Mr. C. Randy Hutchinson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

April 14, 1998

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION PERTAINING TO RESPONSE TO GENERIC LETTER 96-06, "ASSURANCE OF EQUIPMENT OPERABILITY AND CONTAINMENT INTEGRITY DURING DESIGN-BASIS ACCIDENT CONDITIONS," (TAC NOS. M96775 AND M96776)

Dear Mr. Hutchinson:

This is a request for additional information pertaining to your responses to Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions." The staff's questions on this matter are enclosed. Please contact me if you have any questions regarding this request for information.

Sincerely,

ORIGINAL SIGNED BY:

William Reckley, Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket Nos. 50-313 and 50-368

Enclosure: Request for Additional Information

cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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William Reckley

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Project Directorate IV-1
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Request for Additional Information
Generic Letter 96-06, "Assurance of Equipment Operability and
Containment Integrity During Design-Basis Accident Conditions."
Arkansas Nuclear One, Units 1 and 2

I. Pressurization of Containment Penetrations

1. In the submittal dated July 31, 1997, ANO-1 Penetration P-10 and ANO-2 Penetration 2P-18 were identified as not being susceptible to overpressurization during accident or ambient temperature conditions. Please provide the following information related to these penetrations:

   a. The maximum calculated temperature and pressure in the pipe runs associated with the penetrations (P-10 and 2P-18). Describe the method used to calculate these pressure and temperature values (this should include a discussion of the heat transfer model used in the analysis and the basis for the heat transfer coefficients used in the analysis).

   b. The applicable design criteria for the piping and the valves associated with the penetrations (P-10 and 2P-18). Include the required load combinations.

   c. A drawing of the piping run between the isolation valves associated with the penetrations (P-10 and 2P-18). Include the lengths and thicknesses of the piping segments and the type and thickness of the insulation.

2. In the submittal dated December 18, 1997, it was stated that the schedules for installing pressure relief valves to mitigate overpressurization concerns in other containment penetrations at ANO-1 and ANO-2 were being delayed pending the completion of ongoing activities of the Electric Power Research Institute (EPRI) and the American Society of Mechanical Engineers (ASME) Code Committee. Please provide an estimated schedule for when the overpressurization issue will be resolved for the affected containment penetrations at ANO.

II. Water Hammer and Two-Phase Flow Issues

Generic Letter 96-06 included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to waterhammer and two-phase flow conditions. Submittals dated January 28 and July 31, 1997, provided responses to the generic letter for ANO-1 and ANO-2. In order to allow the staff to continue its review of these issues, please provide the following additional information:

1. If a methodology other than that discussed in NUREG/CR-5220, "Diagnosis of Condensation-Induced Waterhammer," was used in evaluating the effects of waterhammer, describe this alternate methodology. Also explain why this methodology is applicable and gives conservative results for both ANO units (typically accomplished through plant-specific modeling, testing, and analysis).

ENCLOSURE

2. For both the waterhammer and two-phase flow analyses, provide the following information (differences between ANO-1 and ANO-2 should be fully explained):

   a. Identify any computer codes that were used in the waterhammer and two-phase flow analysis and describe the methods used to benchmark the codes for the specific loading conditions involved (see Standard Review Plan (SRP) Section 3.9.1).

   b. Describe and justify the assumptions and input parameters (including those used in computer codes) such as amplifications due to fluid structure interaction, cushioning, speed of sound, force reductions, and mesh sizes. Explain why the values selected give conservative results. Also provide the justification for omitting any effects that may be relevant to the analysis (e.g., fluid structure interaction, flow induced vibration, erosion).

   c. Provide a description of the "worst case" scenarios for waterhammer and two-phase flow, taking into consideration the complete range of event possibilities, system configurations, and parameters. For example, all waterhammer types and water slug scenarios should be considered, as well as temperatures, pressures, flow rates, load combinations, and potential component failures. Additional examples include the effects of void fraction on flow balance and heat transfer; the consequences of steam formation, transport, and accumulation; cavitation, resonance and fatigue effects; and erosion considerations. NUREG/CR-6031, "Cavitation Guide for Control Valves," may be helpful in addressing some aspects of the two-phase flow analyses.

   d. Confirm the analysis included a complete failure modes and effects analysis (FMEA) for all components (including electrical and pneumatic failures) that could impact the performance of the cooling water system and confirm that the FMEA is documented and available for review, or explain why the FMEA analysis was not performed and/or documented.

   e. Explain and justify the use of "engineering judgements" in the waterhammer and two-phase flow analyses.

3. Describe the uncertainty in the water hammer and two-phase flow analyses, explain how the uncertainty was determined and how it was accounted for in the analyses to assure conservative results for both of the ANO units.

4. For both ANO units, confirm that the waterhammer and two-phase flow loading conditions do not exceed design specifications or service conditions for the piping system and components, including those stated by equipment vendors; and confirm that the systems will continue to perform their design-basis functions as assumed in the safety analysis reports for the ANO units.

5. For both ANO units, provide a simplified diagram of the system, showing major components, active components, relative elevations, lengths of piping runs, and the location of any orifices and flow restrictions.

6. The January 28, 1997, response presented the ANO-2 analyses on the basis of the similarities between the affected systems in ANO-1 and ANO-2. Confirm that the analyses performed for ANO-2 are bounding for ANO-1 or provide the requested information for each unit. Describe the differences that exist between the units and, if appropriate, explain how those differences were accounted for in the analyses.

7. The January 28, 1997, response indicated that modifications were made to the service water systems for the ANO units to specifically address column separation and rejoining events and that additional analyses were required to address coil boiling scenarios. Explain the modifications and other means of resolving these issues. Explain the specific timing requirements for the valve sequence timer, logic and valves, and explain how the timing requirements are assured over time. Include a discussion of the single failure scenarios that are applicable to the modifications (if not explained elsewhere).