

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/85036(DRS)

Docket No. 50-331

License No. DPR-49

Licensee: Iowa Electric Light and Power Company
Security Building, P. O. Box 357
Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Inspection At: Palo, IA

Inspection Conducted: December 9, 1985 through January 10, 1986

Inspectors:

R.A. Westberg

R. A. Westberg

R.A. Westberg for

R. N. Sutphin

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Approved By:

F. Hawkins, Chief

Quality Assurance Programs Section

1/30/86

Date

1/30/86

Date

1/30/86

Date

Inspection Summary

Inspection conducted December 9, 1985 through January 10, 1986

(Report No. 50-331/85036(DRS))

Areas Inspected: Special inspection by two regional inspectors of control of engineering, maintenance, and surveillance testing activities relative to the HPCI and RCIC systems. The inspection involved 138 inspector-hours onsite and 42 inspector-hours at Region III. It was conducted in accordance with NRC inspection procedures Nos. 30703, 39701, 61700, 61724, 61725, 62700, 62702, and 92700.

Results: No violations or deviations were identified.

DETAILS

1. Persons Contacted

Iowa Electric Light and Power Company

- *D. L. Mineck, Plant Superintendent
- *R. Hannen, Assistant Plant Superintendent, Operations
- *W. J. Miller, Technical Services Superintendent
- *B. Lacy, Maintenance Superintendent
- *J. C. Smith, Acting Technical Support Supervisor
- *R. A. McCracken, Quality Control Supervisor
- *C. R. Mick, Operations Supervisor
- *D. Wilson, Licensing Manager
- *R. Lessly, Manager Design Engineering
- *Y. Anagnostopoulos, Maintenance Engineering Supervisor
- *R. Rockhill, Mechanical Maintenance Supervisor
- *M. Huting, Assistant Quality Control Supervisor
- *R. D. Essig, Supervising Quality Assurance Engineer
- *R. Browning, Senior Licensing Engineer
- *M. S. Grim, Licensing Engineer
- *B. Leimkuehler, Mechanical Engineer
- *M. Dwyer, Technical Group Leader
- *L. G. Jenkins, Quality Assurance Engineer
- *A. Steen, Operations Shift Supervisor
- *B. Seely, Mechanical Foreman
- *D. Pladsen, Mechanical Foreman
- A. R. Jacobstein, Plant Performance Engineer
- K. Peveler, Senior Mechanical Engineer
- J. Kozman, Supervising Engineer
- T. G. Dalton, Licensing Engineer
- R. L. Zook, Assistant Operations Supervisor
- G. R. Fulford, Maintenance Planner
- L. Voss, Electrical Maintenance Supervisor

General Electric

- *J. W. Smith, Operations Engineer

U.S. Nuclear Regulatory Commission

- *J. S. Wiebe, Senior Resident Inspector
- *N. Valliere, Resident Inspector

Other licensee personnel were contacted as a matter of routine during the inspection.

*Denotes those present at the exit interview on January 10, 1986.

2. High Pressure Coolant Injection (HPCI) System and Reactor Core Isolation Cooling (RCIC) System Reliability Assessment

The purpose of this inspection was to perform an indepth assessment of the control of engineering, maintenance, and surveillance testing on the HPCI and RCIC systems by the licensee and their contractors. This inspection was prompted by the NRC's concerns regarding the apparent lack of reliability of the HPCI and RCIC systems as evidenced by the numerous Licensee Event Reports (LERs) issued from 1983 to date. These concerns were heightened in the maintenance area because of poor performance, personnel errors, lack of trending, incomplete equipment history, and a relatively large backlog of corrective maintenance items. They are reflected in previous NRC inspection reports and were the basis for the declining SALP rating in the maintenance functional area.

a. Objectives

The objectives of this assessment were to (1) analyze engineering, maintenance, and surveillance activities relative to the HPCI and RCIC systems; (2) determine basic underlying causes of problems; (3) develop observations and (4) provide recommendations for action.

