July 25, 2003

Mr. Craig G. Anderson
Vice President, Operations ANO
Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS RE: ALLOWING THE USE OF THE SPENT FUEL CRANE TO LIFT HEAVY LOADS IN EXCESS OF 100 TONS (TAC NOS. MB7799 AND MB7800)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 220 to Renewed Facility Operating License No. DPR-51 and Amendment No. 248 to Facility Operating License No. NPF-6 for Arkansas Nuclear One, Units 1 and 2, respectively. The amendments are in response to your applications dated February 24, 2003, as supplemented by letters dated March 25, June 30, and July 21, 2003.

The amendments authorize use of the spent fuel crane (L-3 crane) to lift heavy loads in excess of 100 tons. Specifically, the amendments approve the use of the upgraded L-3 crane for loads up to 130 tons.

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Thomas W. Alexion, Project Manager, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-313 and 50-368

Enclosures: 1. Amendment No. 220 to DPR-51
2. Amendment No. 248 to NPF-6
3. Safety Evaluation

cc w/encls: See next page

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*See previous concurrence
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ENTERGY OPERATIONS, INC.

DOCKET NO. 50-313

ARKANSAS NUCLEAR ONE, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 220
Renewed License No. DPR-51

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee) dated February 24, 2003, as supplemented by letters dated March 25, June 30, and July 21, 2003, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 220, Renewed Facility Operating License No. DPR-51 is hereby amended to authorize the licensee to use the upgraded spent fuel crane (L-3 Crane) to lift heavy loads up to 130 tons, as set forth in the license amendment application dated February 24, 2003, as supplemented by letters dated March 25, June 30, and July 21, 2003, and evaluated in the associated safety evaluation by the Commission's Office of Nuclear Reactor Regulation.

3. The license amendment is effective as of its date of issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Robert A. Gramm, Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: July 25, 2003

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 248
License No. NPF-6

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee) dated February 24, 2003, as supplemented by letters dated March 25, June 30, and July 21, 2003, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 248, Facility Operating License No. NPF-6 is hereby amended to authorize the licensee to use the upgraded spent fuel crane (L-3 crane) to lift heavy loads up to 130 tons, as set forth in the license amendment application dated February 24, 2003, as supplemented by letters dated March 25, June 30, and July 21, 2003, and evaluated in the associated safety evaluation by the Commission's Office of Nuclear Reactor Regulation.

3. The license amendment is effective as of its date of issuance and shall be implemented within 30 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Robert A. Gramm, Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Date of Issuance: July 25, 2003

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 220 TO RENEWED FACILITY OPERATING

LICENSE (FOL) NO. DPR-51 AND AMENDMENT NO. 248 TO FOL NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NOS. 1 AND 2

DOCKET NOS. 50-313 AND 50-368

1.0 INTRODUCTION

By application dated February 24, 2003, as supplemented by letters dated March 25, June 30, and July 21, 2003, Entergy Operations, Inc. (Entergy or the licensee), requested license amendments for Arkansas Nuclear One (ANO), Unit Nos. 1 and 2 (ANO-1 and ANO-2). The supplemental letter dated July 21, 2003, provided additional information that clarified the application, did not expand the scope of the application as noticed on July 9, 2003 (68 FR 41020), and did not change the Nuclear Regulatory Commission (NRC or the Commission) staff's proposed no significant hazards consideration determination as published in the *Federal Register* on July 9, 2003 (68 FR 41020). The application was originally noticed in the *Federal Register* on March 7, 2003 (68 FR 11157).

The proposed amendments would allow the licensee to use the spent fuel crane (L-3 crane) to lift heavy loads in excess of 100 tons. Specifically, the proposed amendments would approve the use of the upgraded L-3 crane for below-the-hook loads up to 130 tons, which is the design capacity of the new single-failure-proof crane. The proposed changes revise the description of the common spent fuel cask handling crane, and change the administrative controls and design features credited to ensure essential safe-shutdown functions are maintained following credible failures in the load handling system.

