



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION II
 101 MARIETTA STREET, N.W.
 ATLANTA, GEORGIA 30323

Report No.: 50-269/86-13

Licensee: Duke Power Company
 422 South Church Street
 Charlotte, NC 28242

Docket No.: 50-269

License No.: DPR-38

Facility Name: Oconee 1

Inspection Conducted: April 4-9, 1986

Inspector: H. L. Whitener 6-26-86
 H. L. Whitener Date Signed

Approved by: Frank Jape 6/26/86
 F. Jape, Section Chief Date Signed
 Engineering Branch
 Division of Reactor Safety

SUMMARY

Scope: This routine, announced inspection involved witnessing the containment integrated leak rate test and reviewing the test procedure.

Results: No violations or deviations were identified.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *M. S. Tuckman, Station Manager
- *T. Barr, Superintendent, Technical Services
- *R. Todd, Performance
- *K. Rohde, Performance
- W. Suslick, General Office
- R. Bond, Performance
- *D. Compton, Compliance

NRC Resident Inspectors

- J. Bryant, Senior Resident Inspector
- *K. Sasser, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on April 9, 1986, with those persons indicated in paragraph 1 above and in subsequent telephone calls on May 27 and 29, 1986. The inspector described the areas inspected and discussed in detail the inspection findings. The following new items were identified:

Unresolved Item 269/86-13-01: Review any developments which may alter the Region II position on paragraph 7.6 of ANSI N45.4-1972. Further, review the results of the licensee's investigation as to the cause of the problems which occurred during the test, the effect these problems may have on test results, and the justification for acceptance of test results based on less than 24 hours of data.

Unresolved Item 269/86-13-02: Verify the licensee's validation of RTD accuracy over the range of use and any data corrections, if required - paragraph 5.d.(2)(b).

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspector during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve violations or deviations. Two new unresolved items identified during this inspection are discussed in paragraphs 5.d.1, 5.d.(2)(a), and 5.d.(2)(b).

5. Containment Integrated Leak Rate Test - Unit 1 (70313) (70307)

The inspector reviewed and witnessed test activities to determine that the primary containment integrated leak rate test was performed in accordance with the requirements of Technical Specification 4.4.1, Appendix J to 10 CFR 50, ANSI-N45.4 and the test procedure PT/1/A/0150/03A, "Reactor Building Integrated Leak Rate Test."

Selected sampling of the licensee's activities which were inspected included: (1) review of the test procedure to verify that the procedure was properly approved and conformed with the regulatory requirements; (2) observation of test performance to determine that test prerequisites were completed, special equipment was installed, instrumentation was calibrated, and appropriate data were recorded; and (3) preliminary evaluation of leakage rate test results to verify that leak rate limits were met.

Pertinent aspects are discussed in the following paragraphs.

a. General Observations

The inspector witnessed and reviewed portions of the test preparation, containment pressurization, temperature stabilization and data processing during the period of April 4-9, 1986. The following areas were inspected:

- (1) The test was conducted in accordance with an approved procedure.
- (2) Test prerequisites selected for review were found to be completed.
- (3) Selected plant systems required to maintain test control were found to be operational.
- (4) Special test instrumentation was reviewed and found to be installed and calibrated.
- (5) Data required for the performance of the containment leak rate calculations were recorded at five-minute intervals.
- (6) Problems encountered during the test were described in the test event log.

- (7) Temperature, pressure, dew point, and flow data were recorded at five-minute intervals. Data were assembled and retained for final evaluation and analysis by the licensee. A final ILRT report will be submitted to the NRC.

No problems were identified in the above areas with the exception of items (4) and (5). These items are discussed further in paragraph 5.d.

b. Procedure Review

The inspector reviewed portions of PT/1/A/0150/03A to verify that test controls, valve alignments and acceptance criteria were specified. Some problems were identified relating to the duration of the Type A test and application of the limits for the imposed leak rate.

