June 1, 2000

Mr. Craig G. Anderson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 SR 333
Russellville, Arkansas 72801

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE ARKANSAS NUCLEAR ONE, UNIT 1, LICENSE RENEWAL APPLICATION

Dear Mr. Anderson:

By letter dated January 31, 2000, Entergy Operations, Inc. (Entergy), submitted for the Nuclear Regulatory Commission's (NRC's) review an application pursuant to 10 CFR Part 54, to renew the operating license for Arkansas Nuclear One, Unit 1, (ANO-1). The NRC staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete its safety review. Specifically, the enclosed questions are from the Plant Systems Branch regarding Sections 2.3.1, 3.3 and 3.6

Please provide a schedule by letter, electronic mail, or telephonically for the submittal of your responses within 30 days of the receipt of this letter. Additionally, the staff would be willing to meet with Entergy prior to the submittal of the responses to provide clarifications of the staff's requests for additional information.

Sincerely,

/***RA***/

Robert J. Prato, Project Manager
License Renewal and Standardization Branch
Division of Regulatory Improvement Program
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: Request for Additional Information

cc w/encl: See next page

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| NAME | EHylton | RPrato | CIGrimes |
| DATE | 5/31/00 | 5/30 /00 | 6/01 /00 |

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REQUEST FOR ADDITIONAL INFORMATION
ARKANSAS NUCLEAR ONE, UNIT 1
LICENSE RENEWAL APPLICATION, SECTIONS 2.3.1, 3.3 and 3.6

## 2.3.1 REACTOR COOLANT SYSTEM (RCS)

2.3.1-1 The reactor vessel leakage monitoring piping from the closure head is typically subject to an aging management review (AMR) (see letter from C.I. Grimes to D.J. Firth, dated October 27, 1999). This conclusion is consistent with the staff's guidance documented in license renewal issue number 98-0012, "Consumables" that was issued to the NEI on April 20, 1999. In this guidance, the staff stated that packing, gaskets, seals, and O-rings are not typically required by the current licensing basis to fulfill the functions of 10 CFR Part 54.4(a)(1)(i) in accordance with ASME, Section III, NB2121, NC2121, and ND2121 because (by design) they are not relied upon for a pressure retaining function in components for which these Code design practices apply. In addition, the staff stated that "applicants can exclude packing, gaskets, seals, and O-rings where there is a clear basis for concluding that such components are not relied upon for a system, structure, or component to perform its intended function (s) under Part 54 . . . ."

Inasmuch as these Code design practices do not apply to the O-ring in the closure head, the sealing surface of the vessel flange does provide the pressure boundary intended function for the closure head. Because the leakage monitoring piping penetrates the sealing surfaces of the vessel flanges, it should be treated as part of the reactor coolant system pressure boundary, and therefore, are within the scope of Part 54. Furthermore, by letter dated November 19, 1999, the B&WOG stated that the reactor vessel leakage monitoring pipes would be removed from the scope of BAW-2251A and should be addressed on a plant-specific basis by the applicant.

On page 2-25 of the LRA, the applicant states that "[t]he lines do not support the RCS pressure boundary........ If the reactor vessel closure O-rings fail and RCS fluid is introduced into the monitoring piping, leak flow would be limited since the ½-inch diameter hole in the vessel flange, which connects the region between the O-rings to the monitoring pipe, is less than the ID of the monitoring pipe. Therefore, the reactor vessel leakage monitoring piping is not subject to AMR since the piping does not directly support the RCS pressure boundary." These statements are not consistent with the guidance discussed above with respect to the leakage monitoring piping being part of the reactor coolant system pressure boundary. In addition, more information is needed to justify the exclusion of the monitoring piping from AMR.

Include the leakage monitoring piping within the scope of components requiring aging management or provide additional technical justification for exclusion of the leakage monitoring piping consistent with the rule and staff guidance in sufficient detail to allow the staff to adequately assess its possible exclusion. The additional information should explain whether the ½-inch diameter hole in the vessel flange would limit leakage to less than normal RCS makeup capacity thereby minimizing the consequences of failure of the reactor vessel monitoring pipes.

2.3.1-2 The application stated that overpressure protection for the RCS is provided by two code safety valves and one power operated relief valve installed on the pressurizer. Provide the following clarification:

- Are the bodies of these valves within the scope of license renewal and subject to an AMR? Identify where in the LRA is the AMR, or provide a justification for the exclusion of these valve bodies from aging management requirements.

- Does ANO-1 take credit for the pressure reducing function of the water spray nozzle of the pressurizer to lower RCS pressure during a design basis event? If so, identify where in the LRA is the pressurizer spray nozzle included within the scope of license renewal, and subject to an AMR or provide a technical justification for excluding the spray nozzle from being subject to an aging management review. (The staff understands that the subject spray nozzle does not perform a pressure boundary function.)

2.3.1-3 The application indicates that the pressurizer and once through steam generator (OTSG) manhole gaskets are not included within the scope of license renewal. Provide a technical justification for excluding these gaskets from the scope of licensee renewal consistent with the rule and staff guidance. In additon, indicate whether the pressurizer manhole gaskets are covered under the GL 88-05, Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components.

2.3.1-4 Please clarify whether the reactor vessel level monitoring system probe itself is subject to an AMR. If not, provide a justification for excluding the level probe from an AMR.

2.3.1-5 Section 2.3.1.7 of the LRA identified once-through steam generator (OTSG) items that are subject to an AMR. Safety or relief valve bodies were not identified in the list. Please clarify whether there are any valves that are associated with the OTSGs which perform any of the OTSG intended functions identified in the LRA, such as, the pressure boundary function. If so, identify where in the LRA is the AMR, or provide a justification for the exclusion of these valve bodies from aging management requirements.

