

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-295/92023(DRS); No. 50-304/92023(DRS)

Docket Nos. 50-295; 50-304

Licenses Nos. DPR-39; DPR-48

Licensee: Commonwealth Edison Company
Opus West III
1400 Opus Place - Suite 300
Downers Grove, IL 60515

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

Inspection At: Zion, Illinois

Inspection Conducted: October 5 - 29, 1992

Inspectors: R. M. Lerch
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12-2-92
Date

R. M. Lerch for
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12-2-92
Date

R. M. Lerch for
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Date

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12-2-92
Date

Approved By: B. L. Burgess
B. L. Burgess, Chief
Operational Programs Section

12/3/92
Date

Inspection Summary

Inspection conducted from October 6 - 29, 1992 (Reports No. 50-295/92023(DRS); No. 50-304/92023(DRS))

Areas Inspected: Announced, routine, safety inspection of modifications and design changes (MC 37700) including engineering and technical support.

Results: Engineering performance was good. The review of modification packages found them to be thorough and correct. Management actions to increase engineering involvement in the site was a strength. A licensee initiative, the Integrated Reporting Program included a look for engineering performance

trends. Some areas of weakness were noted including the temporary alteration program and post-maintenance testing. A violation was written for an inadequate 10 CFR 50.59 safety evaluation of a temporary alteration (paragraph 3.2). A violation was written for lack of a post-maintenance test (paragraph 3.4.a). Other findings were a lack of trending of component performance data (paragraph 4.1), failed safety relief valve tests not reported (unresolved item - paragraph 3.4.b), and inadequate procedural guidance for performing materials engineering technical evaluations and alternate replacement parts evaluations (open item - paragraph 3.3).

REPORT DETAILS

1. Commonwealth Edison Company

- +R. Tuetken, General Manager
- +T. Joyce, Station Manager
- +K. Ainger, Site Engineering Supervisor
- +S. Bakhtiari, Design Engineering Supervisor, Mechanical
- +G. Beale, OPEN Administrator
- +R. Chrzanowski, Technical Staff Supervisor
- +T. Cromeans, Technical Staff Engineer
- +K. Dickerson, NRC Coordinator
- +P. Donavin, Nuclear Engineering Supervisor,
Mechanical/Structural
- +C. Grasser, Quality Verification Staff
- +D. Plauck, Technical Staff Engineer
- +G. Ponce, Quality Control Staff
- +B. Scharping, Technical Staff Engineer
- +S. Stimac, Nuclear Licensing Administrator
- +W. Stone, Performance Improvement Director
- +D. Wozniak, Technical Superintendent

U.S. Nuclear Regulatory Commission

- +B. Burgess, Chief, Operational Programs Section
- +J. D. Smith, Senior Resident Inspector

+Denotes those present at the exit meeting on
October 22, 1992.

Other persons were contacted as a matter of course during
the inspection.

2. Licensee Action on Previous Inspection Findings

- 2.1 (Closed) Unresolved Item 295/90030-23: Inadequate
engineering evaluations of modifications. The Diagnostic
Evaluation Team (DET) questioned the validity of engineering
evaluations performed for modifications after 1989. There
were two modifications needing additional review of the
design change process. One case was related to wrong
orifice plates being installed in the 2B emergency diesel
generator (EDG) lube oil and jacket water cooler. The other
was related to a maintenance valve installed in the reactor
containment fan cooling (RCFC) isolation return header.

The EDG cooler orifice was a fabrication error which was detected and corrected by the licensee prior to installation and was not a design error. The RCPC maintenance valve was installed prior to 1989 and therefore was outside the time period in question. A review of the modification package and station procedures showed that the DET concern for a single failure was evaluated and appropriate administrative controls were in place. This item was closed.

- 2.2 (Open) Violation 295/91014-01: Inadequate technical input for procurement specifications of modifications. The response and corrective actions to this violation were reviewed. Part of the licensee's response to this violation referenced their Engineering Assurance Program Assessment. This program was self-initiated and examined the licensee's overall procurement process with special emphasis on technical input into procurement documents. The Engineering Assurance Program Assessment report, number EA-91-04, documented six deficiencies regarding the inadequacy of providing and reviewing technical input in the procurement process including generation of procurement specifications. This report specifically requested that designated design superintendents develop procedures (QE-83 and QE-51H) to minimize these six deficiencies.