b. Methodology

This assessment was conducted through the evaluation of Licensee Event Reports (LERs), Deviation Reports (DRs), Nonconformance Reports (NCRs), Corrective Maintenance Action Requests (CMARs), Service Information Letters (SILs), preventive maintenance (PM) procedures, maintenance procedures, surveillance testing procedures, measuring and test equipment (M&TE) use, and ongoing maintenance training. The inspectors also conducted a program overview through a review of policy documents, control documents, and personnel interviews.

c. Results

(1) LER Review

The inspectors reviewed all the HPCI and RCIC system LERs for 1984 and 1985 against the requirements of 10 CFR 50.73. Special attention was paid to classification and determination of root causes. This review resulted in the following observations:

- (a) Root causes were incorrectly identified on two of eight HPCI LERs.
- (b) Root causes were not specified on three of eight RCIC LERs and root causes were incorrectly identified on four of the five remaining LERs.

- (c) LER cause code "x", meaning other or unknown, was employed in 6 of 16 samples (37%). The use of this cause code appeared excessive; however, its usage on the 1985 HPCI LERs showed a decrease, while its use on RCIC LERs showed an increase during the same period.
- (d) Human error was the basis for two HPCI and one RCIC LERs in 1984. No LERs were attributed to human error in 1985.
- (e) HPCI reliability appears to be increasing. The fact that five LERs were filed in 1984 and three were filed in 1985 supports that conclusion. Further, of the three LERs filed in 1985, only one relates to HPCI reliability. One of the remaining two, LER 85-007, was written to inform the NRC and the industry of a HPCI turbine reversing chamber cracking problem. The other, LER 85-043, documented a voluntary outage to perform maintenance on a leaking valve.
- (f) RCIC reliability appears to be decreasing. This conclusion is based on the fact that three LERs were filed in 1984, while five were filed in 1985. Of the 1985 LERs, three were caused by defective materials or components, and the remaining two were caused by either defective procedures or preventive maintenance.

(2) Deviation Report Review

Deviation Reports on the HPCI and RCIC systems were reviewed. Deviation Reports (DRs) document the identification and evaluation of a deviation. Deviations include violation of the technical specifications; environmental technical specifications; surveillance test procedures; operations manual.

The deviation reporting system is described in Administrative Control Procedure (ACP) No. 14022, Revision 1. All plant personnel are responsible for the prompt identification of deviations, the origination of deviation reports, and providing the DRs to the Operations Shift Supervisor. A total of 246 DRs had been written and listed on HPCI and RCIC systems since October 1975. The inspectors' review of these DRs produced the following observations:

- (a) Information that is available to assist in trending and problem evaluation is not always used. Several obvious trends in the failure mode of instrumentation and pressure switches were recognized by the inspectors during their review that had neither been recognized nor investigated by the licensee.

- (b) Cause codes, such as "unknown" or "instrument drift", appear to be used too frequently. In a sample of 25 HPCI and RCIC DRs written for instruments found out of tolerance, 17 documented the cause as instrument drift and no cause was given on 5 others.
- (c) Late management reviews and closeouts may be precluding the potential benefits of prompt and effective corrective actions. While the normal time required to close out a DR was one to three months, one DR was identified that was closed two years after an event. Similarly, two DRs were identified that were closed eight months after the respective events.

(3) Nonconformance Report Review

Nonconformance Reports (NCRs) for the HPCI and RCIC systems that were written during the period 1982 through 1985 were selected for review. Fourteen NCRs were reviewed. Two NCRs applied to both HPCI and RCIC, nine applied to HPCI, and three applied to RCIC. These reviews produced the following observations:

- (a) Engineering evaluations in the past have not always been timely. For example, the engineering evaluation required by NRC No. 84-034 (1984) had not been completed at the time of this inspection. When the inspectors brought this issue to the attention of licensee personnel, action was taken to perform the required evaluation.
- (b) Engineering evaluations in the past have not always been as complete as they should be. The engineering evaluation for NCR No. 85-135 failed to address how long the HPCI turbine would continue to run with water contamination in the oil. The evaluation did, however, address starting and reaching the required speed in the required time. Further, the engineering evaluation for NCR No. 83-151 did not clearly define a test for acceptability upon completion of RCIC turbine trip coil rewind.