2.0 REGULATORY EVALUATION

General Design Criterion (GDC) 4, "Environmental and Dynamic Effects Design Bases," of Appendix A to 10 CFR Part 50 specifies, in part, that structures, systems, and components important to safety shall be appropriately protected against dynamic effects, including the effects of missiles, that may result from equipment failures. GDC 2, "Design Bases for Protection Against Natural Phenomena," specifies, in part, that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena, such as earthquakes. Section 9.1.5, "Overhead Heavy Load Handling Systems," of NUREG-0800, "NRC Standard Review Plan," references the guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," and NUREG-0554, "Single-Failure-Proof Cranes for Nuclear Power Plants," for implementation of these criteria in the design of overhead heavy load handling systems.

The basis for the guidelines in NUREG-0612 was to minimize the occurrence of the principal causes of load handling accidents and to provide an adequate level of defense-in-depth for handling of heavy loads near spent fuel and safe shutdown systems. Defense-in-depth is generally defined as a set of successive measures that reduce the probability of accidents and/or the consequences of such accidents. In the area of control of heavy loads, the emphasis is on measures that prevent load drops or other load handling accidents.

In NUREG-0612, the staff provided regulatory guidelines for control of heavy load lifts to assure safe handling of heavy loads in areas where a load drop could impact on stored spent fuel, fuel in the reactor core, or equipment that may be required to achieve safe shutdown or permit continued decay heat removal. In an unnumbered letter dated December 22, 1980, as supplemented by Generic Letter (GL) 81-07, "Control of Heavy Loads," dated February 3, 1981, the NRC requested that all licensees describe the extent to which the guidelines of NUREG-0612 were satisfied at their facility and what additional modifications would be necessary to fully satisfy the guidelines. This request was divided into two phases (Phase I and Phase II) for implementation by licensees. Phase I guidelines address measures for reducing the likelihood of dropping heavy loads and provide criteria for establishing safe load paths; procedures for load handling operations; training of crane operators; design, testing, inspection, and maintenance of cranes and lifting devices; and analyses of the impact of heavy load drops. Phase II guidelines address alternatives to either further reduce the probability of a load handling accident or mitigate the consequences of heavy load drops. These alternatives include using a single-failure-proof crane for increased handling system reliability, employing electrical interlocks and mechanical stops for restricting crane travel to safe areas, or performing load drops and consequence analyses for assessing the impact of dropped loads on plant safety and operations. Criteria for design of single-failure-proof cranes were included in NUREG-0554. Appendix C to NUREG-0612 provided alternative criteria for upgrading the reliability of existing cranes to single-failure-proof standards.

In a letter dated August 26, 1983, the staff approved Ederer's Generic Licensing Topical Report EDR-1 (P)-A, "Ederer's Nuclear Safety Related eXtra-Safety And Monitoring (X-SAM) Cranes," Revision 3, dated October 8, 1982, as an acceptable method of meeting the guidelines of NUREG-0554 and NUREG-0612. Appendices B and C of EDR-1 (P)-A identify the plant specific information that is needed to verify a specific retrofitted crane's conformance with NUREG-0554 guidelines. Appendix B summarizes the plant specific crane data supplied by Ederer. Appendix C summarizes the regulatory positions to be addressed by the applicant. Licensees who incorporated the use of Ederer's hoist and trolley into the design of a crane are to submit Appendices B and C to address how plant specific application of the Ederer system satisfies the guidelines of NUREG-0612 and NUREG-0554.

GL 85-11, "Completion of Phase II of Control of Heavy Loads at Nuclear Power Plants, NUREG-0612," dated June 28, 1985, dismissed the need for the NRC to review the Phase II responses received from licensees, based on the improvements observed during review of the Phase I responses. However, GL 85-11 encouraged licensees to implement actions they perceived to be appropriate to provide adequate safety.

In NRC Bulletin 96-02, "Movement of Heavy Loads over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," dated April 11, 1996, the staff addressed specific instances of heavy load handling concerns and requested licensees to provide specific information detailing their extent of compliance with the guidelines and their licensing basis.

Units 1 and 2 at ANO share a common bridge crane for the handling of spent fuel casks between the shared railroad bay and the Unit 1 or Unit 2 cask loading pits. The two spent fuel pools are adjacent to, but separate from, their respective cask loading pit. The control room for each unit is located between the cask loading pit for that unit and the shared railroad bay, which results in the load handling path for each spent fuel cask passing over a portion of one control room. The railroad bay floor is 50 feet below the adjacent spent fuel pool operating floor, but no safe shutdown equipment is located below the railroad bay floor.