2.3.1-6 Section 2.3.1.7 of the LRA states that “Secondary piping attached to the OTSG nozzles, including the main and auxiliary feedwater headers and riser piping, is addressed in Section 2.3.4.2.” However, Section 2.3.4.2 does not address main and auxiliary feedwater headers and riser piping. Identify where in the LRA is the main and auxiliary feedwater headers identified as being within the scope of license renewal and subject to an AMR, or provide a justification for the exclusion of these headers from an AMR.

## 2.3.2 ENGINEERED SAFEGUARDS (ES)

2.3.2-1 Boric acid solution is stored in heated and insulated tanks, such as the Borated Water Storage Tank (BWST), and is piped in heat-traced and insulated lines to preclude precipitation of the boric acid. It is the staff’s understanding that the heaters, heat tracing, and insulation are designed to maintain the ECCS inventory above Technical Specifications (TS) temperature limits during normal operation. In addition, the purpose of maintaining the required boron concentration during normal operation is to ensure the capability of the emergency systems to shut down the reactor and maintain it in a safe shutdown condition; and, to mitigate the consequences of the design basis events.

Although insulation is nonsafety-related, in this application the insulation supports an intended function which satisfies the criteria defined in 10 CFR 54.4(a)(2); and therefore, should be included within the scope of license renewal. Provide a justification for excluding the thermal insulation of the low pressure injection/decay heat (LPI/DH) and the high pressure injection/makeup and purification (HPI/MUP) systems from an AMR. Please consider the following plant-specific information when responding to this RAI:

a The location and surrounding conditions of the subject insulated tanks and pipes, whether these are housed in buildings/structures, above or under the ground, exposed to high humidity, exposed to outside environment, their potential for flooding, or their vulnerability to damage from normal wear & tear.

b. The required boron concentration and the corresponding boron solubility temperature of water. Calculations demonstrating that the required water temperature and boron concentration can be maintained with the heaters and heat tracers operating, but without the insulation (assuming failure of insulation before an event and that it remains undetected until the event occurs). If boron precipitation occurs inside the tanks and pipes as a result of insulation failure, the required boron concentration in the water may not be maintained and the piping may foul internally because of the deposition of crystalized boric acid.

c. Possibility of localized failure of insulation resulting in localized boron precipitation and fouling.

2.3.2-2 Tanks (including the vertical tanks erected in the field) are considered to be mechanical components. However, the tank foundation and anchorage systems are considered structural components. Vertical tanks, such as BWST, can have tank foundations that are made of concrete or steel. Identify where in the LRA are foundations or pads of the tanks identified as being within the scope of license renewal and subject to an AMR, or provide a justification for the exclusion of these structural components from an AMR.

2.3.2-3 Only one intended function has been identified for flow restricting orifices (refer to Table 3.3-1 of the LRA), which is the pressure boundary function, per 10 CFR 54.4(a)(1)(i). However, some orifices are relied upon to limit the mass flow rate during postulated breaks, and loss of material can degrade this function. Provide a justification as to why limiting the mass flow rate during postulated breaks is not an intended function of some orifices, per 10 CFR 54.4(a)(1)(iii), or provide an AMR for the orifices that have an intended function to limit mass flow rate.

2.3.2-4 Drawing No. LRA-M-231, Sheet 3, Rev.0, which is the P&ID for MUP system, shows that the piping section with valves MU-1210E, F, G & H is not included within the scope of license renewal. Provide a discussion as why this section of the MUP system pipings need not be included within the scope.

2.3.2-5 Section 2.3.2.2 states that sump screens and vortex breakers used in pump suction lines were included within the scope of license renewal, and are subject to an AMR. Please clarify whether the tanks from which ECCS water is drawn have screens or vortex breakers inside them in order to protect the pumps from debris and cavitation. If so, identify which of these tanks are equipped with such passive components, and where in the application is the AMR for these components or provide a justification as to why these components are not within the scope of license renewal and subject to an AMR.

3.3.3 Engineered Safeguards

3.3.3.1 Materials and Environments

Emergency Core Cooling Systems

3.3.3.1-1 Appendix B, Section 1.1, Mechanical Components Subject to Aging Management Review, lists components subject to review in the LRA. In addition to piping, valve bodies, pump casings, etc., Section 1.1 includes flex hoses, filter housings, expansion joints, traps, flow orifices, inline flow meters, cyclone separators, and miscellaneoous processing components. Tables 3.3-1 through 3.3-8 do not contain a similar list of components. Add the missing components to Tables 3.3-1 through 3.3-8 or provide a justification for excluding any of these components, or if addressed elsewhere, reference the section.

3.3.3.1-2 Based on Table 3.3-1 being a complete list of components, materials and environments, and aging effects associated with the Low Pressure Injection/Decay Heat (LPI/DH) system, address the following:

a. Two cavitation venturies associated with the discharge lines from the LPI/DH removal pumps (typically found in the B & W design) were not included on the list of components. Identify the aging effects associated with the material, environment, and operation of these components or, if addressed elsewhere, reference the section.

b. What material (such as epoxy-phenolic, typically found in carbon steel tanks) forms the internal surfaces of the borated water storage tank (BWST)? If a material other than carbon steel forms the internal surface, identify the material, associated aging effects, and program/activity for this internal surface of the BWST.

c. Are the external surfaces of the BWST/components, BWST discharge piping, or other ESF piping imbedded in concrete or exposed to an environment other than a controlled air environment? Is the piping subject to uncontrolled external weather conditions such as acid rain, ground water, heat, and humidity? Cracking or loss of material are typically considered aging effects for carbon and stainless steel in these types of environments. If not, discuss the reasons why these effects are not applicable. If cracking or loss of material are potential aging effects for ESF piping, identify the associated program/activity (in-service inspection, maintenance rule, boric acid corrosion prevention, etc.) for managing these aging effects.

3.3.3.1-3 Section 2.3.2.3, 4 & 5 of the LRA states that seven HPI system mechanical reactor building penetrations are within the scope of the review. Tables 3.3-3, -4 & -5 do not list the penetrations as components or provide sufficient information to adequately assess aging management concerns for these components. Add the missing components to Tables 3.3-3, -4, and -5 or provide a justification for excluding any of these components, or if addressed elsewhere, reference the section.