The inspectors review of the generated procedures, QE-83 (approved in 1991) and QE-51H (currently in the approval process), showed that the procedures did not address the six deficiencies. The author of the QE-83 procedure, the main procedure to address these concerns, had not been aware of the EA-91-04 report, and therefore did not specifically address the six deficiencies. The inspectors discussed these concerns with the licensee staff and they stated that they would review and modify these procedures as appropriate for the response to the EA-91-04 findings. This item remained open.

3. The Quality of the Engineering Activities

The quality of E&TS management and staff activities was good with some weaknesses. Modification packages, and evaluations of deviations were typically thorough and correct. Weaknesses were found with temporary alterations, a lack of evaluation of component performance data, and replacement parts evaluations. This was based on inspector's reviews, observations, and interviews regarding routine and reactive engineering functions. Areas reviewed included modifications, temporary alterations, system engineer activities, deficiency reports, licensee event reports, and others.

3.1 Modification Packages

Modification packages and design engineering performance were good. Twelve modification packages were reviewed for such items as design assumptions, supporting calculations, safety evaluations, post-modification testing, and unreviewed safety questions. No significant concerns were identified with the modification packages reviewed.

- a. The inspectors examined the licensee's modification package, M-22-2-20-555A/B, replacing Grinnel hydraulic snubbers with Lisega snubbers. The inspectors evaluated the licensee's snubber reduction program developed and coordinated by the Mechanical and Structural Support (M&S) organization in the corporate Nuclear Engineering Department. The review identified a thorough and active involvement by the licensee's M&S organization in the snubber reduction program including performance of the design analysis for two systems. The inspectors found the extent and quality of the licensee's effort in this activity to be excellent.
- b. The inspectors identified a concern with modification M22-2-88-47. This modification replaced the starting air compressors for the emergency diesel generators. The concern was that local humidity levels were not clearly specified as part of the environmental considerations in the procurement specifications. This omission contributed to the vendor delivering equipment, that during operation, allowed moisture to condense in the compressor and drain into the crankcase oil. Tainted oil was observed by the licensee maintenance personnel who took immediate action to determine the cause of the contamination and to replace the oil. Licensee technical personnel, with the support of the vendor, analyzed the problem, took appropriate interim measures, and planned for long term fixes. Water in the compressor oil did not have an immediate impact on its operability.

The lack of humidity requirements in the procurement specification was an example of an inadequate specification for which violation 295/91014-01 was previously issued (See paragraph 2.2). Since corrective actions for the violation were not fully implemented to prevent this recurrence, a violation is not being issued.

c. The modifications examined in this inspection were as follows:

- M22-2-87-02C, Increase Steam Generator Blowdown Capacity
- M22-1-88-47C, Replace Diesel Generator Starting Air Compressor
- M22-2-89-029, Replacing Fuel Transfer Switches
- M22-1-90-09, Replace SI 9012 Check Valve with Different Valve
- M22-2-90-555A and B, Hydraulic Snubbers Replacement
- M22-1-90-557, Replacing Valve Trim of PCV VC131
- M22-90-559, Cable Tray Siderails Support Enhancement
- M22-0-90-568C, Heat Exchanger Vent and Drains
- P22-1-91-09A, RC Containment Isolation
- M22-1-91-009B and C, Containment Isolation Valves for ILRT
- M22-1-91-576 A, B, or C, MOV Repairs per Generic Letter 89-10
- M22-1-92-508, Replacing the MCC Cubicle for PP Air Compressor

No violations or deviations were identified in this area.

3.2 Temporary Alterations (TA)

The inspectors found the temporary alteration (TA) program adequate with several weak areas. Although training in the completion of safety evaluations was increased in 1991, the safety and technical evaluations from 1991 and 1992 were of inconsistent quality with varying degrees of detail. Individual TAs were installed that were minor design modifications and were not given the more detailed review of the modification process. The age of many TAs and the total number of active TAs exceeded the goals of the TA program. Although the TA program was well defined by procedure and trended by the monthly report, the licensee did not make progress towards achieving the TA program goals.

