U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-315/85025; No. 50-316/85025

Docket Nos. 50-315; 50-316 Licenses No. DPR-58; No. DPR-74

Licensee: American Electric Power Service Corporation
Indiana and Michigan Power Company
1 Riverside Plaza
Columbus, Ohio 43216

Facility Name: D. C. Cook Nuclear Plant, Units 1 and 2

Inspection At: D. C. Cook Site, Bridgman, MI

Inspection Conducted: August 14 through September 5, 1985

Inspector: S. M. Hare for 10-18-85
Date

Approved By: W. G. Guldemond, Chief 10-18-85
Operational Programs Section Date

Inspection Summary

Inspection on August 14 through September 5, 1985 (Reports No. 50-315/85025(DRS); No. 50-316/85025(DRS))
Areas Inspected: Routine announced inspection by a region based inspector of previous inspection findings; licensee event reports; containment integrated leak rate test (CILRT) performance; CILRT results; Technical Specifications; local leak rate test results; and as found CILRT results. The inspection involved 74 inspector-hours onsite by one NRC inspector, including 34 inspector-hours onsite during off-shifts. An additional 15 inspector-hours were expended in the Region III office.
Results: Of the seven areas inspected, no violations or deviations were identified in six areas. In the remaining area, one violation was identified; (failure to control the calibrated condition of the flowmeter used for the supplemental verification test-Paragraph 4.e.(2)).

DETAILS

1. Persons Contacted

Licensee

*W. G. Smith, Jr., Plant Manager
+*A. A. Blind, Assistant Plant Manager-Maintenance
*B. A. Svensson, Assistant Plant Manager-Operations
+*L. S. Gibson, Technical Engineering Superintendent
*J. F. Stietzel, Quality Control Superintendent
*T. Postlewait, Performance Engineer Supervisor
+*J. R. Sampson, Production Supervisor-Operations
+*D. Climer, Performance Engineer
*R. Czajka, Performance Engineer
*N. A. Baker, Quality Control
+J. Allard, Maintenance
+K. R. Baker, Operations
+D. W. McAlhany, Quality Assurance

NRC

*B. L. Jorgenson, NRC Senior Resident Inspector
+J. K. Heller, NRC Resident Inspector
*C. L. Wolfsen, NRC Resident Inspector

The inspector also interviewed other licensee employees including members of the technical and operating staffs.

+Denotes those attending the exit interview on August 21, 1985.

*Denotes those attending the exit interview on September 5, 1985.

2. Action on Previous Inspection Findings

a. (Closed) Open Item (316/84013-01): Licensee's CILRT procedure had no data rejection criteria for the deletion of erroneous data points. The licensee's procedure now contains data rejection criteria.

b. (Closed) Violation (316/85013-02): Licensee's CILRT procedure allowed the restart of the supplemental test for the sole purpose of passing the test. The licensee's procedure now requires technical justification using data rejection criteria prior to a test restart.

3. Licensee Event Report Followup

a. (Open) Licensee Event Report No. 84-05-00 Item (316/85005-LL): Licensee's local leak rate test results for the Unit 2 1984 refueling outage exceeded the Technical Specification allowable of 0.6 La. In a letter from W. G. Smith to the NRC dated December 12, 1984, the licensee withdrew the LER based upon an incorrect methodology to add Type B and C leak rate test results. This

methodology (minimum pathway methodology) could, in this case, lead to non-conservative results and should not be used to add up local leak rate test results. An acceptable method to compute the combined penetration (Type B) and isolation valve (Type C) leakage for determining Technical Specification and Appendix J compliance is the maximum pathway methodology. This methodology is defined in Paragraph 4.b.(4) and is further discussed in Paragraph 7.b. LER 84-05 should be re-evaluated using the correct methodology and, if appropriate, be resubmitted.

b. (Closed) Licensee Event Report No. 85017-00 Item (315/85017-LL): Licensees local leak rate test results for the Unit 1 1985 refueling outage exceeded the Technical Specification allowable of 0.6 La. This item will be tracked under unresolved item (315/85025-06(DRS)) which is discussed in Paragraph 7.a.

4. Containment Integrated Leak Rate Test (CILRT) Witnessing

a. Procedure Review

The inspector reviewed Procedure 1 THP 4030 STP .202, entitled Containment Integrated Leak Rate Surveillance Test for technical adequacy and conformance with regulatory requirements. With the exception of problems discussed in Paragraph 4.e, and the open items discussed below, the procedure appeared to be adequate.

