U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/91003(DRS)

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
1945 West Parnell Road
Jackson, Michigan 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, Michigan

Inspection Conducted: February 11 through March 1, 1991

Inspectors: R. A. Langstaff — Date 3/11/91

V. P. Lougheed — Date 3/11/91

Approved By: C. L. Vanderniet, Chief, Operational Program Section — Date 3/11/91

Inspection Summary

Inspection on February 11 through March 1, 1991
(Report No. 50-255/91003(DRS)

Areas Inspected: Routine announced safety inspection by regional based inspectors of the licensee's containment integrated leak rate test (CILRT) and local leak rate test (LLRT) program.

Results: No violations or deviations were identified. Inspection modules used during this inspection were 61720, 70307, 70313, 70323, and 93702. The licensee successfully met the acceptance criteria for the CILRT. Licensee strengths were apparent in the preparations for and conduct of the test. No licensee weaknesses were identified.

DETAILS

1. Persons Contacted

Consumers Power

*R. Brzezinski, Instrumentation and Control Superintendent
*H. Esch, Staff Engineer
*C. Hillman, Plant Licensing Engineer
*L. Keanaga, Health Physics Superintendent
*D. Kennedy, Instrumentation and Control Engineer
*J. Kueman, Licensing Administrator
*J. Lewis, Steam Generator Replacement Project
*R. Orosz, Engineering and Maintenance Manager
*T. Palmisado, Administration and Planning Manager
*J. Petro, Quality Engineering Section Head
*G. Slade, General Plant Manager
*K. Toner, Projects Superintendent
*R. VanWagner, Inservice Inspection Section Head
*R. Vincent, Plant Safety Engineer
*T. Watson, Inservice Inspection, ILRT Test Director
*J. Werner, SGRP, Quality Assurance Superintendent

U.S. NRC

J. Heller, Senior Resident Inspector
B. Holian, Project Manager, Nuclear Reactor Regulation
J. Hopkins, Acting Resident Inspector
*D. Passehl, Resident Inspector, D. C. Cook

*Attended exit on March 1, 1991.

The inspectors also interviewed other licensee employees during the course of the inspection.

2. Licensee Action on Previously Identified Findings (93702)

a. (Closed) Unresolved Item 50-255/88019-01 "Testing of Steam Generator Manway Cover": The licensee previously tested its steam generator manway covers under its local leak rate test (LLRT) program. This test was performed by imposing a vacuum on the steam generators. The new steam generators, installed during the 1990-91 refueling cycle, no longer have this testing capability. However, recent guidance from the Office of Nuclear Reactor Regulation (NRR) indicated that it was acceptable for the covers to be removed from the LLRT program, providing that the steam lines were vented during the containment integrated leak rate test (CILRT). The NRR guidance had not been provided by the time that the licensee performed its CILRT; however, the inspectors specifically reviewed the licensee's valve lineups for the main steam lines and found it

acceptable for this test. Based upon the NRR guidance, which is provided as Enclosure 2, this item is considered closed.

b. (Closed) Unresolved Item 50-255/88019-02 "Local Leak Rate Testing of Instrument Air Penetrations": During the 1990-91 refueling outage, the licensee performed a LLRT on the instrument air containment isolation valves. The inspectors reviewed the results of these LLRTs and found them acceptable. The licensee has committed to perform a review of all containment penetrations, determine the Appendix J testing requirements for each penetration and submit this information to NRR in the form of an amendment to the Updated Safety Analysis Report (USAR). Based upon the licensee's commitment, this item is considered closed.

c. (Closed) Unresolved Item 50-255/88019-03 "Local Leak Rate Tests Not Performed at Pt": The licensee performed a full pressure CILRT during the 1990-91 refueling outage. This eliminated the need to perform local tests at a reduced pressure during the outage. The inspectors discussed with the licensee its plans for future CILRTs, and the requirement to perform LLRTs at both Pa (per section III.C.2 of 10 CFR Part 50, Appendix J) and at Pt (per section III.A.5.(b)1 of 10 CFR Part 50, Appendix J) if a reduced pressure CILRT was again performed. At the time of the inspection, the licensee did not have firm plans to run future reduced pressure CILRTs. Therefore, this item is considered closed.

d. (Closed) Licensee Event Report 90-008 "Containment Nitrogen Supply Check Valve Leakage Results in Cumulative Local Leak Rate in Excess of 0.6 La)": During an April 1990 LLRT on the Nitrogen line, the penetration could not be pressurized. The licensee identified the leakage as coming from the inner containment isolation valve. The piston of this valve was found to be stuck on some machining marks on the valve bore. These marks were attributed to original valve manufacturing. During root cause investigation, the licensee found that the valve piston stuck only intermittently, providing an explaination as to how the valve had previously passed LLRTs. The licensee remachined the bore, and the valve successfully passed the LLRT. In October 1990, the valve again had higher then normal leakage. At that time, the valve was replaced with a different design valve. The inspectors had no problem with the licensee's corrective actions.