The existing licensing basis for ANO includes various measures to defend against unacceptable consequences from potential equipment failures that result in a cask drop. Administratively controlled interlocks of diverse design restrict crane motion such that a postulated drop of a cask in either unit's spent fuel pool is not credible. Additional administrative controls require that gates between the spent fuel pool and the associated cask pit be in place prior to suspending a heavy load over the cask pit, which prevents a cask drop within the cask pit from adversely affecting the spent fuel pool. A drop of a 100 -ton cask within the cask pit was found not to affect the integrity of the spent fuel pool. Administrative controls and an interlock limited the lift height of the 100-ton cask to 9 inches above the spent fuel operating floor. In addition, energy-absorbing material was attached to the cask before it traveled above the control room. A load drop analysis was performed for the 3-foot 6-inch thick reinforced concrete slab separating the spent fuel operating floor from the control room, which demonstrated that the postulated cask drop from a 9-inch height would not damage any safety-related equipment located below the load path. Finally, an evaluation of the radiological consequences of a postulated cask drop from 50 feet above the railroad bay has demonstrated that the resultant offsite dose is well within one-quarter of 10 CFR Part 100 limits.

The licensee's upgrade of the existing 100-ton spent fuel crane will facilitate handling of the new transfer cask for the dry cask storage system. The upgraded crane has a 130-ton capacity, meeting the single-failure-proof requirements of NUREG-0554. This change will allow the spent fuel cask process to continue without significant restraints associated with handling of loads. This change will also allow for the removal of existing constraints required in order to meet the guidelines of NUREG-0612 resulting from the previous crane not being single-failure-proof. As part of the upgrade, the licensee also evaluated the adequacy of the existing spent fuel pool crane girder and the supporting structure for the increased loading due to the single-failure-proof crane upgrade.

In order to meet the single-failure-proof requirements of NUREG-0544 and the guidelines of NUREG-0612, the licensee has utilized design acceptance criteria consistent with ANO-1 Safety Analysis Report (SAR) Section 5.1.3.3 and ANO-2 SAR Section 3.2.1 for Seismic Category 2 components and structures. Standards and guides which have been used for determining allowable stress limits and other acceptance criteria are consistent with industry practice and have previously been accepted by the staff for similar applications. These include the American Institute of Steel Construction (AISC) Manual, the Crane Manufacturers Association of America (CMAA) Specification No. 70, the American Concrete Institute (ACI) 318-89, "Building Code Requirements for Reinforced Concrete," the American Welding Society (AWS) D1.1 Standard, and the American Society for Mechanical Engineers (ASME) NOG-1-1995, "Rules for Construction of Overhead and Gantry Cranes."

3.0 TECHNICAL EVALUATION

The NRC staff has reviewed the licensee's regulatory and technical analyses in support of its proposed license amendments which are described in Sections 5.0 and 4.0, respectively, of the licensee's February 24, 2003, application. The detailed evaluation below will support the conclusion that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

3.1 Technical Evaluation of Crane Performance

The proposed changes to the SARs are an increase in the capacity of the spent fuel cask crane from 100 tons to 130 tons, and a concurrent upgrade of the crane to a single-failure-proof design that satisfies the guidelines of NUREG-0612 and NUREG-0554. The upgraded crane will utilize the existing crane runway and box girder bridge assembly to support a new trolley. The trolley will house an Ederer X-SAM hoist, which is a single-failure-proof design. The increase in capacity is necessary to lift the Holtec HI-STORM cask assembly planned for use at ANO, which has a maximum weight of approximately 125 tons, including the lifting device. With a single-failure-proof crane, the guidelines of NUREG-0612 for control of heavy loads are satisfied without additional actions, such as load drop analyses, beyond implementation of the general measures specified in Section 5.1.1 of NUREG-0612.

