure peak, and approximately 20-25 seconds after logoc for MOV-049 initiates its closure.

-- The HPCI turbine exhaust pressure is typically expected to be in the range of 10-50 psig; but, the piping is designed to 175 psig, which is well above the predicted peak containment pressure of 33.7 psig.

The OQA audit of HPCI preoperational testing correctly identified the discrepant MOV-049 stroke times; however, that same audit, the subsequent CAR-040, and the original Surveillance No. 83-27 all failed to fully recognize the concurrent resolution of the valve's stroke time by LILCo startup. OQA was originally unaware of the basis (February 10, 1982 GE letter to S&W) for the approval of the 16-second C&IO test results. However, that basis was explained on November 8, 1982, in the LILCo Startup response to CAR-040. It was that date (not "11/9/83") which the OQA Manager apparently intended to refer to in his caustic note. The CAR was therefore not dispositioned "6 months in advance." In fact, the approval of E&DCR F-41799A on November 8, 1982, appropriately addressed the concerns of CAR-040.

In spite of the large documented effort on the part of both LILCO Startup and OQA to define an acceptable open/close criterion for valve MOV-049, the nominal and maximum times of 18 and 36 seconds are reasonable and appropriate. The long history of test exceptions, E&DCRs, memoranda and letters, and the OQA audit finding and CAR all indicate LILCO's efforts to appropriately disposition this issue.

3.6 Vehicle Decontamination Area

Mr. Henry indicated in the article that there is a LILCo map of an area where there would be "contaminated vehicle parking - where such vehicles would be hosed down, radioactive debris washed off them." He alleged that the area was "supposed to be lined with a catch basin of fiberglass", that the catch basin does not exist, and that when vehicles are washed down, the "radioactivity will go right into the ground water".

3.6.1 References

-- Shoreham Emergency Plan Implementing Procedures (all Revision 2, July 15, 1984):

- EPIP 2-18, Vehicle Monitoring
- EPIP 2-19, Vehicle Decontamination
- EPIP 2-20, Offsite Personnel Monitoring/ Decontamination
- EPIP 2-21, Offsite Decontamination Facilities Activation

3.6.2 Findings

Shoreham Emergency Plan Implementing Procedure (EPIP) 2-21 details the activation of the Wildwood Substation Offsite Decontamination Facility Station, if a site evacuation has been initiated following an accident, but only upon the direction of the Shoreham Radiological Assessment or Protection Coordinators. The facility (a trailer) is located within the fence surrounding the 69 kV Wildwood Substation and is approximately one mile from the plant site, on LILCo property, and just off of the South Property (access) Road and Route 25A. Cabinets in the trailer contain one 1-inch and two 5/8-inch rubber garden hoses. Attachments 1 and 2 to EPIP 2-21 depict the location and layout of the decontamination station/trailer.

EPIP 2-18 ensures that, during a site evacuation, all vehicles leaving the site boundary will be monitored in the South Property Road as they leave the site if the decontamination facility has been activated. If a vehicle is found to be contaminated to a level 100 cpm above background, then it's directed into the area off of the road at the 69 kV substation. Additional surveys are then done, recorded, and the vehicle and occupant (if contaminated) are directed to the trailer.

EPIP 2-19 prescribes methods for vehicle decontamination in steps 5.1.3 through 5.1.5. These steps are progressive measures which include:

-- First attempts with wet gauze pads, vacuum cleaning and sweeping.

-- Careful cleaning with a mild detergent or solvent solution.

-- Detergent in hot water with a scrub brush (if contamination with 100 cm^2 smears still shows a limit of 500 dpm or greater).

-- Parking the vehicle, if still contaminated, at a designated area for "further decontamination efforts at a later date when it is practical".

The inspector verified that no catch basin or collection system are located near the Wildwood substation. Subsequent phone conversations with LILCo representatives on February 1 and 5, 1985, indicated:

-- Their intent to add precautionary statements in EPIP 2-19 and 20 which will require personnel to minimize the use or generation of water at the facility and ensure that contaminated solids are disposed of properly.

