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Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Request for Exemption from 10 CFR 50, Appendix J

Gentlemen:

As provided within 10 CFR 50.12(a)(2)(ii) and 10 CFR 50.12(a)(2)(iii), Entergy Operations requests an exemption from the 10 CFR 50, Appendix J, "Primary Reactor Containment Leakage Testing For Water-Cooled Power Reactors" for Arkansas Nuclear One – Unit 2 (ANO-2). The exemption applies to the pressure at which an integrated leakage rate test (ILRT) of the containment building is performed.

ANO-2 Technical Specification (TS) 6.15 requires performance of the ILRT under the conditions of 10 CFR 50, Appendix J, Option B, Section III.A and RG 1.163. RG 1.163 refers to the guidance stated in NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J" and ANSI/ANS-56.8-1994, "Containment System Leakage Testing Requirements." 10 CFR 50, Appendix J, Option B, requires that the pressure at which the ILRT is performed to be representative of the design basis loss-of-coolant accident (LOCA) containment peak pressure. ANSI 56.8, Section 3.2.11, states that the ILRT (Type A) test pressure shall not be less than 0.96 Pa (peak accident pressure) nor exceed Pd (design pressure). ANSI 56.8, Section 5.4, states that the structural integrity test (SIT) pressure shall be reduced to less than 85% Pa for at least 24 hours prior to repressurization to Pa for the Type A test.

A TS change is not required to support the proposed exemption. ANO-2 TS 6.15 states "A program will be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions." Since the TS currently provides for modifications to the rule provided proper approvals have been obtained, Entergy Operations believes the proposed exemption meets the intent of the TS and, therefore, no revision to the ANO-2 TSs is necessary.

In letter dated November 3, 1999 (2CAN119903), Entergy Operations requested an uprate of the ANO-2 containment building to 59 psig in support of the September 2000 replacement of the steam generators. As a result of the uprate, a SIT will be performed to evaluate the

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ANO-2 containment building for the change in the containment design pressure. The SIT is performed at a pressure higher than that of the ILRT. Entergy Operations desires to perform the required ILRT at the new SIT test pressure of 68 psig and eliminate the pressure reduction and 24-hour stabilization period. Therefore, a one time only exemption to 10 CFR 50, Appendix J, is requested.

The ILRT would normally be performed at the new containment peak LOCA pressure of 58 psig. The proposed exemption to perform the post-RSG ILRT at a SIT pressure of 68 psig meets the criteria for special circumstances as described in 10 CFR 50.12(a)(2)(ii) since application of the current regulation is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR 50, Appendix J, is still achieved in that the ILRT will continue to measure the containment system's overall integrated leakage rate under conditions representing design basis LOCA containment peak pressure and that leakage through the primary reactor containment will not exceed the allowable leakage rate values as specified in the TSs or associated bases.

The proposed exemption additionally meets the criteria for special circumstances as described in 10 CFR 50.12(a)(2)(iii) in that approximately 30 hours of plant outage time could be recovered resulting in substantial savings for Entergy Operations. Since performance of the ILRT at SIT pressure is conservative, Entergy Operations believes realizing this benefit is acceptable.

The attached information demonstrates the acceptability of performing the post-RSG ILRT of the ANO-2 containment building at SIT pressure. Entergy Operations requests approval of the proposed exemption by October 15, 2000. Should you have any questions, please contact me.

Very truly yours,

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10 CFR 50, APPENDIX J EXEMPTION REQUEST

I. BACKGROUND

The Arkansas Nuclear One – Unit 2 (ANO-2) containment building is a Seismic Class 1, fully continuous, reinforced pre-stressed concrete structure in the shape of a cylinder with a shallow domed roof and a flat foundation slab. The cylindrical portion is pre-stressed by a post tensioning system consisting of horizontal and vertical tendons. The dome has a 3-way post-tensioning system. Hoop tendons are placed in 3-240 degree systems using three buttresses as anchorages. The foundation slab is conventionally reinforced with high strength reinforcing steel and is founded on bedrock. A continuous access gallery is provided beneath the base slab for installation of vertical tendons. A welded steel liner is attached to the inside face of the concrete shell to ensure a high degree of leak tightness. The base liner is installed on top of the structural slab and is covered with concrete. The structure provides shielding for both normal and accident conditions. The containment building completely encloses the entire reactor and reactor coolant system (RCS). This ensures that an acceptable upper limit for leakage of radioactive materials to the environment will not be exceeded, even under gross failure of the RCS. Further information on the containment building design can be found in Sections 3 and 6 of the ANO-2 Safety Analysis Report (SAR).

