

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-295/85041(DRS); 50-304/85042(DRS)

Docket Nos. 50-295; 50-304

Licenses No. DPR-39; DPR-48

Licensee: Commonwealth Edison Company
P. O. Box 767
Chicago, IL 60690

Facility Name: Zion Nuclear Power Station, Units 1 and 2

Inspection At: Zion and Chicago, IL

Inspection Conducted: November 12 through 19, 1985

Inspectors: A. S. Gautam

A. S. Gautam

12/23/85
Date

R. J. Smeenge

Conrad C. Williams for

12/24/85
Date

Approved By: C. C. Williams, Chief
Plant Systems Section

Conrad C. Williams

12/24/85
Date

Inspection Summary

Inspection on November 12-15 and 19, 1985 (Reports No. 50-295/85041(DRS); 50-304/85042(DRS))

Areas Inspected: Routine, announced safety inspection by two regional inspectors of licensee action on previous inspection findings and Zion Unit 2 Licensee Event Report No. 85-018-00 regarding unqualified wiring found in Limitorque valve operators. The inspection involved a total of 72 inspector-hours onsite and five inspector-hours offsite by two NRC inspectors.

Results: No violations or deviations were identified.

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DETAILS

1. Persons Contacted

Commonwealth Edison (CECo)

*G. J. Pliml, Plant Manager
*E. J. Fuerst, Superintendent Production
*T. A. Rieck, Superintendent Services
*W. R. Kurth, Assistant Superintendent, Services
*K. L. Kofron, Assistant Superintendent, Maintenance
°P. LeBlond, Nuclear Licensing Administrator
*R. N. Cascarano, Technical Staff Supervisor
F. G. Lentine, SNED Project Engineer
*T. Printz, Assistant Technical Staff Supervisor
*W. Stone, Station QA Supervisor
*M. W. Bailey, Technical Staff
K. E. Depperschmidt, EM Department
*D. Wozniak, SNED Site Engineer
*J. J. Gilmore, Operations Engineer
°R. Grams, Lead EQ Group
°T. Ulinski, Station Nuclear Engineer

Sargent & Lundy (S&L)

°B. Pikelny, Senior Component Engineer
°M. D. Rauckhorst, Onsite Engineer
°B. Gogineni, Project Engineer
°B. Hanke, Component Engineer

*Denotes those attending the exit interviews on November 15 and 19, 1985.

°Denotes those attending the exit interview on November 19, 1985.

2. Licensee Action on Previous Inspection Findings

- a. (Closed) Open Item (304/85-06-03): Implementation of an Environmental Qualification (EQ) training program. The licensee has established two on-site EQ training programs. A four hour site specific session is being conducted for all plant personnel responsible for maintenance of the environmental qualification of plant equipment. Selected plant personnel also attend a general eight hour EQ training program. In addition to these on-site programs, plant personnel from Quality Assurance, Quality Control, Plant Technical Staff and Electrical Maintenance have attended off-site EQ training sessions conducted by the CEC Co Training Center (at Braidwood), Westec Services Incorporated and the Electric Power Research Institute (EPRI). The inspector reviewed training records and the schedule for future on-site EQ training. No further concerns were identified.

- b. (Closed) Open Item (305/85-06-04): Implementation of plant EQ Maintenance Procedures. The NRC inspector reviewed the plant EQ maintenance procedures listed below. These sample procedures were reviewed for implementation of the maintenance and surveillance criteria identified in the licensee EQ documentation packages. The corresponding EQ documentation packages related to this review are identified within the parenthesis:
- (1) E-022-1, "Limitorque EQ Motor Operated Valves," Revision 4, dated September 6, 1985 (EQ-ZN017)
 - (2) E-014-1, "Removal and Installation of New or Rebuilt Solenoid Valves," Revision 0, dated December 12, 1979 (EQ-ZN012)
 - (3) E-024-1, "ASCO Solenoid Valve Environmental Qualification Inspection," Revision 1, dated September 13, 1985 (EQ-ZN012)
 - (4) E-035-1, "Inspection of Kerite Cable and Boston Insulated Wire," Revision 1, dated September 26, 1985 (EQ-ZN007)
 - (5) IMEQ-2, "Rosemount EQ Transmitters (Pressure) (Model 1153, Series B)," Revision 3, dated May 7, 1985 (EQ-ZN035)
 - (6) IMEQ-4, "Rosemount PC Board Changeout," Revision 1, dated May 7, 1985 (EQ-ZN035)
 - (7) IMEQ-5, "Conax Model 7411 ATD's," Revision 0, dated March 21, 1985 (KEQ-ZN036)
 - (8) P/M-030-IN, "Inspection and Lubrication of Environmentally Qualified 4KV Motor Bearings," Revision 0, dated February 27, 1985 (EQ-ZN018)