- a. The inspectors reviewed the temporary alteration program as outlined in Zion Administrative Procedure (ZAP) 3-51-4 dated November 14, 1991, titled "Temporary Alteration Program". The inspectors also reviewed the September 1992 monthly TA status report, ZAP 2-54-5, Rev. 0, dated August 20, 1992 titled "Safety Review and Approval", and 14 TAs dated from February 1989 to July 1992. Individual TAs were reviewed for their adherence to programmatic and regulatory requirements.

b. The inspectors reviewed TA 90-053 "KIT Outlet Valve Leakage Reroute To RCDT" dated June 9, 1990, that had a possible unreviewed safety question. The TA installed a leak off line to route water leaking past valves 2MOV-SI-8801A(B) to the reactor coolant drain tank rather than thermally cycling the cold leg injection check valves. The safety evaluation acknowledged a potential for water hammer, however, it failed to evaluate a failure of the relief valve on the leak-off line draining a portion of the high head injection (HHI) lines. The temporary leak-off drain was in a low point in the system and an approximate 0.11 gallons/hour was leaking through the relief valve body. A portion of the HHI line could drain between the monthly PT-20 stroke test of the MOV-8801 valves which might have resulted in a water hammer affecting all four injection lines. The inadequacy of the safety evaluation was a violation of the requirements of 10 CFR 50.59 (295/92023-01(DRS)). An engineering evaluation performed by the licensee on or about October 21, 1992, determined that an unreviewed safety question did not exist. Based on pipe temperatures, the licensee concluded that the relief valve leakage came from the MOV-8801 valves. That leakage was judged sufficient to keep the injection lines full.

c. Fourteen TAs reviewed were:

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|------|---------|--|
| (1) | 88-119 | Unit "OV & PV System Relief Dampers" |
| (2) | 89-005 | Unit 1 "1C FWP Recirc Valve 1 PCV-FW20" |
| (3) | 89-074 | Unit 2 "2A Aux FW Pump Lube Oil Cooling Line" |
| (4) | 90-053 | Unit 2 "Kit Outlet Valve Leakage Reroute to Root" |
| (5) | 90-056 | Unit 2 "2A charging Pump Shaft Monitoring" |
| (6) | 91-059 | Unit 0 "Alternate Make-up System" |
| (7) | 92-001 | Unit 1 "4KV Bus Voltage Less than 2990" |
| (8) | 92-007 | Unit 1 "Install Blower with New Oil Sight Glass" |
| (9) | 92-0016 | Unit 0 "Door Alarm for Laundry Trailer" |
| (10) | 92-065 | Unit 0 "Replace Aux. Bldg. Sump Pump OC" |
| (11) | 92-0071 | Unit 2 "Jumper Out Aircraft Crash Damper Contacts for 2B D/G" |
| (12) | 92-072 | Unit 1 "Disable HX Cooling Water Low Pressure Trip for Reactor Coolant Sample Shut Off Valves in #1 Rad Sample System" |
| (13) | 92-0073 | Unit 2 "2B RCP Standpipe Low Level Alarm Lead Lift" |
| (14) | 92-076 | Unit 1 "Lift Incore Thermocouple R-05 Leads in 1CB116" |

As stated in paragraph 3.2.b, one violation was identified in this area.

3.3 Parts Assessments

A brief review of parts evaluations and the parts evaluation process was performed. Although an overall assessment of the parts evaluation program was not made, the following two concerns were identified:

- a. The review and approval process for downgrading parts from safety-related to nonsafety-related did not require review from licensed operations personnel or system engineers. Without including the system experts and individuals with an operations background in the parts classification process, the adequacy of the review to determine the safety function(s) of the part's parent component within a system may be lacking.
- b. The inspectors' identified that the lack of a definition for the terms interface, interchangeability, safety, fit, form, and function introduced inconsistencies in their use. This was evident in technical evaluation Z-90-06-1243-00 for a valve in the diesel generator system. The technical evaluation indicated that the part fit, form, or function had not changed when a stiffer spring was being used in the valve supplied by the vendor. Initial discussions with several parts evaluators revealed that changing the spring stiffness was not considered a change to the form or fit of the spring. However, further discussion with the evaluators on the definition of the terms revealed that either the form or fit, or both must have been changed. The adequacy of procedural guidance for performing material engineering technical evaluations and alternate replacement parts evaluations is considered an open item. (295/304/92023-02(DRS))

One open item was identified in this area.