e. (Closed) Licensee Event Report 91-004 "Containment Emergency Airlock Leakage Results in Cumulative Local Leak Rate in Excess of Technical Specification Limits": The licensee experienced excessive leakage around the gasket on the viewing port of the inner emergency airlock door. Further review by the licensee indicated that this gasket had never been replaced or otherwise maintained. The licensee was in the process of establishing a preventative maintenance program for future outages. The inspectors also reviewed other LLRT penetrations which had excessive leakage, and noted that the licensee performed appropriate corrective actions. The licensee appeared to be implementing an effective preventative maintenance program in that no repeat failures were noted over the last three years of LLRT performances.

3. Containment Integrated Leak Rate Test Procedure Review (70307)

a. Surveillance Procedure Review

The inspectors reviewed technical specifications surveillance procedure, RT-36, "Containment Integrated Leak Rate Test," Revision 15, dated January 31, 1991, relative to the requirements of 10 CFR Part 50 Appendix J, ANSI N45.5-1972, and the licensee's Technical Specifications. This procedure was also compared for consistency (as needed) with the structural integrity test procedure, 20557-SIT. In addition, the inspectors reviewed the valve lineups in the procedure to ensure that the licensee was properly venting and draining systems as required by Appendix J. The inspectors did not identify any problems with the CILRT procedure.

b. Clarifications to Appendix J

As during previous inspections, the inspectors discussed with the licensee various clarifications to the requirements of Appendix J. The licensee was given a complete list of clarifications by the inspectors. The following partial list contains only those clarifications which were not previously provided in inspection reports, or those which, while previously provided, were revised since the last inspection.

(1) 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 Specifications requirements. For either methodology, the acceptance criteria is that the measured leakage rate at the 95% upper confidence limit must be less than 75% of the maximum allowable leakage rate for the pressure at which the test was performed.

(2) Periodic Type A, B, and C tests must include the as-found results as well as the as-left. If Type B and C tests are conducted prior to a Type A test, the as-found condition of the containment must be calculated by adding any improvements in leakage rates, which are the results of repairs and/or adjustments (R/A), to the Type A test results using the "minimum pathway leakage" methodology. This methodology is defined as the minimum leakage value that can be quantified through a penetration leakage path (e.g.: the smallest leakage through two valves in series.) This assumes no single active failure of the redundant valve. To calculate the minimum pathway leakage:

(a) In the case where individual leakage rates are assigned to two valves in series (both before and after repairs and/or adjustments), the minimum pathway leakage would simply be the smaller of the two valves' leakage rates.

(b) In the case where a leakage rate is obtained by pressurizing between two isolation valves and the individual valve's leakage rates are not quantified, the as-found and the as-left minimum pathway leakage for each valve would be 50% of the measured leakage rate, if both valves are repaired.

(c) In the case where a leakage rate is obtained by pressurizing between two isolation valves and only one valve is repaired, the as-found minimum pathway leakage rate would be either the final measured leakage rate, or one half of the originally measured leakage, whichever is less. However, in either case, <u>the as-left minimum pathway leakage rate is zero.</u>

(d) In the cases where a leakage rate is determined by pressurizing among <u>three or more</u> isolation valves, appropriate guidance

shall be provided such that the calculated minimum pathway leakage, for the penetration and valves repaired, can be conservatively established. As an alternative, maximum pathway leakages may be used.

(3) Whenever penetration configurations during a CILRT deviate from the ideal, the results of the LLRT for penetrations must be added as a penalty to the CILRT results at the 95% upper confidence level. This penetration leakage penalty is determined using the "minimum pathway leakage" methodology. Additionally, any increase in containment sump, fuel pool, reactor water, or suppression pool levels 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.

(4) For the supplemental test, the size of the superimposed leakage rate must be between 0.75 and 1.25 times the maximum allowable leakage rate (La). The higher the value, the more accurate the measurement. The supplemental test must be of sufficient duration to demonstrate the accuracy of the test. The results are expected to stabilize within the acceptance criteria tolerance band, rather than the results merely ending within the band. Whenever the BN-TOP-1 methodology is being used, the length of the supplemental test cannot be less than approximately one-half of the length of the CILRT.

(5) During a CILRT, it may become necessary to reject or delete specific data sensors, data points due to drifting of erroneous sensors, or data outliers. Data rejection criteria should be developed and used so that there is consistent technical basis for data rejection. One example of an acceptable method for data outliers is described in an Appendix to ANSI/ANS 56.8-1981. Sensor data rejection criteria should be plant-specific and based upon a sensor's trend relative to the average scatter, slope, and/or absolute output of the sensor.