Regarding the calculation of the imposed leak rate in the test procedure, Enclosure 13.2, a typographical error was made in the equation to convert scfm to wt %/day. In calculating the limits of the verification test per Enclosure 13.3 the licensee had inadvertently used an error band of $\pm 0.25(0.75L_a)$ rather than $\pm 0.25L_a$. These minor discrepancies were resolved and had no impact on the acceptability of the test results.

Regarding the test duration, the acceptance criteria in test procedure PT/1/A/0150/03A specified a short duration test, minimum length of eight hours. Step 9.1 of this procedure further specified that the mass plot method would be used to calculate the leak rate. Appendix J to 10 CFR 50, paragraph III.A.3 incorporates ANSI-N45.4-1972 into the leak rate test regulations. Historically Region II has considered that, as part of the regulations, ANSI-N45.4, paragraph 7.6 requires a 24-hour test unless a test of shorter duration has been agreed upon by the NRC. At this time, the only test of less than 24-hour duration which is acceptable to the NRC is the method specified in BN-TOP-1, Revision 1. This test method requires total time analysis in conjunction with acceptance criteria which are more restrictive than those of ANSI/ANS-56.8 which delineates the error analysis for the mass point analysis method. This issue is discussed further in paragraph 5.d.(1).

c. Integrated Leak Rate Test

Containment pressurization was started at 2:15 a.m. on April 5. After experiencing some delays in the pressurization, a test pressure of 61.5 psig was obtained and the compressors were isolated at 12:24 a.m. on April 6.

Containment temperature stabilization was achieved at 11:00 a.m. on April 6, 1986. The Type A leakage rate test (data collection) was started at this time and continued until 11:00 a.m. on April 7, 1986. Following are the licensee's initial test results based on the absolute test method mass point analysis:

Calculated leakage rate	0.0965 wt. %/day
Upper 95% confidence level (UCL)	0.1053 wt. %/day
Maximum allowable leakage rate	0.25 wt. %day
75% of maximum allowable leakage rate	0.1875 wt. %day

The acceptance criteria for the CILRT requires that the upper boundary of the leakage rate calculated at the 95% UCL, plus any required local leakage rate additions, shall be less than 75% of the maximum allowable leakage rate. The licensee did not find it necessary to make adjustments to account for local leakage, i.e., no isolation or repair of leaks were made during the test. However, certain problems were identified with the above test results. These problems are discussed further in paragraph 5.d.(3), "Test Results."

A four hour supplemental test was performed in accordance with the recommendations of Appendix C of ANSI-N45.4-1972. The licensee's measured composite leak rate was within the upper and lower acceptance limit specified by the equation $L_m + L_o - 0.25L_a < L_c < L_m + L_o + 0.25L_a$ for the Mass Point analysis as indicated below:

$$0.187 \text{ wt. \%} < 0.288 \text{ wt.\%} < 0.312 \text{ wt.\%}$$

These values meet the requirements of Appendix J.

d. Identified Issues

(1) Test Duration

The issue of test duration was discussed with the licensee as indicated in paragraph 5.b. The licensee was further informed that a recent NRC staff review of leak rate testing methodology, issued April 1, 1986, from the Deputy Director, NRR to the Director, Division of Inspection Programs, IE, confirms the position stated in paragraph 5.b. This memorandum clearly states that the NRC staff is in agreement that the mass point analysis may be used as an alternate to the total time analysis provided that the test duration for mass point analysis is at least 24 hours. At the exit interview, the inspector stated that although the Type A test extended over a 24-hour period, 11:00 a.m., April 6, to 11:00 a.m., April 7, 1986, instrument failures and a discontinuity in the mass trend appear to reduce the effective test data span to less than 24 hours (see paragraphs 5.d.(2)(a) and 5.d.(3)). The inspector stated that this situation appears to be in violation of Technical Specification 4.4.1 and Appendix J to 10 CFR 50 which incorporate ANSI-N45.4-1972 into the regulations. This matter was categorized as an unresolved item pending review by Region II management and further evaluation of the test data. In subsequent telephone discussions with the licensee, Region II identified the failure to record a consistent mass trend of independent data observations at hourly or more frequent intervals for 24 consecutive hours as an