3.4 Correcting Deficiencies and Adverse Trends

In general, the corrective action of engineering deficiencies and adverse trends was good. Weakness was identified in that root causes determinations, and coordination between system engineers and specialty groups within the technical staff were not always adequate. The inspectors reviewed numerous Deviation Reports (DVR), Discrepancy Records (DR) and Problem Identification Forms (PIF) to evaluate the level and quality of engineering involvement in correcting deficiencies. Based on the review, several concerns were identified.

- a. DVR 22-1-91-142 was written as a result of an interlock failure identified on December 28, 1991, during the performance of PT-2C-D-ST, "ECCS Valve Stroke and Interlock Test (Heatup)". Valve 1MOV-SI8804A (discharge valve from RHR pumps to charging pumps) failed to open with 1MOV-RH8701 (suction valve from RCS to RHR pumps) closed. The DVR evaluation concluded that inadequate maintenance on 1MOV-RH8701 was the root cause. Electricians failed to recognize the requirement to adjust the rotor with the interlock contacts. The inspectors identified that an additional contributor was inadequate testing following maintenance performed on 1MOV-RH8701 in March, 1991. Specifically, PT-2C-D-ST was not performed as part of the post-maintenance testing. The failure to perform adequate post-maintenance testing is a violation of 10 CFR 50, Appendix B, Criterion XI (295/92023-03(DRS)). The inspector identified three additional factors which contributed to the significance of this violation. First, the DVR evaluation failed to identify inadequate post-maintenance testing as leading to the failure. Second, review of subsequent maintenance performed on the RHR pump suction valves revealed that in July, 1992, limit switch maintenance was once again performed on one of the valves without the requirement for the interlock test. Finally, with the interlock inoperable, the ECCS was degraded for nine months in its ability to be lined up for cold leg recirculation.
- b. DVR 22-1-92-039 and DR 92-0045D were generated when two of three pressurizer safety valves set pressures were outside the Technical Specifications allowable band. The DVR evaluation indicated that a root cause analysis of the valve failures could not be performed since the technical staff was not notified of the failure until after the valves received maintenance. The corrective action established to ensure a root cause analysis could be performed in the future was to add a step in the valve testing procedure to notify the technical staff if problems were encountered during testing. Since a step already existed to notify the inservice inspection (ISI) group within the technical staff, the corrective action tracking item was closed out without action. During review of the event, the inspector determined that the ISI group was properly notified, but the information was only documented in a log and was not analyzed, trended, or communicated to the primary systems group within the technical staff. As a result, the inspector concluded that the corrective actions taken to prevent recurrence were inadequate.

The inspectors questioned whether this event was reportable to the NRC. The two relief valves lifted during testing more than 5% below the specified set point. This was at or close to the set point for the power-operated relief valves with a potential for simultaneous lifting. A review of the reporting guidance provided in NUREC 1022, Rev 1, was not conclusive as to the reportability of relief valves found out of tolerance when a plant is shut down. This matter was reviewed with the licensee staff who acknowledged that their reportability guidelines did not address relief valves being significantly out of tolerance. This concern is an unresolved item under review by the NRC (295/92023-04(DRS)).

- c. PIF 304-554-91-CAT4-150 was generated when the 2B SI pump suction valve failed to stroke open on October 31, 1991, during performance test PT-2A, "Safety Injection System Tests". During trouble shooting, 3 strip charts indicated abnormally high current during valve closure, before the torque switch contacts opened. The 1991 PIF evaluation noted that a strip chart from July, 1990 also showed an abnormally high rise in current prior to torque switch trip, but failed to recognize this as unacceptable. Rather, it characterized the chart as a trend. The procedure for evaluating strip charts was reviewed and found to lack detailed guidance. Procedural guidance and training relating to MOV strip charts is considered an open item. (304/92023-05(DRS))

One violation, one unresolved item, and one open item were identified in this area.