3.3.3.1-4 Based on Table 3.3-3 being a complete list of components, materials and environments, and aging effects associated with the HPI systems, address the following:

a. Is there a potential for the brass/bronze valves in the HPI system to be exposed to environments other than ambient-air (i.e., lube oil leakage, boric acid leakage, etc.) If so, justify why loss of material is not an applicable aging effect.

b. Is there a potential for the HPI gear drive reservoirs and associated pumps to be exposed to potentially corrosive environments. If so, justify why loss of material is not an applicable aging effect.

<u>Reactor Building Spray, Cooling and Purge Systems</u>

3.3.3.1-5 Alternate wetting of the surfaces of reactor building spray piping with boric acid solution and subsequent drying (conditions experienced during surveillance testing) could concentrate boric acid, and possibly halogens and sulfates, and create environments conducive to loss of material and cracking. Identify in the LRA where these aging effects are addressed. If not, justify the exclusion of the loss of material and cracking as applicable aging effects for this system.

3.3.3.1-6 Based on Table 3.3-5 being a complete list of components, materials and environments, and aging effects associated with the reactor building cooling and purge system, address the following:

a. Typically, materials such as aluminum, galvanized steel, stainless steel, duct sealants, etc. are used in reactor building cooling system components such as ducts, filters, grills, seals, etc. If these or any other materials other than carbon steel are used in the reactor building cooling and purge system, address the potential for loss of material and cracking in applications where the materials are used and identify the associated program/activity for managing these aging effects.

b. Appendix C of the LRA, Section 8.3.1, addresses the aging effect of loss of material on copper materials in an external ambient environment. Is there any equipment (i.e., equipment listed in Table 3.3-5) made of copper alloy (e.g., 90/10 CuNi) exposed to a gas-air environment and, if so, address the potential for the loss of material as an applicable aging effect and identify the associated program/activity for managing the aging effect.

Sodium Hydroxide System

3.3.3.1-7 In the ANO-1 LRA, Appendix C, Section 5.1, the sodium hydroxide is indicated to have high levels of chlorides as impurities. Stainless steels resist cracking in chloride-contaminated sodium hydroxide, even when oxygen is present, though it is not clear what chloride levels are acceptable. Also, it is not clear how chloride affects stress corrosion cracking and loss of material for carbon steels. Indicate the range of chloride levels that exist in the sodium hydroxide tank solution and provide a specification for maximum chloride impurity that assures ample aging margins for both stainless steel and carbon steel. In addition, other impurities should be considered. Are chemical analyses conducted to characterize impurity species and levels, such as fluorides, hypochlorites, and sulfur compounds? If significant impurity species and levels are detected, provide a justification that the species detected do not promote significant degradation of stainless steel or carbon steel components? Provide a justification as to why “water chemistry” is not indicated as a program/activity for managing aging effects in the sodium hydroxide system.

3.3.3.1-8 The maximum allowable solution temperature in the sodium hydroxide storage tank is indicated to be 120°F (49°C) (Section 6.2.2.4.6, Appendix No. 15). Are stainless steel components in the SH system potentially subject to the maximum temperature? If so, the temperature seems questionably close to the “tentative safe SCC limit” for stainless steel in a sodium hydroxide environment at 20 wt percent, indicated to be about 55°C (estimated) [Ref. A. John Sedriks, “Stress Corrosion Cracking of Stainless Steels,” in *Stress Corrosion Cracking,* R.H. Jones, Ed., p.114, ASM International, Materials Park, Ohio (1992)]. The cracking threshold for carbon steel in 20% sodium hydroxide is about 70°C, only about 20°C above the maximum temperature specification for the sodium hydroxide tank [Ref. Denny A. Jones, *Principles and Prevention of Corrosion*, p. 394. Macmillan, New York (1992)]. Of concern is whether chlorides lower the cracking threshold temperature for carbon steel. Indicate the temperature and impurity limits that apply to the SH system that will prevent stress corrosion cracking of stainless steel and carbon steel.

3.3.3.2 Aging Effects

Emergency Core Cooling Systems

3.3.3.2-1 Identify where in the LRA cracking of the BWST is addressed or justify why this aging effect is not applicable to the ANO-1 BWST.

Reactor Building Spray, Cooling and Purge Systems

3.3.3.2-2 Tables 3.3-2, 3.3-3 and 3.3-4 address heat exchangers (lube oil coolers) in the reactor building spray system as well as the LPI/DHR and MUP/HPI systems. The oil analysis program of Appendix B is credited for ensuring that oil is free of water or contaminants and manages the aging effects of cracking and loss of material. Table 3.3-2 identifies loss of material as the aging effect for the pressure boundary function, but does not identify cracking as an applicable aging effect for heat exchangers. Table 3.3-3 identifies cracking as the aging effect for the pressure boundary function, but not loss of material. Table 3.3-4 is silent regarding the function of the pressure boundary. Discuss each of the following: 1) loss of material and cracking aging effects, 2) the pressure boundary function, and 3) applicable AMPs for heat exchangers in each of the three tables discussed above.

3.3.3.3, Aging Management Programs

Emergency Core Cooling Systems

3.3.3.3-1 Identify where in the LRA cracking of the CFTs is addressed or justify why this aging effect is not applicable to the ANO-1 CFTs.

3.3.3.3-2 Section 3.3.3 of the Applicant's LRA states that ASME Section XI is applicable to all engineered safeguards systems with exception of reactor building cooling and purge and hydrogen control systems. Tables 3.3-1, 2, 3, & 4 do not contain this as an AMP for certain components (i.e., BWST, LPI/Decay heat removal piping, makeup and purification piping, etc.). Add the missing AMP to Tables 3.3-1 through 3.3-4 or provide a justification for excluding the AMP.