The inspector noticed during the inspection that several Steam Generators were being drained by Operations personnel. The inspector noted to the licensee that in order to simulate the post accident conditions required for performance of the Type A test, the Steam Generators should be maintained at a level prescribed for post LOCA conditions. This requirement should be incorporated into the Type A test procedure and is considered an open item (315/85025-01(DRS)) pending inspector review of the revised CILRT procedure.

Additionally, while investigating the cause of valve lineup discrepancies discussed elsewhere in this report, the inspector found containment instrumentation on Penetrations 97 and 98 that was not exposed to Type A test pressure. The inspector was informed that at least one of the instruments could be internally damaged if exposed to full test pressure (manufacturer's warnings). The inspector stated that if this was the case, it should be local leak rate tested and taken as a penalty to the Type A test results. If it was not the case, it should be exposed to Type A test pressure. The inspector noted to the licensee that a detailed review of containment instrumentation should be made to make the aforementioned determinations. This is considered an open item (315/85025-02(DRS)).

b. Summary of Appendix J Requirements

To ensure the licensee's understanding of Appendix J requirements the inspector had numerous discussions with licensee personnel during the course of the inspection. The following is a summary of the issues discussed with the licensee.

(1) Whenever penetration configurations during a CILRT deviate from the ideal, the results of LLRTs for such penetrations must be added as a penalty to the CILRT results at the 95% confidence level. An acceptable penetration leakage penalty is determined using the "minimum pathway leakage" methodology. The minimum pathway methodology as it applies to D. C. Cook is discussed further in Paragraph 8. This methodology is defined as the minimum leakage value that can be quantified through a penetration leakage path (e.g., the smallest leakage of two valves in series). This assumes no single active failure of redundant leakage barriers. Additionally, any increase in containment sump or pressurizer level during the course of the CILRT must be taken as a penalty to the CILRT results. If penalties exist, they must be added (subtraction is never permitted) to the upper confidence level of the CILRT results.

(2) The Type A test length must be 24 hours or longer to use the mass point method of data reduction. If tests of less than 24 hours are planned, the Bechtel Topical Report, BN-TOP-1, must be followed in its entirety except for any Section which conflicts with Appendix J or Technical Specification requirements. For either methodology, the acceptance criterion is that the measured leakage at the 95% upper confidence limit must be less than 75% of the maximum allowable leak rate for the pressure at which the test was performed.

(3) For the supplemental test, the size of the superimposed leak rate must be between 0.75 and 1.25 times the maximum allowable leak rate La or Lt. The supplemental test must be of sufficient duration to demonstrate the accuracy of the test. The NRC looks for the results stabilizing within the acceptance criteria, not just being within the acceptance criteria. Whenever the BN-TOP-1 methodology is being used, the length of the supplemental test cannot be less than approximately one half the length of the CILRT and the BN-TOP-1 method of data reduction must be used.

(4) An acceptable method for determining if the sum of Type B and C tests exceeds the 0.60 La Appendix J limit is to utilize the "maximum pathway leakage" method. The maximum pathway methodology as it applies to D. C. Cook is discussed further in Paragraph 7.b. This methodology is defined as the maximum leakage value that can be quantified through a penetration leakage path (e.g., the larger, not total, leakage of two valves in series). This assumes a single active failure of the better of two leakage barriers in series when performing Type B or C tests.

(5) Future periodic Type A, B, and C tests must include both as found and as left results. In order to perform repairs prior to a Type A test, an exemption from Appendix J requirements should be obtained from NRR. The exemption should state how the licensee plans to determine the as found condition of the containment since local leak rate repairs are being performed prior to the CILRT. An acceptable method is to commit to add any improvements in leakage rates which are the result of repairs or adjustments (RAs) using the "minimum pathway leakage" methodology.

c. Instrumentation

The inspector reviewed the instrument calibration data associated with performing the CILRT. A multipoint calibration of all instrumentation was performed. Correction values were generated based on the difference between measurements of resistance from an NBS verified resistance box and actual resistance. All corrections were placed as an array or equation into the CILRT computer.