In Attachment 1 to the application dated February 24, 2003, Entergy summarized how the objectives and general guidelines of NUREG-0612 would be satisfied following installation of the upgraded crane. Attachment 1 described implementation of the general guidelines with regard to: (1) establishment of safe load paths; (2) development of procedures; (3) training and qualification of crane operators; (4) selection of special lifting devices; (5) selection of slings; (6) inspection, testing and maintenance of cranes; and (7) application of standards to crane design. A combination of electrical interlocks and administrative controls will continue to ensure that movement of heavy loads over the spent fuel pool, other than the authorized movement of the cask pit gate, will be prevented. Also, administrative controls will continue to ensure that the cask pit gate effectively isolates the spent fuel pool from the cask pit during cask movement. Damage to fuel assemblies within the cask and the resulting consequences have been evaluated for the following postulated events: (1) a drop of the cask lid while the cask is in the cask pit, and (2) a cask drop of 50 feet in the railroad bay. The potential consequences of these events are well within the guideline criteria of NUREG-0612, and Entergy has committed to reevaluate the consequences of these events for the increased capacity of the HI-STORM cask prior to loading casks of that design with more than 24 fuel assemblies. Therefore, the important to safety function of the single-failure-proof crane is limited to making the potential for a critical load drop over a portion of the control room or within the cask pit extremely small.

In accepting EDR-1 (P)-A for reference in plant-specific licensing actions, the NRC staff noted that the acceptance applied only to the features described in the topical report, and did not constitute acceptance of the total overhead crane handling system or the requirements which may be necessary to assure the safe application of the crane system within the nuclear power plant. The plant-specific information required, as identified in Appendices B and C of EDR-1 (P)-A, was included in Attachment 4 to the February 24, 2003, application. By letter dated

June 30, 2003, the licensee submitted a revised version of this plant-specific information. The staff reviewed the plant specific information, which was presented in table form, and compared the information to the guidelines of NUREG-0554, NUREG-0612, and the exceptions to those guidelines (e.g., wire rope breaking strength) approved in the safety evaluation of EDR-1 (P)-A. After this review, the staff requested clarification of the information regarding the conduct of the 125% load test and the material and construction of the wire rope. Preliminary responses were discussed during a conference call on March 12, 2003.

In Attachment 1 to the supplemental letter dated March 25, 2003, Entergy provided additional information regarding the load test and the wire rope construction, and included revised plant specific information as Attachment 2. Attachment 3 to this letter included a specific commitment to establish an interim minimum operating temperature of 65 °F for the crane. The basis for this operating restriction is to preclude the possibility of crane bridge failure at stresses below design level due to brittle fracture. During the conduct of the 125% load test, Entergy had not measured and documented the bridge temperature. However, the temperature of the crane hook was documented as 65 °F the next day during other testing. Entergy concluded that this temperature is conservative because the crane is not directly exposed to outside ambient temperatures, the load test was performed in January with the hatch open to admit outside air, and the hook temperature was measured with the hatch closed. The staff found that the combination of a conservative temperature measurement and the wide margin between the specified minimum operating temperature and temperatures typically associated with brittle fracture concerns provide adequate assurance that the crane will not fail due to brittle fracture. Subsequent cold proof 125% load tests may demonstrate acceptable margin to brittle fracture at lower bridge temperatures.

The NRC staff reviewed the revised plant-specific information related to the design of the hoist, the adequacy of specific components, the response of the crane to potential component failures, and the test information demonstrating satisfactory performance of the overall crane. The staff found that the plant-specific information provided adequate assurance that performance of the crane would satisfy the objectives of NUREG-0612 and the intent of NUREG-0554 with regard to maintaining the potential for a load drop extremely small. In particular, the staff noted the following:

1. The main hook, special lifting devices, and slings have been designed or selected with twice the normal stress design factor, based on the combined maximum static and dynamic loads, as an alternative to a dual load path with normal stress design factors. This is consistent with Item (5), “Implementation of NUREG-0554 for Operating Plants,” in Appendix C to NUREG-0612 for the main hook, and Section 5.1.6(1) of NUREG-0612 for the special lifting devices and slings.

2. The lay down areas on the spent fuel operating floor were analyzed to withstand the maximum kinetic energy achieved by the critical load following a postulated failure of the drive train or a single wire rope. While traversing a load suspended from the main hoist, the licensee will use administrative controls to maintain a vertical distance of greater than 1.5 feet between the load and the spent fuel operating floor. This ensures that, in case of a drive train or single wire rope failure, the load will not impact on such a surface because the X-SAM hoist system is designed to have a maximum load drop of 1.5 feet.

3. The staff performed confirmatory calculations to verify that the selected wire rope satisfies the acceptance criteria specified in Section C.3.e of EDR-1 (P)-A. These criteria include margin for rope degradation, and maximum static and dynamic loading in case of a drive train or single wire rope failure, but credits the drive system torque limiting device in reducing the maximum load resulting from potential operator errors.