apparent violation. In these discussions, the licensee stated that he believes the requirements of ANSI-N45.4-1972, paragraph 7.6 gives authority to the leak rate test engineers to alter the 24-hour time requirement. The first sentence of paragraph 7.6 clearly states that, "The leakage rate test period, for any method, shall extend to 24 hours..." The second sentence of paragraph 7.6 states that, "If it can be demonstrated to the satisfaction of those responsible for the acceptance of the containment structure that the leakage rate can be accurately determined during a shorter test period, the agreed-upon shorter period may be used." The licensee contends that this statement allows his engineers to agree upon a shorter time period and deviate from the time period of 24 hours specified in the first sentence of paragraph 7.6.

Region II does not concur with the licensee's position on paragraph 7.6 of ANSI-N45.4-1972. The Region believes that the second sentence is simply a statement of the obvious; specifically, that with the review and approval of the regulatory body that initially approved the rule, in this case the NRC, an acceptable alternate to the requirements of that rule may be implemented. The Region also believes that the NRC staff review discussed above supports this position. However, upon request from the licensee for time to pursue clarification of the meaning of paragraph 7.6, Region management has categorized this matter as unresolved as follows:

Unresolved Item 269/86-13-01: Review any developments which may alter the Region II position on paragraph 7.6 of ANSI N45.4-1972. Further, review the results of the licensee's investigation as to the cause of the problems which occurred during the test, the effect these problems may have on test results, and the justification for acceptance of test results based on less than 24 hours of data.

(2) Instrumentation

(a) Loss of Temperature Sensors

At about 3:00 p.m., on April 6, the licensee realized that a process board had failed in a manner which caused RTDs 2 through 7 to read about 10 degrees high from the start of the test at 11:00 a.m.. The board was replaced. Rather than restarting the test at 3:45 p.m. on April 6, when the RTDs were returned to service, the licensee used the difference between the repaired RTDs and RTDs in similar locations, which had not failed, to generate the temperatures for RTDs 2 through 7 for the time period 11:00 a.m. to 3:45 p.m. on April 6. The same board failed again and data for RTDs 2 through 7 was lost from 7:25 a.m. to 8:15 a.m. on April 7. In this case, the last functional reading for RTDs 2 through

7 was used. The licensee concluded that the manipulation of these data did not affect test results because the containment air temperature was stable and only very small changes in temperature would occur over the time period for which these data were artificially generated.

The inspector's position on this matter was that the basis of the mass point analysis is a statistical analysis to determine the best fit line to the data and to calculate the confidence error.

The statistical analysis assumes random scatter in the data, determined from independent observations. Forcing 25% (six RTDs) of the temperature sensors to track other sensors has the potential to affect both the least square fit and the confidence interval calculations. If these data from 11:00 a.m. to 3:45 p.m. on April 6 are excluded, the test time is reduced to less than the required 24-hours. At the exit interview, the inspector identified this matter as a potential violation for the following reasons:

- The licensee's Technical Specification 4.4.1 and Appendix J to 10 CFR 50, paragraph III incorporate the requirements of ANSI-N45.4-1972 into the regulations.
- Paragraph 7.6 of ANSI-N45.4 requires that the test period shall extend to 24-hours.
- Paragraph 7.9 of ANSI-N45.4 further states that leak rates shall be calculated on at least an hourly basis for 24 consecutive hours.
- Paragraph 7.8 of ANSI-N45.4 requires that pressure temperature and humidity observations (analysis assumes independent observations) shall be made at hourly or more frequent intervals.

Contrary to the above, the licensee did not record independent data observations on an hourly or more frequent interval in the time period from 11:00 a.m. to 3:45 p.m. on April 6, 1986. Rejection of this time period results in a test duration of about 19-hours. Further, a perturbation in the mass trend at 10:00 p.m. (details in paragraph 5.d.3) resulted in a reduction of consistent data for analysis to about 9-hours (10:05 p.m. April 6 to 7:20 a.m. April 7, 1986). The matter was categorized as unresolved at this time (see paragraph 5.d.(1)).