The following instrumentation was used in the CILRT:

Type	Quantity
RTD's	46
Flowmeter	1
Pressure Gauges	6
Dewcells	6

The inspector noted to the licensee that their present data acquisition system (data logger plus manual data entry into computer), while adequate, is prone to data entry error and with a ½ hour data entry interval requires additional data points to obtain an accurate measurement of containment leak rate.

d. Pretest Containment Inspection

The inspector performed a pretest containment inspection to ensure the proper placement of test instrumentation. The inspector noted the close proximity of RTD's to the containment walls. The reason for this was that each RTD had associated with it a junction box in which permanent wiring had been run for the specific purpose of performing a CILRT. The inspector asked the licensee if they had determined sensor location by performing a temperature survey or equivalent as required by ANSI N45.4 - 1972. During the inspection period, the licensee was unable to determine if they had ever performed a temperature survey. In order to resolve this matter, the licensee is requested to submit to Region III information showing either; that a temperature survey was performed or; justification for not conducting a temperature survey. This is considered an unresolved item 315/85025-03(DRS), pending the inspector's review of the licensee's submittal.

e. Test Witnessing

(1) First Attempt

The licensee began pressurizing the containment on August 17, 1985, stabilized, and began the measured leakage phase of the CILRT at 4:00 a.m. on August 18. During the period between the beginning and the end of the measured leakage phase of the CILRT, the inspector, with the aid of the licensee, reviewed valve lineups against drawings and performed a valve walkdown to verify that systems were properly isolated and vented. The following valve lineup discrepancies were identified:

Component	Required Condition	As Found Condition
Valve GPX-312 VI (Nitrogen to Accumulator)	Open to provide vent path	Closed
Gauge GPX-312 (Nitrogen to Accumulator)	Removed to provide vent path	Installed
Gauge XPX-100 (Control Air)	Removed to provide vent path	Installed
Gauge XPX-110 (Control Air)	Removed to provide vent path	Installed
Pressure feedback line for Valve GPC-310 (Nitrogen to RCDT)	Removed to provide vent path	Installed

These components had been independently verified to be in the correct position in the procedure's valve lineup section.

Since the incorrect positioning of these components had the potential to invalidate the test (potential source of in leakage from pressurized air systems outside of containment), the inspector notified the licensee immediately of his findings.

As a result of the inspector's findings the licensee reverified the position of valves in similar systems outside containment and found an additional 12 lineup discrepancies. In response to these additional discrepancies, the following actions were taken:

(a) A special safety inspection was performed by Region III management to determine the root cause of the valve mispositioning. The result of this special inspection is documented in Inspection Report 50-315/85027.

(b) All valve lineup discrepancies that affected the containment boundary were corrected and independently verified.

(c) The licensee repressurized containment and reperformed the CILRT when the valve lineup verification was completed.

(2) Second Attempt

After the aformentioned valve lineup discrepancies were corrected and the containment was repressurized and declared stable, the measured leakage phase began at 2:30 p.m. on August 20. After the successful completion of the 24 hour test and prior to the point at which the supplemental leak was imposed, the inspector noticed that the flowmeter to be used to measure the magnitude of the imposed leak rate had a small diameter polyflow tubing fitting installed in its outlet. This fitting could create backpressure in the flowmeter that would alter the calibrated condition of the flowmeter. Failure by the licensee to control the calibrated condition of the flowmeter is contrary to the requirements of 10 CFR 50, Appendix B, Criterion XII, on Control of Measuring and Test Equipment which states in part that "measuring and test devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits," and is considered a violation (315/85025-04(DRS)).

The licensee, after checking with the manufacturer of the flowmeter to ensure that the flowmeter was not calibrated with the polyflow fitting, removed the fitting and began the supplemental test.

(3) Post CILRT Valve Lineup Verification

Due to the valve lineup difficulties encountered outside of containment, a valve lineup verification was performed inside containment after depressurization. The following valve lineup discrepancies were noted by the licensee:

Component	Required Condition	As Found Condition
Valve SI-164-1 (SI Accumulator Vent)	Open	Closed
Valve SI-164-4 (SI Accumulator Vent)	Open	Closed
Valve NPX-300 (Nitrogen supply to PRT)	Open, vent plug removed	Open, plug loosely installed

As a result of these discrepancies, the licensee performed an evaluation to determine what effect they had upon the CILRT results. In this case, any effect the valve lineup discrepancies caused may be expressed as penalties to the CILRT results. These penalties are listed in Paragraph 5.c.

f. Summary

During the performance of the Type A test(s) the inspector noted the following:

(1) The deficient valve lineups appear to violate NRC requirements. Additional detail on this finding is provided in inspection report 315/85027(DRS).

(2) The licensee's prompt corrective action of valve lineup reverification and reperformance of the CILRT demonstrates their strong commitment towards safety.

(3) The problems with the valve lineup and flowmeter identified by the inspector were problems which should have been identified by the licensee's Quality Control (QC) organization and are indicative of limited QC involvement in the CILRT.

No other violations or deviations were identified.