-- Of 12 operating plants surveyed regarding Emergency Plan procedures for vehicle decontamination after an accident: 9 specify no special collection provisions of liquids; 1 has provisions for dry materials; 1 has a decontamination center located 13 miles away with a truck bay that is lined with plastic; and 1 decontaminates vehicles onsite in an area which is capable of containing any liquids generated.

The licensee's representatives stated that no commitment or plan for a fiberglass catch basin was ever made, and that no such basin currently exists.

3.6.3 Conclusion

EPIP 2-18 through 21 do not call for "hosing-down" of vehicles which are contaminated, and no catch basin for contaminated liquids is required by Shoreham's Emergency Preparedness Program. A survey of Emergency Plan post-accident vehicle decontamination measures at operating nuclear stations indicates that Shoreham's Offsite Decontamination Facility is typical with respect to accepted industry practice.

While no NRC regulatory requirement or documented recommendation for providing a catch basin exists, the adequacy of Shoreham's Emergency Preparedness Program (including the measures for containing liquid contamination) is currently under evaluation by NRC. Also, the issue of offsite emergency preparedness at Shoreham is currently being litigated by an Atomic Safety and Licensing Board.

3.7 Emergency Drill Plume Plotting

During his participation in an "emergency drill", in which plant radiochemistry and health physics personnel were monitoring prevailing winds and predicting the heading of the (ficticious) radioactive plume, Mr. Henry stated that an error was made upon which evacuation recommendations were being made. Because plant personnel were "plotting the plume totally wrong", he stated that they were "calling for an evacuation of the North Shore of western Suffolk County". This exercise recommendation, which should have been "premised on prevailing winds from the West" was "off-by 180 degrees".

3.7.1 References

-- Scenario dated July 2, 1982 for Emergency Preparedness (EP) Exercise No. 11 conducted on July 7, 1982

-- Critique of July 7, 1982 Exercise No. 11

-- NRC Region Inspection Report (EP Appraisal Followup) 50-322/83-37, issued February 6, 1984

3.7.2 Findings

LILCo EP Drill No. 11 of the Shoreham Onsite Emergency Preparedness Plan was conducted on July 7, 1982. The exercise was intended to activate the control room, technical support center (TSC) and operations support center. This exercise was also the first to use a pre-planned and prepared scenario. LILCo's initial training session involving emergency preparedness was conducted on May 23, 1982. As of January 31, 1985, 109 training sessions have been held.

LILCo personnel identified four sessions in which Mr. Henry was listed as a participant. During the July 7, 1982 drill, he was an OQA representative assigned as a "TSC Coordinator". His duties involved being a phone-person who was provided information added as the scenario developed which be relayed to the TSC.

At a time approximately 2½ hours into the exercise, there was confusion associated with wind direction, plume heading, and evacuation recommendations. This was later noted during the critique of the drill by its members (on the same day of the drill) as "no announcement in TSC of wind shift during drill ... crucial to TSC dispatcher ... resulting in delay of survey teams." The scenario cover page, under "Meteorological Data", listed the following wind directions:

Time	Wind
0:00-2:30	From 315 degrees elevated
2:30-6:30	From 215 degrees elevated

The inspector was informed that this printed wind shift 2½ hours into the exercise (from 215 or southwest) was a typographical error. The readings at selected detector locations, which were listed on subsequent pages of the scenario for the last four hours of the exercise, correctly reflected the intended wind shift as from the 35 degree (northeast) direction.