Summary of Crane Performance

On the basis of preceding discussions, the NRC staff finds that the proposed upgrade of the existing spent fuel cask crane to a single-failure-proof design is in accordance with NUREG-0612 and satisfies the intent of NUREG-0554. The staff finds that use of the proposed crane, with special lifting devices and slings meeting the specified design criteria, will enable the licensee to handle heavy loads with little risk to irradiated fuel stored in the spent fuel pool or redundant trains of safe shutdown equipment.

3.2 Technical Evaluation of Structural Impacts

Attachment 6 of the February 24, 2003, application contains calculations for the fuel building runway girder and the support structure. The results of this analysis support the proposed technical analysis in Section 4.0 of Attachment 1 of the February 24, 2003, application. The staff evaluated the design criteria, loads and loading combinations, analytical methodology, and the acceptance criteria for the analytical results related to the crane girder and the steel supporting structure. The loading considered included various combinations of dead, live, lifted, impact, and seismic loads.

The runway girder on one side of the crane is assumed to resist the entire transverse horizontal load due to either a horizontal impact or a horizontal seismic event. The dead weight of all crane components, other than the suspended load, was considered in determining the horizontal seismic load. Since the runway girder is a simple span beam and the load from the crane is a point load, the beam is considered to be a single degree freedom system and no higher mode participation was considered. In its supplemental letter dated June 30, 2003, the licensee upgraded the calculations to account for more conservative seismic accelerations. These seismic accelerations are based on the assumption that the L-3 crane bridge is not a rigid structure. Treating the bridge as a beam, the first modal frequency was calculated and then the applicable "g-value" was obtained from the building floor response spectrum curve at that frequency. A multiplication factor of 1.5 for multimode responses was also included in the analysis. The AISC allowable stresses were used for the normal load case. The AISC allowable stresses were increased by a factor of 1.5 (not to exceed 0.9 yield stress (0.9 Fy)) for the design basis earthquake (DBE) loads. The effects of the three directional seismic loads were combined by the square-root-of-the-sum-of-the-squares method.

The NRC staff finds the licensee’s methodology for determining seismic loads acceptable because it is based on the ANO Units 1 and 2 SAR requirements and accepted staff positions.

The impact loads are based on the speed at which the load can be lifted per the crane operations manual. An impact factor less than 1.25 is generally used for crane upgrade work to minimize the modification effort. CMAA-70 Section 3.3.2.1.1.4 provides the basis and governing equations for determining the vertical inertia forces. The total vertical impact consists of impact due to crane dead weight and impact due to inertia in the vertical direction

from the lifted load. Since the travel speed in the vertical direction is less than 30 feet-per-minute, an impact factor of 1.15 was used for the calculation. The vertical impact is only applicable for the lifted load, including the weight of the load block. An impact factor of 1.1 was used to determine the impact load due to crane dead weight.

The design criteria used for the reanalysis of the crane girder and steel support structure indicate that methodologies from two different standards have been used for computing the vertical and horizontal impact loads. (The CMAA-70 methodology was used for the vertical impact load and the ACI 318-89 standard was used for the horizontal impact load.) The NRC staff requested that the licensee provide the rationale and justification for using two different standards for determining impact loads.

In Attachment 1 of its March 25, 2003, supplemental letter, the licensee stated that the cited reference to ACI 318-89 for the transverse horizontal load is incorrect. This should have referred to ASME NOG-1-1995. This is consistent with CMAA-70 and the proposed use of ASME NOG-1-1995 will yield conservative results. The ANO design records were revised to show the corrected reference.

The NRC staff finds the licensee's response satisfactory and acceptable because the use of the ASME NOG-1-1995 standard will yield conservative results.

The NRC staff requested that the licensee provide calculations to support the statement in Attachment 6 of the February 24, 2003, amendment request that, "The period of oscillation of the lifted load in pendulum motion during seismic event is long. Therefore, the horizontal seismic effect due to lifted load is very small and will be neglected." The staff concern was that in case loads are lifted to higher elevations, it seemed feasible that the period of oscillation in pendulum motion could interact with the motion of the crane and support structure during a seismic event and alter seismic loads.