The ANO-2 steam generators are scheduled for replacement during the fall of 2000. The replacement steam generators (RSG) will require an access opening be cut in the containment building structure. Upon closure of the containment structure, an integrated leak-rate test (ILRT) will be required to test for primary containment integrity. The purpose of the ILRT (Type A test) is to determine that total leakage from the containment does not exceed the maximum allowable leakage rate as specified in ANO-2 Technical Specification (TS) 6.15. The ILRT will be performed at a higher pressure to encompass the new loss-of-coolant accident (LOCA) containment peak pressure (Pa) required due to the RSGs.

The ANO-2 containment building was originally designed and tested for an internal pressure of 54 psig. The ANO-2 containment building has recently been reevaluated for an uprate in accident pressure to 58 psig with a design pressure of 59 psig and shown to be acceptable in ANO-2 letter dated November 3, 1999 (2CAN119903). As a result of the uprate, a structural integrity test (SIT) will be performed to evaluate the ANO-2 containment building for the change in the containment design pressure. The purpose of the SIT is to verify the containment building structure can safely carry design loads and that the structural behavior is similar to that predicted by analysis. The post-RSG SIT will be performed at 68 psig (1.15 times design pressure).

10 CFR 50, Appendix J, Option B, Section III.A, for Type A Tests states "Type A tests to measure the containment system overall integrated leakage rate must be conducted under conditions representing design basis loss-of-coolant accident containment peak pressure." ANO-2 TS 6.15 states "A program will be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995. The peak calculated containment internal pressure for the design basis loss of coolant accident, Pa, is 54 psig."

As discussed previously, the new Pa following the RSG installation will be 58 psig and therefore TS 6.15 is being amended accordingly. RG 1.163 recognizes ANSI/ANS 56.8, "Containment Leakage Testing Requirements," as the acceptable technical methods and techniques for performing Types A, B, and C tests, except for test intervals, which are established under NEI 94-01 Section 11.0. ANSI/ANS 56.8, Section 3.2.11, states "The Type A test pressure shall not be less than 0.96 Pa nor exceed Pd (containment structure design pressure)." ANSI 56.8, Section 5.4, states "The structural integrity test (SIT) pressure shall be reduced to less than 85% Pa for at least 24 hours prior to repressurization to Pa for the Type A test." Under the above rules and guidance, the post-RSG ILRT would be required to be performed at a pressure not to exceed 59 psig. However, Entergy Operations plans to perform the ILRT concurrently with the post-RSG SIT, at a SIT pressure of 68 psig and eliminate the pressure reduction and 24-hour hold period. Therefore, an exemption to ANSI/ANS 56.8 is necessary.

II. JUSTIFICATION FOR EXEMPTION

The Type A leak rate test will be performed at 68 psig. This test pressure is approximately 17 % greater than the post-RSG design basis accident pressure (Pa) of 58 psig. Six Type A tests have been conducted at ANO-2, at a Pa of 54 psig. Trends of previous Type A test results indicate that the containment structure is maintaining a high degree of leak tightness and is not showing signs of deterioration or aging due to environmental affects. The containment barrier consists of a welded steel liner having a minimum thickness of 1/4 in. Liner material and welds were rigorously controlled and examined during construction. In addition, the liner is examined for damage and degradation during every refueling outage. Since no evidence of damage or degradation has ever been found, the existence of leakage paths through the liner is extremely unlikely.

Liner strains generally increase in the positive direction as containment internal pressure increases. Therefore, any postulated leakage path through the liner will tend to enlarge as pressure increases. As a result, if a liner leakage path does exist, the containment leak rate will tend to be higher at elevated pressures. For this reason, there is reasonable assurance that performance of the ILRT at 68 psig is more conservative than one performed at 59 psig.

The Absolute Method will be utilized for the Type A test of the containment building structure. Mass Point Analysis will be used to determine the dry air mass in the containment utilizing the Ideal Gas Law, at each point during the test. The rate of change of air mass will be calculated using regression analysis (least squares fit) to the air mass points. The rate of change of air mass will be converted to the leakage rate in units of percent per day (%/24 hrs) by dividing the slope of the regression line by the intercept of the regression line and multiplying the ratio obtained by negative 2400. An upper confidence limit for the leakage rate will be based upon normal regression theory. The only potential effect of the proposed exemption to the Type A test pressure is the probability that containment building structural leakage that would not normally be identified at the lower Pa pressure would be apparent at the higher SIT pressure.

The containment building will be pressurized to 68 psig for the SIT. A 1-hour stabilization period will exist prior to commencement of the SIT deflection measurements and crack mapping activities. Depending on the duration of the inspection period (4 - 6 hours), the containment structure will be at SIT pressure for 5 - 7 hours. During this time, the containment structure will stabilize under the 68-psig pressure envelope. Extending the duration of this envelope to complete the ILRT test will not exert additional forces or transients upon the containment structure or equipment within containment.

Postulated containment building failure under severe accident conditions is primarily due to phenomenological effects associated with severe accidents. Such effects were considered as part of the ANO-2 Individual Plant Examination (IPE), GL 88-20. None of the identified containment building failure mechanisms for severe accident are impacted by the proposed increase in the ILRT pressure from 59 psig to 68 psig.