3.3.3.3-3 Table 3.3-2 does not list the BWST heat exchanger as a component that is subject to an AMR nor does it appear to list all aging effects that may potentially affect the heat exchanger. Identify where in the LRA loss of material and fouling for this heat exchanger are addressed or justify why these aging effects are not applicable.

3.3.3.3-4 Identify where in the LRA loss of material (from crevice corrosion and pitting) and boric acid corrosion (of external surfaces) for the RCP, HPSI, and LPSI pump seals in borated water are addressed, or justify why these aging effects are not applicable to these pump seals.

3.3.3.3-5 Boric acid is a prominent environment in the core flood, low pressure injection, and high pressure injection systems. Intergranular stress corrosion cracking (IGSCC) of stainless steels in weld heat-affected zones is a known applicable aging effect in a borated water environment, particularly in stagnant systems. This aging effect was not identified as applicable in stagnant portions of system in the LRA. Chlorides and sulphates present in this environment also impact this aging effect. In the LRA, the control of chlorides and sulphates is specified at levels below 0.05 ppm in the primary system water chemistry control program. Do the same levels apply to the applicable ESF systems? If so, do ANO-1 operating history and chemistry records confirm that the specifications are consistently met and are being effective in controlling IGSCC in the applicant's ESF systems? If not being consistently met, what steps are being taken to verify that levels will be met to ensure satisfactory aging management during the period of extended operation?

3.3.3.3-6 A review of plant history has indicated that sections of ANO-1 core flood, low pressure injection, and/or high pressure injection system piping or other components have been replaced or have had other significant modifications made to the systems. Were these modifications made as a result of aging? If so, what was the aging effect that resulted in the replacements? Have there been additional replacements since the original replacement campaigns? If so, what is the evidence from corrective procedures and current surveillance programs that the original aging effect(s) have been eliminated?

3.3.3.3-7 The applicant's LRA lists, in addition to ASME Section XI, preventive maintenance, maintenance rule, and level monitoring as appropriate programs/activities for ASME Class 1, 2, & 3 tanks such as the demineralized water storage tank. Table 3.3-2 only identified preventive maintenance (and did not apply these other programs) as an AMP for the BWST. Correct this discrepancy and based on the AMP included, provide a demonstration that the effects of aging will be managed such that the current licensing basis will be maintained during the period of extended operation.

3.3.3.3-8 Table 3.3-2 addresses heat exchangers in the LPI/DH system (DH coolers) and listed AMPs for the aging effects of fouling associated with the heat transfer function of the heat exchangers. The heat exchanger monitoring program described in Appendix B of the LRA is credited with managing the effects of aging on the heat transfer function. The program described in Appendix B focuses on inspections for structural integrity concerns and does not address the loss of the heat transfer function. Identify where in the heat exchanger monitoring program the inspection activities are intended to identify fouling or identify any other program activities that will address the potential for fouling.

In addition, Table 3.3-2 lists LPI/DH lube oil coolers as a component covered by aging management programs. It also lists management programs for the aging effects of fouling on the heat transfer function of the heat exchangers. Section 4.14, Oil Analysis, of Appendix B is credited for managing the effects of aging on the heat transfer function. The program described in Appendix B shows that it focuses on degradation of lube oil coolers that would result in contamination of oil by contact with water. Provide information on other programs at ANO-1 that would specifically relate to the management of the aging effects of fouling on the heat transfer function of lube oil coolers.

3.3.3.3-9 Appendix B, Section 4.4, Bolting and Torquing, of the applicant's LRA describes a program for aging management of carbon steel bolts in the ESF systems. Tables 3.3-1, -2, -3, -4. -6, and -7 do not identify this activity as applicable to the respective systems. Add the missing program to these tables or provide a justification for excluding this program.

Reactor Building Spray, Cooling and Purge Systems

3.3.3.3-10 Provide a justification for not including loss of material as an applicable aging effect for stainless steel piping and fittings, and flow orifices in the reactor building spray system, core flood system, LPI/decay heat removal system, makeup and purification system, and reactor building isolation system, Tables 3.3-1, 2, 3, 4, & 7, in a borated water environment.

3.3.3.3-11 Provide a justification for not including loss of material as an applicable aging effect for carbon steel bolting in an air environment in the reactor building spray system and other ESF systems.

3.3.3.3-12 Table 3.3-4 does not address an operational leakage monitoring or housekeeping program to monitor the aging effects from boric acid deposits and potential corrosion to external surfaces for the reactor building spray system and other ESF systems. Identify in the LRA where boric acid corrosion on the external surfaces of the reactor building spray system components, due to exposure to borated water from within the reactor building spray system or other adjoining systems, is addressed or justify why this aging effect is not applicable to these components.

3.3.3.3-13 Section 3.3.3 of the LRA indicates that the heat exchanger monitoring program is applicable to the coolers of the reactor building cooling and purge, LPI/decay heat removal, and makeup & purification systems. Tables 3.3-2, -3, and -5 do not list the heat exchanger monitoring program. Add the heat exchanger monitoring program to these tables or provide a justification for its exclusion.

Sodium Hydroxide System

3.3.3.3-14 Table 3.3-6 indicates that loss of material and cracking are credible aging effects for stainless steel piping and valves. The corresponding aging management activities are indicated to be pressure tests and tank level monitoring. The staff, in general, does not accept “failure detection” as an acceptable AMP. What programs and activities are in place to detect degradation for the sodium hydroxide system before leaks or breaks occur?