A confirmatory calculation provided by the licensee in its June 30, 2003, supplemental letter shows that with the maximum critical load lifted to the maximum permitted height, the period of oscillation is approximately 5 seconds. Therefore, the interaction between the crane motion and the support structure during a seismic event is not considered feasible.

Also, in Attachment 1 of its March 25, 2003, supplemental letter, the licensee stated that the maximum lifted height is normally at the fuel pool floor elevation. All other lifted positions would be lower than that of the floor elevation (loads from this elevation are lowered to an elevation below this position). The assumption is based on the maximum lifted height and maximum critical load (MCL) of 130 tons which, when lifted to its maximum height, would be just below the upper limit switch. Therefore, all other lifted heights would be lower than the basic assumption.

In addition, the licensee stated that the MCL was considered as the design load for the crane components. This load of 130 tons is what was used in defining the impact load for the component. The bent frame analysis indicates that the expected frequency of the building structure at this elevation is at or near the zero period acceleration range of ANO site response spectra and changes in oscillation are not expected to be significant. Therefore, it is concluded that the calculation provided in Attachment 6 to the February 24, 2003, amendment request is bounding.

The NRC staff finds the licensee's response satisfactory and acceptable because the worst case loading has been addressed in the calculation.

The calculations to evaluate the adequacy of the bent frame and the columns to the upgraded crane loads indicate that the operating basis earthquake (OBE) seismic load case has not been evaluated. Since the allowable limits for the OBE seismic load case are more restrictive than the DBE loading case, the NRC staff requested that the licensee demonstrate compliance with design code limits for the OBE condition as well. In its supplemental letter dated June 30, 2003, the licensee provided further clarifications to demonstrate that the stresses in the structure meet the design code limits for the OBE condition. On this basis, the staff's concerns related to the OBE calculations is considered resolved. In addition, the staff had a concern with the interaction coefficient for the DBE case relating to the girder in ANO-1, which had been determined to be slightly greater than one. Therefore, the NRC staff requested that the licensee demonstrate compliance for this case.

In Attachment 1 of its March 25, 2003, supplemental letter the licensee stated that for the Seismic Category 2 design, its use of OBE and DBE loads were evaluated to determine which load is most critical for design. Since the design used the site's existing response spectra in lieu of Uniform Building Code seismic values for Category 2 components, it was concluded that the DBE case would be more conservative. The design code limits are those accepted codes and standards applicable to the design of Category 2 components. In this case, the use of the stated load cases reflects the most severe loading condition.

The licensee also stated that the applied loads are considered to be conservative since the loads are based on ANO-2 values. If values for ANO-1 were to be applied, the interaction would result in a lower value. For this portion of the analysis, the computer analysis applied the code check requirements of the AISC Manual against the computed stresses with no increase in these allowable values to account for DBE conditions. In conclusion, the results are based on the OBE allowable case and these allowables were not exceeded.

In addition, the licensee performed a confirmatory calculation on the acceptability of the ANO-1 interaction coefficient to confirm the conservative nature of the calculation provided in Attachment 6 of the February 24, 2003, request. The confirmatory calculation was provided in Attachment 1 of the March 25, 2003, supplemental letter, as upgraded in the June 30, 2003, supplemental letter.

The NRC staff finds the licensee's response acceptable because the DBE loads were used while using OBE allowable limits, which is conservative.

The analysis of the frame structure and columns for the revised crane loads in Section 8.0 of Attachment 6 of the February 24, 2003, amendment request indicates that only the following loading combinations will be evaluated:

1. DL+LL+IL+WL (with AISC allowable)

2. DL+LL+DBE (with 1.5 times AISC allowables not to exceed $0.9F_y$)

The NRC staff requested that the licensee define the acronyms in the above equations. In the February 24, 2003, amendment request, the licensee also stated that the crane will not be used

to lift the maximum load during plant operation. Therefore, the NRC staff requested that the licensee discuss the lifted loads and provide their magnitude for the evaluation of the frame structure considering the above loading combinations.