The intended wind conditions in that exercise were 10 mph from the northwest for the first 2½ hours (stability Class C), shifted to 6 mph from the northeast for the last 4 hours (stability Class E) - an 80 degree shift. The confusion as to plume heading and evacuation direction was further compounded by the compass headings (marked in degrees) on the posted sector map in the TSC. Instead of the normal compass markings (eg. 90-degrees being due East), the map was rotated by 180 degrees, such that the West sector was marked 90-degrees. This was intended for the simplicity of correlating wind direction to plume heading. Stated differently, when a meteorological condition of 90-degree (or "easterly") winds was given, the drill personnel could then easily locate the plume passage on the map at the location marked 90-degrees (actually a west sector). This map has since been changed to indicate true compass headings (ie. 90-degrees is the eastern sector).

3.7.3 Conclusion

There was confusion at the midpoint (wind shift) of the July 7, 1982 exercise, as alleged. Wind direction and the associated dispatch of survey teams and evacuation recommendations were in error for a short time. LILCo personnel responsible for the drill noted that error, and discussed it during the subsequent drill critique. Similar errors have not been experienced with the approximate 100 Emergency Plan training exercises that have since been conducted.

The error in that exercise is attributed to:

-- A typographical error in the scenario.

-- Compass/degree markings on the TSC map.

Those map markings have been corrected, and subsequent training exercises have not had similar problems. NRC inspections have observed and reviewed Emergency Preparedness Program training at Shoreham and no significant problems have been identified.

3.8 LPL Inspectors

Mr. Henry apparently stated that quality control inspectors from LPL Technical Services of Great Neck (New York), contracted by LILCo, were "routinely laid off for being strict on standards".

3.8.1 Findings

Personnel files were reviewed, in the presence of the LILCo Quality Assurance and Control Division Managers, for all employees provided by LPL Technical Service, Inc. A total of 19 inspectors, all with former ANSI N45.2.6 Level II certification from at least one other nuclear facility, were considered for assignment as OQA inspectors. Twelve of those 19 individuals were eventually certified - seven were never certified, for various reasons. Certification was governed by LILCo procedure QAP-S-2.3, "Certification of Inspection Personnel".

LPL contractors were present at Shoreham as OQA inspectors during the 2-year period of April 1982 - April 1984. During that time, construction progressed from approximately 95% to full completion, and the remaining 25% of preoperational testing was finished. Also, the majority of activity during that period focused upon the TDI diesel generators' preoperational and recovery test programs.

The original contract with LPL Technical Service, Inc. was a lump-sum bid, billed on time/material and originally based on 6 individuals for 18 months. LILCo's Manager of Quality Control Division provided the following data on the complement of OQA inspection activity by LPL inspectors:

-- Their assignment was to handle peak work loads associated with preoperational and C&IO testing, and the TDI diesels.

-- The maximum number of LPL personnel, which supplemented the 8 OQA personnel who were full-time LILCo employees, was six at any one time.

-- A large attrition rate was experienced with LPL personnel, such that the average residence time of any one LPL contractor was estimated to be 2 months.

-- Of the total 12 LPL employees who were certified as Level II inspectors at Shoreham, three were terminated by LILCO - the remaining 9 left on their own accord. The three who were terminated by LILCo were apparently let go because their contract expired, and LILCo indicated that they had no further need of their services.

-- The last LPL contract inspector assigned to LILCo OQA, left in April 1984.

3.8.2 Conclusion

Based on a review of the LPL staffing history no evidence was found to support the allegation that LPL inspectors were routinely laid off for being strict on standards. There were a total of 12 employees from LPL, over a 2-year period, assigned to LILCo OQA. Only 3 were stated to have not left on their own accord; apparently their services were not needed and their contract had expired. There has not been an LPL contract inspector at Shoreham since April 1984.

3.9 Exit Interview

The inspector discussed the preliminary findings of this inspection with licensee personnel on January 30, 1985. Phone conversations have been held with other LILCo personnel, during the period January 31 - February 7, 1985, to clarify details of this inspection. The LILCo Vice President - Nuclear Operations, J. Leonard, Jr., was also apprised of preliminary inspection findings in a phone conversation held on January 31, 1985.