3.3.6 Structures and Structural Components

3.3.6-1 Arkansas Nuclear One, Unit 1 (ANO-1) license renewal application (LRA) Section 2.4 - Structures and Structural Components does not specify expansion joint sealants, structural sealants or caulking as components in the license renewal (LR) scope. The only reference to expansion joint sealant is in Section 3.6.1.1, where degradation of the joint sealant is identified as a pre-condition for loss of material of the containment liner plate below the floor. In the staff guidance regarding consumables (see LR Issue No. 98-0012, “Consumables,” dated 4/20/99), when these non-metallic components are part of the structures and structural components within the scope of LR, they are also considered to be within the scope of LR and subject to an aging management review. In addition, IWE Examination Category E-D specifically addresses inspection of these non-metallic components for containment. Therefore, provide the following information:

a. Is IWE Examination Category E-D credited for LR to manage aging of expansion joint sealants, structural sealants, and caulking for the Reactor Building (RB)?

b. If not, identify the alternate aging management program (AMP), and where in the LRA is this program specifically discussed with respect to expansion joint sealants, structural sealants, and caulking for the Reactor Building (RB).

c. For structures and structural components other than the RB, describe the AMP which is credited to manage aging of these non-metallic components consistent with the 10 elements in the Standard Review Plan in sufficient detail to allow the staff to assess the adequacy of this program to manage the applicable aging effects.

d. If no AMP is credited, provide a justification for excluding the structural sealants within the scope of license renewal from being subject to an aging management review.

3.3.6-2 Section 2.4.1.1 of the ANO-1 LRA indicates that attachment welds to the liner plate are included in RB Internal Structural Components. However, welds of integral attachments to the liner plate are included within the scope of ASME Section XI, Subsection IWE. On this basis, provide the following information:

a. The liner plate welds have a pressure boundary intended function as well as a structural support intended function. Discuss why the liner plate welds were grouped with the RB Internal Structural Components instead of the RB, and discuss how the AMPs selected for the RB Internal Structural Components will manage the aging effects that may effect the pressure boundary intended function.

b. What is the AMP that manages aging of attachment welds to the liner plate?

c. Describe the AMP program for the attachment welds to liner plate consistent with the 10 elements in the Standard Review Plan in sufficient detail to allow the staff to assess the adequacy of this program to manage the applicable aging effects and discuss if the inspection requirements are equivalent to or more stringent than the requirements of IWE?

If inspection activities are less stringent, provide a technical justification for relaxation of the IWE requirements.

3.3.6-3 Section 2.4.1.1 of the ANO-1 LRA states that surveillance requirements for gears, latches, linkages, etc. of both the larger personnel hatch and the smaller emergency hatch are included in the ANO-1 Technical Specifications. Identify where in the LRA is fretting and lockup of hinges, locks and closure mechanisms for personnel hatches discussed, or provide a technical justification for not considering fretting and lockup as applicable aging effects for these components. If these aging effects are determined to applicable, identify where in the LRA or provide a description of the AMP for the personnel hatches consistent with the 10 elements in the Standard Review Plan in sufficient detail to allow the staff to assess the adequacy of this program to manage the applicable aging effects.

3.3.6-4 Section 2.4.1.1 of the ANO-1 LRA states that the seals of each personnel hatch and the equipment hatch in the RB are not long-lived, passive components and do not require an aging management review because they are replaced when warranted by their condition. 10CFR54.21(a)(1)(ii) states that structures and components that are not subject to replacement based on a qualified life or specified time period are subject to an aging management review.

a. Provide a technical justification consistent with the requirements of 10 CFR 54.21(a)(1)(ii) to support the determination that seals for personnel and equipment hatches need not be subject to an aging management review based on the seals not being long-lived.

b. If the personnel and equipment hatch seals are determined to be subject to an aging management review identify where in the LRA is the aging management review, or provide an AMR and a description of the AMPs consistent with the 10 elements in the Standard Review Plan in sufficient detail to allow the staff to assess the adequacy of this program to manage the applicable aging effects.

3.3.6-5 In Section 2.4.1.2 of the ANO-1 LRA, the Elastomeric Silicone Rubber Coating on the RB Dome is identified as providing protection for the dome from weathering conditions. In the past, when protective coatings have been credited for eliminating plausible aging effects, the coating itself would be included within the scope of license renewal and subject to an AMR.The application does not discuss whether the RB Dome coating is “credited” for protecting the dome or if this coating is included within the LR scope.

a. If damage to the coating has been identified, what AMP will be used to address the loss of material and resulting defects to the RB Dome?

b. Based on this information, identify where the AMR of the RB dome coating can be found in the LRA, provide a technical justification for not managing the aging of the RB dome coating, or perform an AMR of the RB dome.

3.3.6-6 In Section 2.4.1.2 of the ANO-1 LRA, the Tendon Access Gallery is identified as a separate structure from the RB that does not perform an intended function, and consequently is outside the scope of LR. However, NUREG-1522 states that an adverse environmental conditions in the tendon access gallery can have a deleterious effect on the lower tendon anchor components and surrounding concrete. On the basis of this information, provide the following information:

a. Describe the history of contaminants, humidity, and water infiltration into the gallery?

b. Have any remedial steps been taken in the past to alleviate any existing adverse conditions in the gallery such as water infiltration or deterioration of concrete and embedded rebar?

c. Is there an existing inspection/maintenance program which addresses deterioration of the gallery and its environment?

d. Identify any previous or existing condition of the lower tendon anchor components and surrounding concrete, with respect to corrosion of steel and loss of material, cracking, and change in material properties of concrete.

e. On the basis of NUREG 1522 and your responses to the above questions, provide a technical justification for excluding the tendon gallery from an AMR.

3.3.6-7 Section 3.6.7 of the LRA evaluates the following two aging effects/mechanisms for elastomers:

- cracking due to ultraviolet radiation, thermal exposure, and ionizing radiation
- change in material properties due to ultraviolet radiation, thermal exposure, and ionizing radiation

In order to complete the evaluation of the effects of aging for elastomers, the staff requests Entergy to provide the following information:

a. Subsection 3.6.7.1 of the ANO-1 LRA concludes that cracking of elastomers (waterstops) due to thermal exposure is not an applicable aging effect because the temperatures will be less than 95° F. Cracking due to ionizing radiation is not an applicable aging effect for waterstops since the radiation levels will be less than $10^6$ rads. Provide the technical bases (e.g., technical references) for the stated threshold values for temperature (less than 95° F) and radiation levels (less than $10^6$ rads).

b. Provide a description of the applicable site-specific operating history and include occurrences of observable seepage or leaching through concrete walls below grade, which would be indicative of degradation of waterstops, waterproofing membranes, caulking, and/or sealants.

c. Because seepage through these materials has been previously identified in other nuclear power plant structures, which is indicative of elastomer aging, provide a technical justification for not identifying aging that is applicable to elastomers.

d. If such conditions exist at ANO-1, provide an aging management review for the affected items or explain why such a review is not required.