(b) Instrument Calibration

In review of instrument calibrations, the inspector found that the RTDs had been calibrated at only one point, 32°F. The licensee stated that any problem with the RTDs would be evident at the ice point. This matter was discussed with personnel of the temperature measurements department of the National Bureau of Standards who indicated that a true calibration would include comparison with a known standard at a minimum of three points. Further, paragraph 6.2 of ANSI-N45.4 indicates that a comparison with a known standard should be made over a range of temperatures. In further discussions on this item, the licensee stated that a misunderstanding may have occurred. He believes that documentation of a multipoint calibration exists. This matter was identified as unresolved pending review of the documentation: Unresolved Item 269/86-13-02: Review temperature calibration documentation to verify that an adequate calibration over the range of use was performed.

(3) Test Results

Examination of the mass plots at the end of the test showed that a discontinuity occurred in the data at 10:05 p.m. on April 6. The mass plot showed a step increase of about 180 pounds.

The only perturbation which could be identified at this time was an increase of 0.02 psi in the pressure readings. This is consistent with the mass change. The mass trend remained offset from the earlier data which renders the leak rate calculation of 0.096 wt. %/day inaccurate. Based on a preliminary evaluation of a portion of the data, the leak rate appeared to be 0.138 wt. % with a UCL of 0.145 wt. % per day. Although this leak rate still appears to be within the limit of 0.1875 wt. % per day the margin for error is reduced to about 0.04 wt. % per day. Further, a consistent mass trend for analysis is reduced to about 9-hours, 10:05 p.m. on April 6 to 7:20 a.m. on April 7, 1986.

Re-evaluation of the Type A test data at the Region II office showed the following results:

1. Due to instrument failures and an unexplained discontinuity in mass trend, 24 hours of independent data observations yielding a linear mass vs. time relationship (based on assumption of a constant leak rate) were not available for analysis by the approved 24-hour total time analysis per ANSI-N45.4 or the NRC accepted alternate methodology of a 24-hour mass point analysis by the methods specified in ANSI/ANS 56.8.

2. Analysis of data from 10:05 p.m. April 6 to 7:20 a.m. on April 7, in which there are no apparent instrument failures or discontinuity in the linear mass trend show that the test does not meet the criteria of the NRC accepted methodology of BN-TOP-1, Rev. 1 for the termination of a Type A test in less than 24 hours. Specifically, the total time analysis per BN-TOP-1, REV. 1 shows an upper confidence limit of about 0.42 wt% per day which is greater than the allowable limit of 0.1875 wt% per day.

As indicated above, the 9¼ hour span of consistent data show a leak rate of 0.138 wt% per day and a UCL of 0.145 wt.% per day by mass point analysis. While this leak rate may be a reasonable representation of the containment leakage, the inspector does not have specific NRC approved and issued criteria to judge the acceptability of a short duration, mass-point test.

Final acceptance of the Type A test result is deferred pending a review of the cause of the instrument failures and the perturbation in the mass trend and the possible effect of these problems on the test results. At the exit interview, the licensee stated that an evaluation and analysis of these events would be included in the containment leak rate test report to the NRC. Review of this commitment has been incorporated into unresolved item 269/86-13-01, paragraph 5.d.(1).

(4) As-Found Leak Rate

The licensee had not yet determined the as-found leak rate. The inspector stated that his understanding is that determination of the as-found leak rate is a requirement but the penalty for a failed test is open for review to determine if an alternate to the Type A test is appropriate corrective action. Resolution of this matter was deferred until the licensee provides the as-found leak rate.

(5) Outstanding Item Review

Inspection followup item (287/84-12-01) concerned improvement in control of field activity relative to making repairs or adjustments to boundary valves during a Type A test. The inspector found that specific instructions have been included in the test procedure PT/3/A/0150/03B to prohibit any repair or adjustment to valves prior to review and approval by the test director.

This item is closed.