4. Extent of Engineering Involvement

Through interviews with operations, maintenance, design engineering, and technical staff personnel, and review of various technical staff engineering positions, the inspectors concluded that, overall, the extent of engineering involvement in support of the station was good.

4.1 Technical Staff

Involvement by the technical staff was good with respect to knowledge of assigned systems, system walkdowns and daily plant status. However, the following weaknesses were identified:

- a. Component trending performed by the technical staff was minimal. Although component failures were logged, in the cases of the out-of-tolerance relief valves and

the MOV motor currents, an analysis of information was not performed that could have been used to improve component reliability.

- b. System engineer involvement in correcting deficiencies for components within their system was lacking when specialty groups (such as the MOV and ISI groups) within the technical staff were ultimately responsible for the review. As a result, system engineers were not always aware of component problems within their system.
- c. Improvement was noted by operations and maintenance personnel in the system engineers' understanding of system-related procedures. Interviews indicated, however that lack of comprehensive system knowledge places some system engineers at a disadvantage when dealing with operations and maintenance.

4.2 Site Engineering

Site engineering was established on site in 1992 with technical staff engineers and design engineers relocated from the corporate office in Downers Grove, Illinois. Interviews with site design engineers indicated that the engineers were finding the proximity to the site and other station engineering groups beneficial for resolving issues.

4.3 Engineering Management

Engineering management involvement was evident. Significant changes had been made to improve engineering functions, however, two areas inspected were weak. The initiatives and weaknesses are discussed below.

- a. The reorganization of the engineering groups included relocating personnel to the site and establishing a site engineering organization. It also separated responsibilities for most modifications from the technical staff and gave them to specific engineering groups.
- b. Management had increased its expectation that engineers review the products of engineering contractors. The design engineering staff members interviewed were aware of this expectation and were performing these reviews. As a result, substantive comments were being transmitted to the contractors. This is significant and positive since the licensee is transferring its primary engineering services contract from Sargent and Lundy to ABB Impell.

- c. The temporary alteration (TA) program had several indicators of weak performance. As discussed in paragraph 3.2, the station was not meeting its goals for either the total number of TAs (approximately 60 were active) or age (17 were over 2 years old). The safety and technical reviews were not always rigorous enough to support the potential impact an alteration might have. Also, periodic reviews of TAs appeared to provide little or no enhancement of TA safety or reliability. This area was discussed with the licensee managers who stated that specific plans would be developed for the elimination of each TA and that the evaluation and review programs for TAs would also be examined. The licensee is also developing a procedure for "exempt modifications" which will provide a more efficient process for minor modifications. This may alleviate the motivation to use TAs for design changes.
- d. The licensee formed a performance monitoring group in the technical staff. This group will correlate equipment performance data from all station departments and issue periodic reports on trends. This group will also be responsible for implementing trending to meet the maintenance rule which will be based on reliability studies. These studies were not completed and it will be a couple years before this program is working. Based on the weaknesses observed by inspectors with equipment trending for relief valves and MOVs, the licensee missed opportunities to avoid equipment failures by not performing more evaluation of equipment performance data.
- e. The licensee had initiated an "Integrated Reporting Program" consolidating most of the stations problem reports. The program created a single problem report mechanism using a "Problem Identification Form (PIF)." The data in this program allowed the licensee to identify some specific performance indicators for different organizations. The indicators for engineering were newly established, but the program demonstrated the ability to identify trends which may lead to problems in areas such as foreign material exclusion and radiological controls.

No violations or deviations were identified in this area.

5. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. An unresolved item disclosed during the inspection is discussed in Paragraph 3.4.b.

6. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or licensee or both. Open items disclosed during the inspection are discussed in Paragraphs 3.3.b. and 3.4.c.

7. Exit Meeting

The inspectors met with the licensee representatives (see Paragraph 1) on October 29, 1992, to conclude the inspection. The inspectors summarized the inspection purpose, scope, and findings. The licensee acknowledged the information and did not identify any information as proprietary.