5. Test Results

a. CILRT Data Evaluation

The second 24-hour CILRT was performed with data being collected and reduced by the licensee every 30 minutes. The inspector independently monitored and evaluated leak rate data using the ANSI 56.8 (mass point) methodology to verify the licensee's calculations of the leak rate. There was excellent agreement between the inspector's and licensee's results as indicated by the following summary (units are in weight percent per day):

Measurement	Licensee	Inspector
Leakage rate calculated (Lam) during CILRT.	6.55x10-3	6.65x10-3
Lam at upper 95% confidence level 5.	0.0143	0.0144
Lam at upper 95% confidence level including penalties.	0.0174	0.0175

Appendix J Acceptance Criterion at 95% confidence level = 0.75 La=0.75 (0.25)= 0.1875. As indicated above, the adjusted Lam at the 95% confidence level was less than the Appendix J Acceptance Criterion.

b. Supplemental Test Data Evaluation

After satisfactory completion of the 24-hour test a known leakage of 0.1927 weight percent/day was induced. The inspector independently monitored and evaluated leak rate data to verify the licensee's

calculation of the supplemental leak rate. There was acceptable agreement between the inspector's and licensee's leak rate calculations as indicated in the following summary (units are in weight percent per day):

Measurement	Licensee	Inspector
Calculated leakage (Lc) rate during supplemental test	0.1933	0.1935

Appendix J Acceptance Criterion: $Lo-Lam-0.25La<Lo<Lo+Lam+0.25La$ ($0.1301<Lo<0.2552$). As indicated above, the supplemental test results satisfied the requirements of 10 CFR Part 50, Appendix J.

c. CILRT Valve Lineup Penalties

Due to valve configurations which deviated from the ideal penetration valve lineup requirements for the CILRT, the following penalties must be added using the minimum pathway leakage method:

Component Description	Leakage Penalty (Weight Percent/Day)
Non-Essential Service-Water Penetrations	1.25x10-4
CVCS Letdown Penetration	1.25x10-4
CVCS Charging Penetration	2.88x10-3
Glycol line to and from Ice Condenser	0.00
mispositioned valves (see Paragraph 4.e.2)	0.00
Total	3.13x10-3

No violations or deviations were identified.

6. Technical Specification Review

During the course of this inspection, the inspector reviewed the D. C. Cook Technical Specifications for conformance with 10 CFR 50, Appendix J requirements and NRC policy regarding Type A, B, and C testing. Technical Specification Surveillance Requirement 4.6.1.2.c., Paragraph 3 "Requires the quantity of gas injected into the containment or bled from the containment during the supplemental test to be at least 25 percent of the total measured leakage at Pa, 12.0 psig." This is contrary to the requirement of ANSI N45.4 - 1972 and is not consistent with the NRC position that the quantity of gas injected or bled from containment be between 0.75 and 1.25 La. This information will be forwarded by Region III to NRR for their review and correction of the D. C. Cook Technical Specifications. This is considered an open item (315/85025-05(DRS)).

No violations or deviations were identified.

7. Local Leak Rate Test Results Review

The inspector reviewed the local (Type B and C) leak rate test results for this outage and previous outages for acceptability and conformance with regulatory requirements. The inspector noted the following:

a. The licensee's local leak rate test (LLRT) results for this outage were far in excess of the 0.6 La Technical Specification and Appendix J requirement for the sum of penetration and isolation valve leakages. Additional review revealed that previous refueling outages also had excessive LLRT results. This violation of the 0.6 La limit for penetration and isolation valve leakage and the continuing failure of isolation valves may be indicative of inadequate corrective action taken by the Licensee. In order to resolve this matter, the licensee is requested to submit a list of isolation valves that have been consistently failing their local leak rate test, a summary of the corrective actions taken to correct the failures, and current plans to preclude the continuing failures of these valves. Review of this information relative to the adequacy of past and planned corrective action will be tracked as an unresolved item (315/85025-06(DRS)).

b. The licensee incorrectly sums LLRT results to satisfy the Technical Specification and Appendix J limit of 0.6 La. The licensee stated that they were adding LLRT results based on AEP Guidelines. These guidelines are incorrect. The correct methodology to determine Technical Specification and Appendix J compliance as described in Paragraph 4.b.(4) above, is the "maximum pathway leakage" methodology. Applying the correct methodology to test results obtained by pressurizing between two isolation valves, the maximum pathway leakage would be 100 percent of the leakage measured unless a conservative assignment of leakage can be made to the larger leaker of the two isolation valves. In that case, and in the case where isolation valve leakage is determined independently, the maximum pathway leakage for the penetration would be the larger of the two leakages. The inspector went over the correct methodology in detail with licensee personnel prior to the September 5, 1985 exit interview.