(6) An acceptable method for determining if the sum of Type B and C tests exceeds the 0.60 La of Appendix J limits, is to utilize the "maximum pathway leakage" methodology. 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 to the better of two leakage barriers in series when performing Type B or C tests.

(7) Whenever a valve is replaced, repaired, or repacked during an outage for which Type A, B, and/or C surveillance testing was scheduled, local leak rate testing for the as-found, as well as the as-left condition, must be performed on that penetration. In the cases of a replaced valve, the as-found test can be waived, except during outages when a Type A test is scheduled, provided no other containment isolation valve of similar design exists at any nuclear site owned by the same utility.

(8) All air sources inside containment during a CILRT must be vented to atmosphere during the test. If they are not vented, then they must be monitored. In the latter case, the CILRT penalty needs to take into account the readability and sensitivity of the monitoring instrumentation. If the air sources are neither vented nor monitored, the penalty added to the CILRT results must assume that the air source pressure dropped from its design pressure to the test pressure during the course of the test.

(9) When determining the results of the Type B and C tests, the minimum readability, accuracy, and sensitivity of the instrumentation need to be taken into account. No leakage rates should be reported as zero, but rather reported as the minimum discernable value.

4. Containment Integrated Leak Rate Test Witnessing (70313)

a. Calibration Data

The inspectors reviewed the calibration data and determined that all the instruments used in the CILRT had been properly calibrated and that the correct weighting factors had been placed in the computer program as required. The following instrumentation was used throughout the test:

Type	Quantity
Temperature	26
Humidity	10
Pressure	1
Flow	1

b. Witness of Test

The inspectors witnessed the final containment pressurization (the containment was depressurized and held at a reduced pressure for 24 hours following pressurization to the full structural integrity test pressure of 77.95 psia), temperature stabiliazation, and the beginning of the CILRT. The inspectors noted that test prerequisites were met and that the appropriate revision to the test procedure was followed by test personnel. Valve lineups for various systems were verified to ensure that no fluid could enter the containment atmosphere and that proper venting and draining was provided. The following systems were the only systems not verified to be in their required test positions:

System/Penetration

CILRT Fill Line/ Penetration MZ-27: valve lineups verified through ability to pressurize containment.

Containment Spray Discharge/ Penetrations MZ-30, 31: water filled line.

Containment Sump Level Instrument Lines/ Penetrations MZ-17, 52A, 52B, 56: instruments verified to be working during CILRT.

Instrument Air/Penetration 65: not verified.

All other systems had the entire inside containment portion and the majority of the outside containment valve lineups verified.

No violations or deviations were identified.

5. Test Results Evaluation (70323)

a. Review of Licensee's Computer Program for Calculation of Leakage Rates

The inspectors reviewed the licensee's results and independently calculated containment masses and leakage

rates, using the licensee's individual sensor data. Minor discrepancies were noted between the licensee's program and the program used by the inspectors. These discrepancies were discussed with the licensee. The inspectors determined that these discrepancies were attributable to round-off errors, among other items. The final results from both the inspectors' program and the licensee's program were acceptable.

b. CILRT Data Evaluation

A 14.75 hour CILRT was performed on February 15, 1991 at a test pressure of 69.7 psia following satisfactory pressurization to the full structural integrity test pressure of 77.95 psia, a partial depressurization hold period, repressurization, and the required temperature stabilization period. Data was collected every 15 minutes. The inspectors independently evaluated leak rate data using total time (BN-TOP-1) formulas to verify the licensee's calculations of the leak rate and instrument performance. As noted above, there were minor discrepancies between the inspectors' and licensee's methodologies for calculating masses. Once these were taken into account, there was excellent agreement between the inspectors' and licensee's results as indicated by the following summary (units are in weight percent per day).

Measurement	Licensee	Inspectors
Measured leak rate during CILRT (Lam)	0.025	0.025
Lam at 95 percent Upper Confidence Level (UCL)	0.070	0.070

The Appendix J acceptance criteria is that Lam, at the 95% upper confidence level (UCL), be less than 0.75 La (0.075 wt%/day). The test met this criteria.

c. Supplemental Test Data Evaluation

After satisfactory completion of the CILRT, a known leakage rate of 5.47 scfm, equivalent to 0.101 wt%/day was induced. The licensee commenced the supplemental test following the one hour stabilization period required by BN-TOP-1. Data was collected and analyzed by the licensee every 15 minutes. The licensee concluded the test after 7.5 hours, following a test period approximately one-half the hold test in length, as required by BN-TOP-1. The inspectors independently

calculated the supplemental test imposed leakage rate and test results, as noted below. All data units are in weight percent per day (wt%/day).