3.3.6-8 In Section 2.4.4 of the ANO-1 LRA, Category 2 building areas of the Intake Structure appear to be excluded from the LR scope. An earlier statement in Section 2.2.2 of the LRA indicates that some Category 2 structures are included in the LR scope. To clarify which Category 2 structures are included in the LR scope, Entergy is requested to provide the following information:

a. What Category 2 structures are included in the LR scope and what Category 2 structures are excluded?

b. If any Category 2 structures are excluded from the LR Scope, provide the technical justification for each.

c. For each Category 2 structure included in the LR scope, specify the LRA section which addresses the aging management review.

3.3.6-9 Section 2.4.5 of the ANO-1 LRA discusses earthen embankments included in the LR scope. The intake and discharge canals to Lake Dardanelle and the emergency cooling pond are listed. The earthen embankments provide a heat sink during DBA or station blackout conditions, according to the LRA. From the information provided in Section 2.4.5 of the LRA, it is not clear whether Lake Dardanelle is in the scope of the rule, and if the lake is in the scope of the rule, is the water control structures and earth embankments, such as dams, within the scope of the rule. On the basis of this discussion, provide the following information:

a. Is Lake Dardanelle in the scope of license renewal, and, if so, what is the intended function of Lake Dardanelle?

b. If the lake was determined not to be within the scope of license renewal, provide a technical justification as how the ultimate heat sink function is satisfied without relying on the lake.

c. If the lake does perform an intended function, identify any water control structures which are relied upon to maintain the water inventory of the lake.

d. For any water control structures identified in (c), provide an aging management review,identify applicable aging effects, and describe the AMPs which are relied on to manage aging.

3.3.6-10 Sections 3.6.1, 3.6.2, and 3.6.3 of the ANO-1 LRA do not address how aging effects of structures and structural components in inaccessible areas are managed. In the LRA the only mention of inaccessible areas is in Appendix B, Section 4.3.6 - IWL Inspections, which states that “items exempt from the examination requirements include inaccessible end anchors and concrete surfaces.” Managing aging degradation of inaccessible areas needs to be addressed for all structures and structural components within the scope of LR.

ASME Section XI exempts inaccessible areas in containment. However, 10CFR50.55a provides additional requirements that the licensee evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas. In accordance with NUREG-1611 for LR, the staff has determined that applicants also need to evaluate, on a case-by-case basis, the acceptability of inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas, in order to ensure that the intended functions of the structures and components will be maintained consistent with the CLB during the period of extended operation. This additional evaluation needs to be performed for four aging mechanisms presented in NUREG-1611.

In accordance with the conclusion from NUREG-1557, aggressive chemical attack and corrosion of reinforcing steel may cause potentially significant degradation of below-grade portions of Class 1 concrete structures. Also, corrosion is potentially significant for inaccessible structural steel. To address these issues, applicants for LR are expected to describe a plant-specific aging management program that could include monitoring of groundwater chemistry, inspection and testing.

On the basis of this discussion, provide the following information:

a. For the RB (containment), describe how aging effects for inaccessible areas will be addressed when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas. The aging management review for this condition(s) needs to consider the aging effects discussed in NUREG 1557 such as loss of material, increased porosity, cracking, etc. (caused by leaching of calcium hydroxide from concrete, aggressive chemical attack on concrete, corrosion of structural steel and liners, and corrosion of embedded reinforcing steel). If any of these aging effects do not apply, provide technical justification in accordance with the guidance presented in NUREG-1611.

b. For other structures within the scope of LR, describe how aging effects for inaccessible areas will be addressed. If the aging effects discussed in NUREG 1557 such as loss of material, increased porosity and permeability, spalling, scaling, expansion, loss of bond, distortion, reduction in foundation strength, and cracking are determined to be not applicable, provide your technical justification in accordance with the guidance presented in NUREG-1557.

c. Chemicals in groundwater and chemicals in raw water have been identified as environments applicable to ANO-1 concrete. Provide a description of the AMP consistent with the ten elements of an AMP identified in the SRP in sufficient detail for the staff to adequate evaluate the program.

3.3.6-11 Sections 3.6.2 and 3.6.3 of the LRA discuss potential aging effects of concrete in accessible areas. A statement is made that "other potential aging effects and aging mechanisms do not apply to ANO-1 concrete components and commodities due to the absence of susceptible material and environmental conditions." A number of potential aging effects identified in NUREG-1557 have not been addressed in the LRA. Provide a technical justification for determining that the aging effects identified in NUREG 1557 need not be managed during the period of extended operation including the loss of material, increased porosity and permeability, spalling, scaling, expansion, loss of bond, distorsion, reduction in foundation strength, and cracking.

3.3.6-12 It is noted in Section 3.6.1 of the ANO-1 LRA that the spent fuel pool steel liner is addressed in Sections 2.3.3 and 3.4 of the ANO-1 LRA. However, the staff's aging management review of the spent fuel pool liner is included with the steel structures. Section 3.4.2 of the ANO-1 LRA, states that cracking is a potential aging effect for the spent fuel pool liner. Section 3.4.3 lists the Spent Fuel Pool Monitoring Program (a new program described in App. B, Section 3.6) and the Spent Fuel Pool Level Monitoring Program (described in App. B, Section 4.21.8) as applicable to the spent fuel pool liner plate. The Spent Fuel Pool Monitoring Program is used to monitor the spent fuel pool monitoring trench drains. The Spent Fuel Pool Level Monitoring Program is used to monitor the water level in the spent fuel pool. The staff has previously concluded that stress corrosion cracking and crevice corrosion of fuel storage facility stainless steel liners are adequately managed by periodic monitoring of the leak chase system drain lines and the leak detection sump. On the basis of the above discussion, provide the following information:

a. A description of the spent fuel pool monitoring trench system with identification of any differences from a typical spent fuel pool leak chase system.

b. Will the monitoring of trench system drains, coupled with the monitoring of the fuel pool water level, provide for fuel pool leakage detection at least equivalent to that which would be achieved with the monitoring of a spent fuel pool leak chase system? Describe the basis for this conclusion.

c. If not, provide a technical justification for the specified monitoring programs.