In Attachment 1 of its March 25, 2003, supplemental letter, the licensee provided the definition of the acronyms which are as follows:

DL = Dead Load	WL = Wind Load
LL = Lifted Load	DBE = Design Bases Earthquake
IL = Impact Load	

The licensee also clarified that the maximum lifted load during normal operation is that of a fully loaded dry cask with lifting apparatus. This load is approximately 125 tons. However, the crane design load is for the MCL condition of 130 tons. It is not anticipated that non-critical loads exceeding the MCL will be experienced by the crane during its design life. Therefore, the MCL on the crane will be the loaded dry cask, and an adequate design margin is included as required by the established codes and standards to ensure the design of the crane is acceptable for this intended use.

The NRC staff finds the licensee's response reasonable and acceptable.

The NRC staff requested that the licensee provide confirmation that the loading combinations and allowable limits used in the revised analysis with the upgraded loads are in compliance with the requirements in the SAR for the normal/upset, emergency, and faulted loading conditions. Also, if deviations from the SAR requirements do exist, the NRC staff requested that the licensee discuss the nature of the deviations and justification for noncompliance.

In Attachment 1 of its March 25, 2003, supplemental letter, the licensee stated that the location of the crane is in the Class 2 portion of the turbine building. Therefore, the SAR provides no specific loading combination for consideration in the L-3 crane's design. The analysis approach is based upon design methods of accepted codes and standards insofar as they are applicable to this design. The application of normal/upset, emergency, and faulted loading conditions are applied with respect to the design guidance for single-failure-proof crane designs. This is consistent with the information provided in the SAR as stated in ANO-1 SAR Section 5.1.3.3 and ANO-2 SAR Section 3.2.1 for Seismic Category 2 components and structures.

The NRC staff finds the licensee's response reasonable and acceptable because the loading combinations and allowable limits used in the revised analysis are in compliance with SAR requirements.

In response to Regulatory Guide (RG) 1.104, "Overhead Crane Handling Systems for Nuclear Power Plants," position C.1.d, the licensee stated in Attachment 4 to the February 24, 2003, amendment request that the weld geometries used in the existing bridge structure are not considered susceptible to lamellar tearing. The NRC staff requested that the licensee describe the screening criteria used to make this determination.

In Attachment 1 of its March 25, 2003, supplemental letter, the licensee stated that the original bridge structure is constructed of thin plates utilizing small welds. The bridge and its welds were not impacted by this modification. This finding is based on review of CMAA-70

Table 3.4.8-2, the existing girder design drawing, and walkdown of the crane prior to development of final design.

The NRC staff finds that the licensee's response clarifies the staff's concern and is acceptable because the screening criteria used to determine susceptibility to lamellar tearing is based on CMAA-70, as well as inspections.

In response to RG 1.104, positions C.1.b(3), C.1.b(4), C.4.d, and C.3.1, the licensee stated in Attachment 4 of the February 24, 2003, amendment request, that a commercial-grade dedication plan and various nondestructive testing will be implemented. The NRC staff requested that the licensee describe the current status of implementation and available results of nondestructive examinations (NDEs) and fatigue life evaluations.

In Attachment 1 of its March 25, 2003, supplemental letter, the licensee stated that the Ederer quality assurance (QA) program was invoked on the replacement trolley. The Ederer QA program complies with the requirements of 10 CFR Part 50, Appendix B and American National Standards Institute (ANSI)/ASME NQA-1. The program encompasses the procurement of basic components from approved suppliers and the dedication of commercial-grade items by Ederer for use in safety related applications. This dedication was done in accordance with Electric Power Research Institute NP-5652, "Guideline for the Utilization of Commercial Grade Items in Nuclear Safety Related Applications (NCIG-07)." After arrival on site, ANO QA was invoked for the installation process using the engineering design change process. The trolley met the NDE requirements as reflected in EDR-TOP-1 Appendix A, as applicable.

The licensee also stated that the girder and end trucks meet the QA requirements of the original purchase specification. This specification invoked designs per EOCI #61 (CMAA-70) specifying all material to be A-36 steel with a safety factor of 5 for this section. Calculations were performed on the girder and end trucks to verify that the existing welds and connections were adequate for the upgrade. The calculations identified that portions of the girder around the existing wheels required additional support due to the added seismic requirements of the new trolley and MCLs. Additional reinforcement was added along the box girder. Welding, welding procedure qualification, and welder qualifications were performed in accordance with ANSI/AWS D1.1 and D14.1. NDE requirements for this change included Magnetic particle (MT) examination. The results of these calculations are documented in the design change package for the crane upgrade.