(4) Corrective Maintenance Action Request Review

The inspectors reviewed the licensee's list of CMARs issued for work on components either contained within the HPCI and RCIC systems or directly associated with the systems. The list contained 600 items of work activity from 1978 to December 10, 1985. The list included the CMAR number, origin date, activation date, completion date, component identification, and a brief description of the maintenance problem or activity required. The list was arranged in numerical order by the CMAR number.

The inspectors used the list to generate a CMAR history for three safety-related motor operated valves in the HPCI system, for further review. This history was limited to activity from 1981 through 1985. The valves selected were MOV-2239 (HPCI steam line outboard isolation valve), MOV-2238, HPCI steam line inboard isolation valve), and MOV-2202 (HPCI steam supply valve). This maintenance history review resulted in the following observations:

- (a) The planned component maintenance history program had not been implemented to identify adverse trends and potential problems.
- (b) Root causes are not always identified in the maintenance data packages for future reference and use.
- (c) Corrective actions are not always taken promptly whenever adverse trends or significant problems are identified as evidenced by the repetitive maintenance on the HPCI steam supply valves during a 23-month period in 1982 and 1983.
- (d) Maintenance training or retraining is not conducted for areas that show adverse trends.

(5) Service Information Letter (SIL) Review

SILs are issued by General Electric Nuclear Fuel and Services Division to recommend actions to be taken for problems that have been experienced by operating BWR plants.

During this inspection, the licensee's HPCI/RICI Reliability Task Force Chairman indicated that 13 SILs were being evaluated by the task force. The inspector read SILs and selected four which specifically indicated that system reliability could be improved through their implementation. The following observations were made:

- (a) SIL No. 31 (1976) and SIL No. 336 (1980) had been previously evaluated and partially implemented; however, more work was being considered during the term of the inspection.
- (b) SIL No. 377 (1982) and SIL No. 382 (1982) were being evaluated. No evidence of previous evaluation was evident.

(6) Preventive Maintenance Review

Preventive maintenance is established by Chapter 8 of the Quality Assurance Manual. It is implemented by Procedure No. 1409.2, "Preventive Maintenance," Revision 3, and Procedure No. MD-012, "Preventive Maintenance Action Request (PMAR) Form Description," Revision 0. PM is scheduled by the computer as a preplanned task under the direction of a PM Coordinator.

The inspector reviewed the program description, the implementing procedures, the schedule for HPCI and RCIC PM, and selected PM procedures. The following observations were made:

- (a) The PM Coordinator is responsible for all electrical, mechanical, and instrument PM. This was considered a strong point by the inspector.
- (b) There is no scheduled PM on valve packing inspection and Limitorque torque switch settings or motor operator running current. This is not consistent with current industry practices.

(7) Maintenance Performance Review

Corrective maintenance is established by Chapter 8 of the Quality Assurance Manual. It is implemented by Procedure No. 1408.1 "Corrective Maintenance," Revision 9. Maintenance activities are preplanned and initiated by a formal work request. When maintenance activities are complex, a maintenance procedure is required. Written authorization by the Operations Supervisor must be received prior to commencing work.

The inspector reviewed the program description; the implementing procedure, including the latest draft; selected maintenance repair procedures; and MAR No. 69480 which documented recent HPCI maintenance. This review produced the following observations:

- (a) MAR No. 69480 required only a visual inspection of the valve stem when the valve had been repacked seven months previously. Additionally, the stroke time had increased three seconds in each direction due to an operator change and the valve had previously placed the plant in a LCO condition due to the same packing leak. It appears that direct measurement of the stem would have been appropriate since the cause of failure was not determined and maintenance on the valve for a third time will defeat any ALARA considerations which may have existed.
- (b) The instructions for adjusting the valve packing in the maintenance instructions for MAR No. 69480 described an alternative method for adjustment of the packing that was not addressed by either existing repair procedure No. GPM-007, "Valve Repacking," Revision 0, or procedure No. GPM-030, "Anchor/Darling Gate Valve Repair Procedure," Revision 1.