3.3.6-13 Provide a description of the findings from the operating experience review for steel components, IWE, IWF, Boric Acid Corrosion Prevention and Maintenance Rule AMPs.

3.3.6-14 In Section 3.6.1 and Table 3.6-8 of the ANO-1 LRA, Thermashield [associated with pipe supports] is listed as a submaterial under steel components. No further reference to this material is provided in the ANO-1 LRA. provide the following information:

a. A description of this material, its purpose and its use in/on ANO-1 structures and structural components.

b. Intended function(s) associated with Thermashield and the technical basis for its inclusion/exclusion in the scope of LR.

c. Discuss if the aging effects and the AMPs associated with the steel components are applicable to Thermalshield. If so, identify the attributes monitored to detect the aging associated with Thermalshield and the attributes monitored in the managing the aging.

d. Discuss potential aging of steel components due to contact with Thermalshield.

e. Can application of Thermashield reduce or compromise the effectiveness of AMPs credited with managing the aging of the Thermashield-treated structural components (e.g., render component inaccessible for inspection)? If so, how does the credited aging management program compensate for this potential concern.

3.3.6-15 Section 3.6.2.4 identifies the review of ANO-1 operating experience as one basis for concluding “no additional aging effects beyond those discussed in this section have been identified” for concrete. Discuss the results from any concrete structure and structural components, concrete commodity groups, and concrete submaterials inspections that have been performed at ANO-1, and describe any follow-up corrective actions as a result of these inspections.

3.3.6-16 Section 3.6.2.4 and Table 3.6-5 refers to the Maintenance Rule Program (Section 4.13 of Appendix B) as the Aging Management Program (AMP) for managing the effects of loss of material for the intake structure exterior concrete wall at the normal lake level. In accordance with NUREG-1557 conclusions, Regulatory Guide 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants” describes an acceptable basis to the staff for developing an appropriate in-service inspection and surveillance program for water control structures, such as the intake structure. On the basis of this information, provide the following:

a. Describe the inspection requirements for Maintenance Rule AMP with respect to (equivalent to or more stringent) the aging management activities describe in NUREG-1557.

b. If not, provide a technical justification for relaxation of the the aging management activities described in NUREG-1557.

3.3.6-17 Section 3.6.2.4 and Table 3.6-4 refers to the Fire Protection Program (Fire Barrier Inspections) and the Maintenance Rule Program (Sections 4.8.1 and 4.13 of Appendix B) as the Aging Management Program for managing the effects of cracking for masonry block walls in the Auxiliary Building. In accordance with NUREG-1557, inspection requirements imposed in I&E Bulletin No. 80-11, “Masonry Wall Design” and plant-specific monitoring proposed by NRC Information Notice (IN) No. 87-65, “Lessons Learned from Regional Inspection of Licensee Actions in Response to IE Bulletin 80-11” are effective programs for managing aging effects of masonry block walls. On the basis of this information, provide the following:

a. Identify the masonry walls and the applicable intended functions that are included within the scope of LR and subject to an AMR.

b. Identify any masonry wall included in the scope of IE Bulletin 80-11 and USI A-46 for ANO-1 that is not within the scope of license renewal and subject to an aging management review. Provide a justification for excluding any of these walls from an aging management review.

c. Describe how the ANO-1 AMP for periodic inspection and surveillance of masonry walls incorporates the insights provided in IN No. 87-67.

3.3.6-18 LRA Appendix B identifies and briefly describes the AMPs which are credited for ANO-1. Appendix B Sections 4.3.4 (IWE Inspections), 4.3.5 (IWF Inspections), and 4.3.6 (IWL Inspections) identify three (3) inspection programs which are credited by 10 CFR 50.55a for the current licensing term. However, the description of these AMPs do not reference the additions and modifications imposed by 10 CFR 50.55a, nor the specific editions/addenda of ASME Section XI that are specified in 10CFR50.55a. For IWE Inspections, page B-34 of the LRA specifies the ASME B&PV Code Section XI, 1992 Edition, 1993 Addenda for Pressure Testing; 10 CFR 50.55a specifies the ASME Code Section XI, 1992 Edition, including the 1992 Addenda. For IWF Inspections, page B-36 indicates that the ASME Section XI, 1992 Edition, 1993 Addenda for Pressure Testing will be used to develop the aging program; 10 CFR 50.55a specifies the use of IWF, ASME Code Section XI, 1989 Edition for support inspection. For IWL Inspections, page B-37 specifies the ASME Code Section XI, Subsection IWL, with no indication of the edition. 10 CFR 50.55a specifies the ASME Code Section XI, 1992 Edition, including the 1992 Addenda.

On the basis of the above discussion, provide the following additional information:

a. For IWE Inspections, describe the differences between the Code editions, especially any relaxation afforded by the 1993 Addenda for Pressure Testing. Also, clearly state whether the additions and modifications specified in 10CFR50.55a are part of the AMP; justify any exclusion.

b. For IWF Inspections, describe the differences between the Code editions, especially any relaxation afforded by the 1993 Addenda for Pressure Testing.

c. For IWL Inspections, clarify if “Alternative Examination 99-0-002" for Arkansas Nuclear One, Units 1 accepted by NRC on June 2, 1999 will constitute your AMP.