All of the procedures reviewed had incorporated the plant specific criteria identified in the EQ documentation packages. At the time of this inspection only one of the licensees EQ maintenance procedures had not been implemented. This procedure was in the final review and approval process. The inspector has no further concern in this area.

- c. (Open) Unresolved Items (304/85-06-01; 304/85-06-09): The licensee was informed that a supplemental response was still required for resolution of these items. The licensee committed to providing a supplemental response by January 1, 1986.
3. Review of Zion Unit 2 LER 85-018-00, dated October 4, 1985 (Module 92716B) Limitorque Operator Wiring

The objective of this review was to determine the effect of unqualified wiring, found by the licensee in safety related limitorque operators, on the safe operation and shutdown of the plant. These operators were mounted on 10 CFR 50.49 EQ related valves required for the safe shutdown

of the plant and also required to perform during and after a design basis event. This problem was reported by the licensee as generic per 10 CFR 21 - in their LER 85-018-00 pertaining to Unit 2. A follow-up LER will be issued by the licensee based on their continuing review.

The inspectors reviewed the LER against 10 CFR 21 reporting, evaluation and corrective action requirements, no discrepancies were identified. The reported defect is generic and may affect other licensee's as well as other CECOs plants. A Part 21 followup is planned by the NRC for other facilities as applicable.

The NRC inspectors reviewed the status and effect of unqualified wires in the valve operator, on the safe shutdown of the plant during and after a LOCA/HELB. The following areas were reviewed:

a. Review of Licensee's Onsite Evaluation in Regard to Unqualified Limitorque Motor Operator Switch Wire for Environmentally Qualified Motor Operators

The inspectors reviewed the licensee's onsite evaluation dated November 15, 1985 (DSR/073/85), Revision 1 for consequences of unqualified limitorque operator wiring. All valves on the station EQ list were found to be addressed in terms of the number of valve strokes required by each EQ valve during a LOCA. The licensee's EQ list had located two valves inside the containment, however, the licensee removed these two valves from their EQ list as not required to function during design basis events based on a November 7, 1985, justification/letter from F. Lentine, Project Engineer to G. Pliml, Plant Manager. The licensee in their site evaluation addressed all the EQ valves as required to stroke early and only once during the accident to perform their safety function. The licensee's evaluation determined that all valves would stroke once and concluded that there were no safety implications in operating Unit 1 (Unit 2 is in a cold shutdown), "even if one assumes the non-qualified wire exists in all environmentally qualified operators." The inspectors found the licensee's evaluation acceptable for both Zion Units 1 and 2.

b. Review of Valve Motor Operator Logic

The inspectors reviewed motor operator schematic and wiring drawings for postulated faults during and after a LOCA/HELB design basis accident. Schematic drawing 22E-2-4840, Revision JK for steam generator 2B Atmospheric dump valve 2MOV-MS0020 was reviewed for a postulated loss of power to the motor operator due to shorting or grounding of unqualified wiring on the torque switch and limit switch during a LOCA/HELB. The inspectors observed that during a loss of power the valve would fail as is. Thermal overloads (OLs) in the control circuits were sized in accordance with Limitorque Corporation Overload Heater Sizing Report No. 19-45-0006-3, dated October 7, 1982. The licensee reported that the OLs would trip after 7 to 10 seconds under stalled or locked rotor current. In the event

of postulated faults in harsh environment such conditions would occur after the valve has stroked, since there were no fuses in the control circuits and the valves would stroke once. These conditions were reported by the licensee as generic to all the EQ related limitorque operators. EQ failures were not postulated in the control switch, open and close coils, indicating lights and OLs since they were mounted in a motor control center away from the harsh environment of the operator. Based on the above review the inspectors determined that 2MOV-MS0020 would stroke once before a postulated loss of power due to unqualified wiring in a harsh environment.