- (c) Anchor Valve drawing No. 1463-3, Revision C, shows a stainless steel lantern ring in the subject valve. No lantern was found when the valve was disassembled on MAR No. 69480. No engineering justification or 10 CFR 50.59 review could be produced documenting approval for this configuration. Subsequently, it was determined that the lantern ring was removed in 1975. During this inspection, an Engineering Work Request No. EWR 86-002 was generated to require both an engineering evaluation of the lantern ring's removal and a 10 CFR 50.59 safety evaluation. The inspector found the results acceptable.
- (d) The CMAR procedure currently in draft appeared weak in the area of root cause analysis and determination.

(8) Maintenance Training

There is currently no documented training program for maintenance personnel; however, apprentice training programs for I&C, electrical, and mechanical maintenance personnel are currently being developed and implemented.

The inspector reviewed the proposed "step programs" for maintenance personnel, the 1986 Training Course Catalog, and the training records of selected maintenance personnel. In addition, interviews were conducted with key training and maintenance personnel. This review produced the following observations:

- (a) The step programs for apprentice maintenance personnel appear to be excellent.
- (b) The more experienced the maintenance personnel, the less the training they have received. Conversely, the newer maintenance personnel have received more documented maintenance training.
- (c) Administrative Training Procedure No. ATP-8.6, "Continuing Training Program for Maintenance, Radiation Protection, and Non-Licensed Operators," Revision 0, deals primarily in plant occurrences and industry related events. It does not provide for continuing training of journeymen mechanics in maintenance.
- (d) There is no training schedule for retraining or continuing training of journeymen mechanics.

(9) Measuring and Test Equipment Review

The licensee's M&TE program and activities were reviewed. ACP 1408.8, "Control of Measuring and Test Equipment", Revision 4, ACP 1408.7, "Control of Permanent Plant Instrumentation, Revision 3, and ACP 1408.6, "Calibration Procedures", Revision 0, were reviewed and found to provide an effective program plan.

(10) Surveillance Testing Review

The licensee's surveillance testing program was reviewed to verify compliance with commitments and activities directly associated with the HPCI and RCIC systems. Two administrative control procedures, three surveillance test procedures for HPCI, and three surveillance test procedures for RCIC were reviewed. All were found to be acceptable.

d. Conclusions and Recommendations

The inspectors concluded that the licensee's task force has identified several methods to improve HPCI and RCIC reliability. The increase in HPCI reliability is indicative of their effort's effectiveness; however, the overall assessment indicates that additional attention is required in several areas. Accordingly, consideration should be given to the following recommendations:

- (1) Place increased emphasis on the determination of the root causes of events and equipment malfunctions (Paragraphs 2c(1)(a), (b), and (c); 2c(2)(b); and 2c(4)(b)).
- (2) Increase management attention relative to required engineering reviews. (Paragraphs 2c(3)(a) and (b) and 2c(2)(c)).
- (3) Investigate the obvious trends apparent in the Deviation Report Listing. (Paragraph 2c(2)(a)).
- (4) Reduce the excessive use of cause codes unknown and "other". (Paragraphs 2c(1)(c) and 2c(2)(b)).
- (5) Give increased attention to manufacturers/vendors recommendations for reliability (Paragraphs 2c(5)(a) and (b)).
- (6) Implement the planned maintenance history and trending program as soon as practicable (Paragraph 2C(4)(a)).
- (7) Rewrite Procedure No. GPM-007 to reflect current maintenance practices and train the personnel in its implementation. (Paragraph 2c(7)(b)).
- (8) Include valve packing inspections and limit torque torque switch settings in the PM program (Paragraph 2c(6)(b)).
- (9) Establish training objectives, a training schedule, and training program for continuing training for journeyman level and supervisory maintenance personnel (Paragraphs 2c(8)(c) and (d)).
- (10) Strengthen the corrective maintenance procedure relative to root cause determination and documentation and train the responsible personnel in its implementation. (Paragraph 2C(7)(d)).

(11) Include more QC or peer type inspections on LCO-related maintenance to ensure root cause determination. (Paragraph 2c(7)(a)).

(12) Investigate the practice of removing lantern rings from valves so equiped without an engineering evaluation and identify any generic implications. (Paragraph 2c(7)(c)).

3. Exit Interview

The inspectors met with licensee representatives (denoted in Paragraph 1) on January 10, 1986, and summarized the purpose, scope, and findings of the inspection. The probable contents of the report were discussed with licensee personnel and no proprietary information was identified.