Measurement	Licensee	Inspectors
Measured leakage rate (Lc) during supplemental test	0.122	0.122
Induced Leakage Rate (Lo)	0.101	0.101
Results from main test (Lam)	0.025	0.025
Lc - (Lo + Lam)	-0.004	-0.004

The Appendix J acceptance criteria is that the value of [Lc - (Lo + Lam)] be within a band of $\pm$ 25 % of La. For Palisades, this results in an acceptance criteria of $-0.025 < [Lc - (Lo + Lam)] < 0.025$. The supplemental test results fell within this band.

d. CILRT Volume Change Corrections

At the completion of the CILRT and the supplemental test, the licensee is normally required to make corrections to the calculated Lam at the 95% UCL due to changes in volume of various water sources inside containment. The inspectors reviewed the licensee's test log and noted that no water source volume changes were experienced during the test. Therefore, no corrections for this factor were necessary.

e. CILRT Valve Lineup Penalties

Due to valve configurations which deviated from the ideal penetration valve lineups for the CILRT, the results of LLRTs for such penetrations must be added as a penalty to Lam at the 95% UCL, per Appendix J. The licensee had the following penetrations in a configuration which differed from that which would be experienced following an accident (Leakage rates in units of standard cubic centimeters per minute (SCCM)):

System/ Penetration	Leakage
Component Cooling Water/ Penetration MZ-15	18.5
Containment Pressure Instrumentation/ Penetration MZ-17	9.1

Letdown/ Penetration MZ-36	155.2
Controlled Bleedoff/ Penetration MZ-44	165.7
Containment Isolation & Safety Injection Signal/ Penetration MZ-48	8.7
Containment Sump Drain/ Penetration MZ-52	3.0
ILRT Instrument Line/ Penetration MZ-66	19.7
Total Leakage	379.9

Addition of the as-left minimum pathway LLRT result for these non-vented penetrations added a penalty of 379.9 SCCM to the 95% UCL limit. This leakage was equivalent to 0.0002 wt%/day, which was negligible.

f. As-Found Condition of Containment

The as-found condition is the condition of the containment at the beginning of the outage prior to any repairs or adjustments to the containment boundary. This is normally calculated by reviewing the summary of the LLRTs and calculating the amount of leakage rate improvement due to repairs or adjustments using the minimum pathway methodology. This assumes that no major changes to the containment structure were made, but that all leakage improvements were due to penetration repairs or adjustments.

However, during this outage, the licensee cut a hole through the primary containment structure in order to allow replacement of the steam generators. Thus, no correlation could be established between the pre- and post-modification leakage rates. Therefore, this CILRT was considered to be a pre-operational test to show that the repairs to the containment adequately met the Technical Specification leakage requirements, rather than the performance of a periodic CILRT.

In regard to the determination that this CILRT constituted a pre-operational test of the containment boundary, the inspectors discussed with the licensee the need to rebaseline the reduced pressure test leakage rate data. The licensee did not wish to include a baseline reduced pressure test during this refueling outage. It committed, however, either to run

a baseline test per 10 CFR Part 50 Appendix J Section III.A.4.a.1, or to submit sufficient information to NRR to show that a new baseline was unnecessary, prior to performance of a reduced pressure test.

No violations or deviations were identified.

6. Review of Local Leak Rate Test Results (61720)

a. Review of Local Leak Rate Procedures

The inspectors reviewed the licensee's LLRT procedures. The inspectors noted that the licensee had one main procedure, RO-32, "Local Leak Rate Test Main Procedure", Revision 25 dated July 31, 1990. This procedure maintained the as-found and as-left totals of LLRTs completed under individual procedures. The inspectors also reviewed a number of individual procedures, which were identified by RO-32 and an additional suffix showing the penetration number. The licensee used the pressure decay method to perform LLRTs. The inspectors noted that the licensee pressurized the penetrations to approximately 10 pounds above Pa (55 psig), and then allowed the pressure to decay to approximately Pa. The licensee stated that this was to ensure that all tests were performed at no less than Pa. The inspectors reviewed a number of individual test results, and no problems were identified.

b. Witnessing of Local Leak Rate Tests

The inspectors attempted to witness the performance of a LLRT on the personnel airlock (Penetration MZ-19) following maintenance to establish the interlock function between the two doors. During the stabilization period, the licensee noticed moisture forming on the viewing port. This was attributed to condensation due to either moisture in the pressurization air or due to heatup of the airlock temperatures due to rate of pressurization. At the time of the exit, the licensee was depressurizing the airlock in order to remove the moisture. A successful test was run on March 1, 1991, with the final results reviewed by the resident inspectors.

No violations or deviations were identified.

7. Exit Interview

The inspectors met with licensee representatives (denoted in section 1) throughout the inspection. An exit meeting was held prior to leaving the site on March 1, 1991. The inspectors summarized the scope and findings of the inspection. The inspectors also discussed the likely informational content of the inspection report with regards to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents or processes as proprietary.