3.3.6-19 Appendix B, Section 4.3.4 of the LRA indicates that the scope of the ASME Section XI, Subsection IWE Inspections, credited for LR, includes inspections of the RB liner plate. No mention is made of the other components (Examination Categories E-A, E-B, E-C, E-D, E-F, E-G, E-P) included in the scope of IWE Inspections. In addition it is not clear whether all requirements contained in Subsection IWE of the Code are included in the aging management program. Therefore, provide the following information:

a. Whether the aging management program (IWE Inspections) for LR commits to the entire scope and all requirements stated in ASME Section XI, Subsections IWE and the additions and modifications specified in 10 CFR 50.55a

b. If not, identify and provide a justification where the scope and requirements differ.

3.3.6-20 Appendix B, Section 4.3.6 of the LRA indicates that IWL inspections are performed on the RB’s post-tensioning systems and concrete components that are subject to an aging management review as identified in Sections 2.4 and 3.6 of the LRA. Please verify that all RB post-tensioning components within the scops of ASME, Section XI, Subsection IWL are included in the scope of components requiring aging management. Identify any additional RB post-tentioning components requiring aging management. In addition, please verify that all the requirements contained under Subsection IWL of the Code, including limitations under 10 CFR 50.55(a)(b)(2)(ix), are included in the AMP. If not, provide a description and justification where the scope and/or aging management requirements differ.

3.3.6-21 Section 4.5 of Appendix B of the ANO-1 LRA states that the Boric Acid Corrosion Prevention program is credited with monitoring the boric acid corrosion of carbon steel surfaces exposed to leakage from borated water. It is stated that, in this program, ANO-1 completes visual inspections to identify pressure boundary leaks and gives consideration to the possibility of flow paths from the leak to carbon steel components, or the accumulation of boric acid in insulation.

a. Is a periodic visual examination of structures, components and supports adjacent to (in proximity and below) pressure boundary components included in the visual inspections performed in this program?

b. Based on staff experience, we have required inspection of adjacent structures and components (including supports) to manage the effects of boric acid corrosion. If your program does not include inspection of adjacent structures and components, provide a technical justification for excluding these inspection activities or include them as part of the proposed AMP.

3.3.6-22 It is stated in Section 3.6.1 of the ANO-1 LRA that the types of steel components and commodities subject to an AMR for ANO-1 are summarized in Tables 3.6-1 through 3.6-8. An aging effect not listed in the tables is the loss of component support for Class 1, 2, 3, or MC piping. On the basis of the staff's experience from the review of the first to LRAs, the loss of component support for Class 1, 2, 3, or MC piping due to corrosion, distortion, dirt, overload, vibratory, cyclic thermal loads and elastomer hardening is typically within the scope of LR and subject to an AMR. Identify where in the LRA is this AMR described, or provide a justification for not considering loss of component support as an applicable aging effect for Class 1, 2, 3, or MC piping.

3.3.6-23 Subsection 3.6.4.4 of the ANO-1 LRA states that the same AMPs that are credited for the management of aging effects for steel components and commodities are credited for the management of aging of threaded fasteners. A review of Tables 3.6-2 through 3.6-8 of the LRA indicates that the table entries omit reference to various aging effects for threaded fasteners. Examples are loss of material from boric acid wastage for threaded fasteners in structural connections in the vicinity of the spent fuel pool, and stress corrosion cracking and intergranular attack of stainless steel threaded fasteners in raw water. It is not clear what AMPs correspond to to which threaded fasteners and whether every identified aging effect for threaded fasteners at ANO-1 is being managed.

In addition, subsection 3.6.4.4 contains a statement that self-loosening of bolted connections due to vibration is not an aging effect because of adequate preload during installation. However, expansion and undercut anchors in concrete may become loose due to local degradation of the surrounding concrete as a result of vibratory loads. On the basis of the above discussion, provide the following information:

a. Identify the specific AMP(s) which is credited for managing each applicable aging effect for threaded fasteners;

b. Provide a technical justification for not identifying loss of preload due to the effects of vibration on concrete surrouding expansion and undercut anchors.

3.3.6-24 Section 3.6.3.3 indicates that "prestressed concrete components are not exposed to temperatures that exceed the threshold for degradation identified in ACI 318-63." It should be noted that ACI 318-63 (as well as other Editions of ACI 318) only refers to various types of losses in prestressing forces similar to those described by the applicant in its UFSAR. It does not address the effects of temperature and radiation on the material properties of concrete or prestressing steel. Information Notice (IN) 99-10 describes operating experience at various plants where it was discovered that the normal sustained temperature (> 90°F) effects on the relaxation of prestressing steel is significant in the prestressed concrete containments. In light of the discussion in Attachment 2 of this IN, provide a summary of how the prestressing forces at ANO-1 are affected by such sustained temperatures.

3.3.6-25 During review of the LRA, a number of potential editorial errors were identified. Verify if the following were editorials.

a. Section 3.1.1 (p. 3-2) - verify that "4.7" should be "4.6"

b. Section 3.1.3 (p. 3-2) - specify the proper reference to Appendix B for "Structures and Systems Walkdowns." It appears that "4.16" should be "4.13"

c. Table 3.6-2 (p. 3-113) - verify that "Fuel Transfer Tube" should be "Fuel Transfer Tube Penetration."

d. Table 3.6-5 (p. 3-121) - verify that Footnote F should be specified one row above where it is currently specified. If this is not the case, explain the apparent discrepancy between the wall elevation and the normal lake level elevation.

e. Appendix B, Section 4.16 (p. B-79, 5th paragraph) - verify that "Type C" should be "Type B". Type B tests are described as an AMP for the reactor building in App. B, Section 4.16.2.

f. Appendix B, Section 4.21.8 (p B-103) - in the 4th line from the bottom of the page, verify that "3.7" should be "3.6."

g. Table 3.4-1 (p. 3-58) - Verify that the Spent Fuel Pool Monitoring Program should also be listed as a program for liner plate cracking along with the Spent Fuel Pool Level Monitoring Program. If not, provide a justification.

Arkansas Nuclear One
Docket No. 50-313

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