A similar review was performed on valve 2MOV-MS0017, schematic drawing 22E-2-4840, Pages MS4, Revision JK, MS95, Revision D and MS96, Revision C; and valve 1MOV-RH8700B, schematic drawing 22#-1-4840, Pages RH4, Revision H.

It was determined that any shorting or grounding of limit switch or torque switch wires during a LOCA/HELB would create a solid connection and not prevent the valve from stroking once. Indicating lights were determined to malfunction during such a fault, but the licensee reported that operating procedures would provide sufficient information so as not to mislead the operator.

The licensee is currently completing corrective action and has replaced all unqualified wiring in Unit 1 limitorque operators. Work in Unit 2, currently in an outage shall be completed prior to start up.

No violations or deviations were identified.

c. Licensee Reinspection of Limitorque operators

- (1) The inspectors reviewed licensee work status sheets and records for valves included in the reinspection program for both Units 1 and 2. The list of valves reinspected were compared against the licensee's current EQ list and the inspectors verified that all EQ valves had been included. The inspectors reviewed the licensee's Procedure, TSSP 91-85, "EQ Limitorque Limit/Torque Switch Wire Inspection," Revision 2, dated October 23, 1985, and found it to be adequate for reinspection of the motor operators. In addition to this procedure licensee personnel performing this inspection were provided a visual aid which had samples of qualified and unqualified wires mounted on a card. The CECO inspectors recorded the types of wires as found in the operators on inspection records. Any damaged wires, or wires found which did not match the qualified wires on the visual aid were identified on a separate work request and were or planned to be replaced.

The licensee identified the following wires as acceptable. These wires are currently installed in the reinspected operators and were included on the visual aid card.

- 1/c No. 14 Kerite Double insulated, 600V, Insulation Type FR
- 1/c No. 14 Kerite, 600V Insulation Type FR
- 1/c No. 14 Rockbestos Firewall Type SIS
- 1/c No. 14 Boston Insulated Wire
- 1/c No. 14 Raychem Flamtool 60B0311-14, 600V
- 1/c No. 14 Champlain EXAR 400, Type SIS, 600V

The licensee identified the following wires as unacceptable, having no qualification documentation. These wires were/are being replaced on EQ operators. These wires were also displayed on the visual aid card.

- Type TW E14656, 600V, UL
- Type TW E13489, 600V, UL
- Type TEW 105 American Wire and Cable Company
- Any unidentified switchboard and Essex wire.

Based on interviews held with plant personnel, the inspectors concluded that these unqualified wires were installed onsite during installation of the limitorques prior to 1971. Apparently at that time, due to a lack of commitment to any EQ related standard, plant personnel had not considered the impact of using unqualified wire in these Limitorque operators.

- (2) The inspectors physically reviewed three Limitorque valve operators to verify that installed wiring matched wires identified by the licensee as qualified. Unit 1 Safety Injection Valve SI8804B was reviewed in the field while wires were being replaced by CECO personnel. At the completion of their work, the wires were identifiable with the qualified wires on the visual aid.

Steam generator Atmospheric Dump Valves MS0017 and MS0020 were also reviewed in the field after they had been reinspected by the licensee. Licensee records indicated no unqualified wires were found. During review the NRC inspectors found jumpers with no markings. However, the licensee reported that these wires were qualified and had been reviewed during reinspection to ensure that they were in fact the qualified wires shown on the visual aid. Based on this response, no discrepancies were found.

