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SUBJECT: Requests exemption form 10CFR50 App J re containment integrated leak rate testing. Util requests exemption to allow use of Mass-Plot method rather than Total Time method to perform leakage calculations. Fee paid.

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United States Nuclear Regulatory Commission
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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
CONTAINMENT INTEGRATED LEAK RATE TESTING
REQUEST FOR EXEMPTION FROM 10CFR50, APPENDIX J

Gentlemen:

Carolina Power & Light Company (CP&L) hereby requests an exemption from 10CFR50, Appendix J, paragraph III.A.3, which requires that all Type A (Containment Integrated Leak Rate) tests be performed in accordance with ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors." ANSI N45.4 requires that leakage calculations be performed using the Total Time method. However, as a result of a 1976 NRC staff position, CP&L has been performing leakage calculations using the Mass-Plot method. ANSI N45.4-1972 has been revised (reference: ANSI/ANS 56.8-1981, "Containment System Leakage Testing") to incorporate the newer Mass-Plot method; however, Appendix J has not been revised to reference this new Standard. The Company revised the integrated leak rate test (ILRT) procedure to use the Total Time method upon learning that the 1976 staff position had been determined to be contrary to the regulation. Analysis of data from the recently completed ILRT has been completed using both methods. Due to initial data fluctuations and stabilization time associated with the Total Time method, it appears that the Mass-Plot method is more appropriate as discussed below. Therefore, CP&L is requesting this exemption to allow use of the Mass-Plot method (as provided in ANSI/ANS 56.8-1981, paragraph 5.7) rather than the Total Time method (ANSI N45.4-1972, paragraph 7.9).

DISCUSSION

In 1973, 10CFR50, Appendix J, was issued to establish requirements for Primary Reactor Containment Leakage Testing. Appendix J incorporated by reference ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors." The Standard requires that containment leakage calculations be performed using either the Point-to-Point method or the Total Time method. The Total Time method was used most by the nuclear industry until about 1976. As noted in N45.4, the Point-to-Point method is suited to uninsulated containments where atmospheric stability is affected by outside diurnal changes, while the Total Time method is appropriate for insulated containments that are relatively unaffected by diurnal changes. In 1976, an article (reference: "Containment Leak Rate Testing: Why the Mass-Plot Analysis Method is Preferred," Power Engineering, February 1976) compared the results of test analyses that were performed using Point-to-Point, Total Time, and Mass-Plot techniques. Subsequently, the Mass-Plot method received NRC staff endorsement and became the staff-recommended method to use. A revision to the Standard (reference: ANSI/ANS 56.8-1981, "Containment System Leakage Testing") specifies the use of Mass-Plot, to the exclusion of the two older methods. The draft revision to Appendix J incorporates the new Standard.

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Carolina Power & Light Company believes that this exemption should be granted pursuant to 10CFR50.12(a)(2)(ii); i.e., application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule. The need for this exemption is predicated on the determination that, although the technical adequacy of the Mass-Plot method is not in question, the recommendation to use it is not consistent with the requirements of Appendix J.

Mass-Plot is a newer and more accurate method of calculating containment leakage. The Total Time method calculates a series of leakage rates based upon air mass difference between an initial data point and each individual data point thereafter. The adequacy of the method is extremely sensitive to the accuracy of that initial data point. If, due to any reason (such as instrument error, lack of temperature equilibrium, ingassing or outgassing) the initial data point is not accurate, the results of the test will be affected. Even if the data point is accurate, during the early stages of the test the leakage varies with time; as a result, the initial value and, therefore, the calculated leak rate become time dependent. In the Mass-Plot method, the mass of air in containment is calculated and plotted as a function of time. The slope of the linear least squares fit to the data is the leakage.

The calculation of leakage rates as a function of time required using the Total Time method creates the situation where increasing the amount of data available causes the results to become more erratic and the 95 percent confidence interval to become wider. Using Total Time, the 95 percent confidence interval may range from one-half to twice the measured leak rate. In the case of Mass-Plot, the 95 percent confidence interval is between 5 and 20 percent of the measured leak rate.

The most recent HBR2 ILRT (April 1987) was well within acceptance criteria using either the Total Time or Mass-Plot method. However, during the supplemental accuracy test, initial data fluctuations (as discussed above) caused a data skew in the Total Time method, which caused the test results to fall slightly outside the acceptance criteria by a very small 0.004% per day. Eliminating this erratic initial data would make the Total Time test results very consistent with the technically preferred, more accurate Mass-Plot method, thereby falling well within acceptance criteria.

In summary, the NRC staff in 1976 recognized that the Mass-Plot technique was superior to those methods in use at the time and acted to take advantage of it. This exemption will allow CP&L to take credit for a more accurate technique to calculate containment leakage that provides increased confidence in the integrity of the containment.

A similar exemption was granted to Duke Power for their Oconee reactors on February 24, 1987. Expedited handling of this matter is requested to support startup from Refueling Outage 11, currently scheduled for May 17, 1987.

An application fee of $150 is included with this request.

Questions regarding this matter may be referred to Mr. S. R. Zimmerman at (919) 836-6242.

Yours very truly,

A. B. Cutter

JSK/lah (5179JSK)

cc: Dr. J. Nelson Grace (NRC-RII)
Mr. H. Krug (NRC Resident Inspector - RNP)
Mr. K. Eccleston (NRC)