The Appendix J Type B and C tests, which are unaffected by the proposed exemption, will continue to detect leakage through containment building valves, penetrations and airlocks. Existing procedures for local leakage rate tests (LLRT) provide for a testing range of 54 psig (Pa) to 60 psig. Penetrations tested to the high end of the range, which encompasses the post-RSG Pa, have consistently provided acceptable test results. From this historical data it can be concluded that the Type B and C test results will be unaffected by the new Pa.

The existing Type B and Type C testing programs will be modified due to the increase of Pa to include the post-RSG test pressure of 59 psig. Those penetrations whose sealing capabilities will not be improved by a higher test pressure will be tested at a range of 58 - 63 psig. Those penetrations whose sealing capabilities might improve with a higher pressure (i.e., check valves, etc.) will be limited to a 58 - 59 psig range. LLRTs will be completed on all available penetrations prior to the ILRT/SIT. However, the penetrations will not be vented and drained for the ILRT as called for in the aforementioned guidance. The purpose of selected penetrations being drained and vented during the ILRT is to allow detection of potential leakage through postulated paths open to the RCS during an accident. Since Entergy Operations proposes to perform the post-RSG ILRT at an SIT pressure of 68 psig, venting and draining the selected penetrations could damage sensitive equipment external to the containment building. To account for this exemption, the LLRT results will be added as penalties to the ILRT test results for the 95% upper confidence limit (UCL) for conservatism.

Computed containment leak rate (reported at the 95% UCL) will be adjusted to account for penetrations that are not drained and vented during the test. The minimum pathway leakage through these penetrations, as determined using the results of Type C LLRTs performed at a nominal pressure of Pa (58 psig), is summed and added to the 95% UCL. The 95% UCL is computed as a percent of containment air mass per day while component leakage rates used to determine pathway leakage are measured and reported as volumetric rates (sccm). The summed pathway leakage must be converted to a

percentage rate before it can be added to the 95% UCL. This conversion will be done using the standard Type A test pressure of 59 psig. The 59 psig is conservative to use for the conversion since it yields a larger adjustment than the use of a higher pressure.

The above methodologies will assure that the higher SIT test pressure of 68 psig will not impact sensitive equipment external to the containment building, nor will the higher pressure aid in sealing off system components (i.e., check valves, etc) that might otherwise provide a leakage path at Pa. System and structural components located within the containment building will be evaluated to determine their sensitivity to the 68-psig SIT pressure. Those items that would be impacted by the increased pressure will be isolated or removed, as necessary, to ensure that they are not damaged during the pressure test.

The proposed exemption to perform the post-RSG ILRT at an SIT pressure of 68 psig meets the criteria for special circumstances as described in 10 CFR 50.12(a)(2)(ii) since application of the current regulation is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR 50, Appendix J, is still achieved in that the ILRT (Type A test) will continue to measure the containment system's overall integrated leakage rate under conditions representing design basis LOCA containment peak pressure and that leakage through the primary reactor containment will not exceed the allowable leakage rate values as specified in the TSs or associated bases. The 68-psig pressure test is greater than the design basis LOCA containment peak pressure of 59 psig and, therefore, meets and exceeds the requirement for testing at Pa. In addition, meeting the TS requirement for acceptable leakage at a higher test pressure is conservative and well within the intent of Appendix J and the Tech Spec requirements. Therefore, the above information demonstrates that there is reasonable assurance that performing the post-RSG ILRT at the SIT test pressure of 68 psig will provide continued validation of the leak integrity of the containment structure.

The proposed exemption additionally meets the criteria for special circumstances as described in 10 CFR 50.12(a)(2)(iii) in that approximately 30 hours of plant outage time could be recovered resulting in substantial savings for Entergy Operations. Since performance of the ILRT at SIT pressure is conservative, Entergy Operations believes realizing this benefit is acceptable.

III. CONCLUSION

The proposed exemption to perform the post-RSG ILRT of the ANO-2 containment building structure concurrently with the SIT at a pressure of 68 psig is conservative. The higher test pressure ensures an equivalent or greater overall leak rate will be detected as compared to a similar test performed at Pa. Since penetrations will not be vented and drained to support the ILRT, LLRT results will be conservatively added to the ILRT results at the 95% UCL. Isolating sensitive equipment within the containment building and not venting and draining penetrations ensures equipment will remain protected during the ILRT. Extending the time in which SIT pressure is held to support completion of the

ILRT will not present any additional stress on the containment structure or the components that housed within the containment. Therefore, there is reasonable assurance that performing the post-RSG ILRT at the SIT test pressure of 68 psig will provide continued, safe validation of the leak integrity of the containment structure and that a one time exemption from the aforementioned rule is acceptable.