LER 85-018-00, reported a problem with wiring as a result of an inspection conducted in Spring 1985 during a refueling outage of Unit 1. Limitorque motor operator limit switch and torque switch wiring was inspected to the requirements of Procedures TSSP-18-24 and E022-1. During the inspection, the licensee identified ten Limitorque valve operators that had jumper wires different from those tested by Limitorque, and the licensee replaced those wires at the time of that inspection. The NRC inspectors questioned the licensee why this problem had not been immediately identified and followed up in Unit 2 prior to the March 1985 deadline for compliance to 10 CFR 50.49. The licensee responded that since only ten Limitorque operators were found to have unqualified wiring during the Spring 1985 inspection, this concern was not considered generic and further inspection in Unit 2 was deferred until a planned later outage. After review of the licensee's efforts in identifying, reporting, and correcting this unidentified wiring in the Limitorque operators installed prior to 1971, and after review of applicable safety concerns regarding hot plant shutdown of operating Unit 1 (discussed in paragraphs 3a and 3b of this report), the inspectors found the licensee's response and actions acceptable.

The inspectors also gave credit to the licensee for being the first plant in the country to identify this potentially generic problem.

No violations or deviations were identified.

d. Review of Qualification Packages

The NRC inspectors reviewed the EQ qualification of Limitorque motor operator replacement wiring installed by the licensee as corrective action to rectify this problem. The following wires and qualification reports were reviewed for qualification of wires to their accident environments:

- (1) Champlain EXAR 400, 1/c No. 14, Type SIS, 600V, Qualification Report No. 558-1024, April 2, 1981, Applied Engineering Test Labs, Hartwood, VA. Certification that EXAR is crosslinked polyethylene. Exposed to SLB/LOCA simulation.
- (2) Rockbestos Firewall SIS, Double Insulated 1/c No. 14, 600V, Nuclear Grade. Qualification Report: "Qualification of Firewall III Class 1E Electric Cables (Irradiation of Cross Linked Insulation)", The Rockbestos Company, New Haven, Conn. (Firewall III equivalent to Firewall SIS). Exposed to LOCA simulation.
- (3) Raychem Flamtrol 60B0311-14 - 600V. Qualification Reports No. F-C4033-1, "Tests of Raychem Flamtrol Insulated and Jacketed Electrical Cables Under Simultaneous Exposure to Heat, Gamma

Radiation, Steam, and Chemical Spray While Electrically Energized," Franklin Institute Research Labs, January 1975. The above report tested Cable Type 60B0211; however the licensee reported confirmation from Raychem Corp that the report was valid for a family of cables with the 60B prefix.

- (4) Kerite, Type Code 01146, 1/c No. 14, 600V, Insulation Type FR, Jacket Type FR. Qualification Report No. F-C4020-1 and F-C4020-2, "Tests of Electrical Cables Under Simultaneous Exposure to Gamma Radiation, Steam, and Chemical Spray While Electrically Energized." Prepared by Franklin Institute Research Labs, March 1975. Exposed to LOCA simulation per IEEE323/1974 profile.
- (5) Boston Insulated Wire (BIW), 1/c No. 14, 600V, Ethylene Propylene (EPR)/chlorosulphonated polyethylene (CSPE) insulation with a CSPE jacket. BIW Qualification Report No. B-915 Revision 1. Exposed to LOCA simulation of IEEE323/1974.

Since the valves considered necessary to function during an accident would be exposed to environments less severe than a LOCA envelope described in IEEE323/1974, qualifications of wires reviewed were considered adequate.

Based on the above review, the inspectors concluded that the unqualified wires found generic to Limitorque operators in Units 1 and 2 of Zion Station would not have prevented the EQ valves from stroking once to perform their safety function during an accident, and that the licensee had taken adequate corrective action in identifying, reporting, and replacing these unqualified wires.

No violations or deviations were identified.

4. Exit Interview

The Region III inspectors met with the licensee representatives (denoted under Paragraph 1) at the conclusion of the inspection on November 15 and 19, 1985. The inspectors summarized the purpose and findings of the inspection. The licensee acknowledged this information. The inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents/processes as proprietary.