In addition to briefing the licensee on the correct methodology for adding local leak rate test results, the inspector suggested that the licensee incorporate into their local leak rate test procedure this methodology to ensure that the local leak rate test results will be added correctly in the future. This is considered an open item (315/85025-07(DRS)).

No violations or deviations were identified.

8. As Found Condition of CILRT Results

a. The "as found" condition is the condition of the containment at the beginning of the outage prior to any repairs or adjustments (RAs) to the containment boundary. 10 CFR 50, Appendix J, Paragraph III.A.1 requires that 'During the period between the initiation of the containment inspection and the performance of the Type A test, no repairs or adjustments shall be made so that the containment can be tested in as

close to the "as is" condition as practical.' ANSI N45.4-1972, Paragraph 4.2 requires "For retesting, an initial record proof test shall be conducted at time periods and pressures established by the responsible organization, before any preparatory repairs are made. This will disclose the normal state of repair of the containment structure and a record of the results shall be retained." The NRC's position on the "initial record proof test" requirement, is that it may be waived, provided the Type A test results are back corrected for all RAs to the containment boundary made prior to the performance of the Type A test.

If RAs are made to the containment boundary prior to the Type A test, local leak rate tests must be performed to determine the leakage rates before and after the RAs. The "as found" Type A test results can then be obtained by adding the difference between the affected path leakages before and after RAs to the overall Type A test results. These "as found" leakage rate results are required and carry the same reporting requirements as the other Type A and supplemental test results. The correct methodology for back correcting the Type A test results, as described in Section 4.b.(5) of this report, is the minimum pathway leakage methodology.

b. The inspector reviewed the licensee's calculation of the as found Type A test penalty and found their as found penalty overly conservative by a factor of two. After reviewing their "AEP Guidelines" to calculate an as found Type A test penalty, two problems came to light:

(1) AEP Guidelines state that when the leak rate is determined by pressurizing between two isolation valves, the worst case through leakage is 33.4% of the leakage measured. This is contrary to the the NRC position that the through leakage should be 50% of the leakage measured. The licensee's methodology is unacceptable.

(2) The licensee was following the AEP Guidelines as evidenced by their overly conservative calculation of Type A test penalty. This may be attributed to a misunderstanding as to the purpose of back correcting the Type A test. The purpose behind these calculations is to determine what the containment would have leaked if a Type A test was performed prior to any valve repairs.

c. To insure the licensee's understanding of how to calculate an as found penalty the inspector and a member of the licensee's staff went over in detail the methods to determine an as found penalty. The following is a summary of what was discussed:

(1) In the case where individual leak rates are assigned to two valves in series, the penetration through leakage would simply be the smaller of the two valves' leak rates.

(2) In the case where a leak rate is obtained by pressurizing between two isolation valves and the individual valve's leakage is not quantified, the penetration through leakage would be 50 percent of the measured leakage.

(3) In the case where a leak rate is obtained by pressurizing between two isolation valves and only one valve is repaired, the as found penetration through leakage would conservatively be the final measured leak rate and the as left penetration through leakage would be zero (this assumes the repaired valve leaks zero).

The inspector suggested that the licensee correct the AEP Guidelines to reflect the correct methodology to ensure that the as found Type A test penalty will be calculated correctly in the future. This is considered an open item (315/85025-08(DRS)) pending the inspector's review of the CILRT report and the revised AEP Guidelines.

d. The inspector reviewed as found and as left local leak rate test results to determine an as found Type A test result. The following is a summary of the as found containment leak rate (units are in weight percent/day):

Measurement

Penalties incurred due to repairs or adjustments prior to the CILRT	0.0832
As found Type A test results:	0.1006

Appendix J, Acceptance Criteria for the as found condition of the containment = 0.75 La = 0.1875 wt %/day. As indicated above the as found containment leakage rate was less than the Appendix J acceptance criterion.

No violations or deviations were identified.

9. 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 this inspection are discussed in Paragraphs 4.a, 6, 7.b and 8.c.

10. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. Unresolved items disclosed during the inspection are discussed in Paragraphs 4.d and 7.a.

11. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1) on August 21, 1985, and at the conclusion of the inspection on September 5, 1985, and summarized the scope and findings of the inspection activities. The licensee acknowledged the inspector's statements. The inspector discussed the likely informational content of the inspection report with regard to documents reviewed by the inspector during the inspection. The licensee did not identify any such documents as proprietary.