The licensee also stated that, in accordance with NUREG-0554, a visual inspection of the existing box girder was performed prior to and following the cold load test. This inspection did not reveal any areas requiring additional rework due to cracked welds or misaligned components. If problems were identified during this step in the installation process, they were to be documented and corrective measures, as necessary, implemented prior to final acceptance. There were no identified deficiencies noted during this inspection that required modification or correction. However, after further discussion with the NRC staff, Entergy committed to perform additional surface NDE of the critical welds associated with the box girder. Based on the licensee's review, the critical welds that could have the potential for girder failure involve certain welds connecting the end trucks to the box girder. Per the licensee's June 30, 2003, supplemental letter, this surface inspection using MT examinations was performed and documented per the Entergy MT examination procedure, which is consistent with AWS D1.1. The acceptance criterion was that any confirmed cracks or linear indications are unacceptable. Individuals performing MT exams were qualified per this Entergy MT

procedure. The proposed NDE was performed prior to lifting a fully loaded cask, which is the MCL.

The licensee also stated that the use of “commercial grade dedication” is meant to demonstrate that all the required controls necessary to meet the requirements of the single-failure-proof crane and those of EDR-1 (P)-A are adequately maintained during the procurement of the new trolley components and during the installation process. Since the crane is non-safety-related, contract purchase documents invoked all the necessary QA requirements to address those requirements of NUREG-0554 and to apply those same requirements as necessary to the installation package. By doing so the entire replacement activity would adequately capture all the QA requirements for meeting single-failure-proof criteria.

The licensee also stated that a fatigue review was performed based on the fatigue stress provisions of CMAA-70. This review is addressed through the re-evaluation of the box girder and its connections to meet the requirements of CMAA. Appendix C to EDR-1 for the ANO L-3 crane has been updated to reflect more appropriate discussion for the 10 CFR Part 50, Appendix B application and is provided in Attachment 2 of the licensee's March 25, 2003, supplemental letter, as updated in Attachment 4 of the licensee's June 30, 2003, supplemental letter.

The NRC staff finds that the licensee’s response provides a reasonable and satisfactory explanation to the NRC staff’s concerns and is considered acceptable because the required controls necessary to meet the single-failure-proof crane criteria of NUREG-0554 have been maintained and the fatigue review was performed to meet CMAA requirements.

Summary of Structural Impacts

Based on its review as discussed above, the NRC staff finds that all structural impacts have been confirmed to meet seismic and load requirements for this application and the existing spent fuel pool crane girder, including the supporting structure, is structurally adequate for the increased loading. In its supplemental letter of March 25, 2003, the licensee committed to perform additional surface NDE of the critical welds in the connection of the end trucks to the box girder. As discussed in the licensee's June 30, 2003, supplemental letter, the MT surface examination of the welds was performed consistent with the AWS D1.1 Standard. The staff finds this acceptable because it satisfies the requirement in NUREG-0544 related to lamellar tearing.

4.0 EXIGENT CIRCUMSTANCES

The amendment application, as supplemented, was submitted on an exigent basis based on the following. The licensee has worked expeditiously to revise the appropriate design basis and to confirm the crane's implementation completeness. The licensee has performed available load lifts within the existing design basis to the extent possible. Additionally, the licensee will be seeking an alternate loading pattern for the ANO-2 spent fuel pool that will alleviate interim space limitations due to degradation of the neutron absorbing boroflex panels. Given the acceptability of the alternate loading pattern amendment, the ANO-2 spent fuel pool will be able to accept a full core offload; however, the spent fuel pool will be severely restricted for other potentially necessary spent fuel pool movements and activities (i.e., fuel examinations). In order to provide critical space in the ANO-2 spent fuel pool, the licensee will need to perform fuel transfers using the new Holtec casks during August 2003. To accomplish the first loading

of the new Holtec cask, preparation for cask component heavy load movement requiring the use of the L-3 crane must start the week of July 28, 2003. This schedule will support demonstration of cask component handling capability as required by 10 CFR Part 72 prior to loading nuclear fuel. Therefore, the licensee requests NRC approval by July 25, 2003, in order to make final preparations for these cask loading activities.

5.0 FINAL NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

The Commission's regulations in 10 CFR 50.92 state that the Commission may make a final determination that a license amendment involves no significant hazards consideration if operation of the facility, in accordance with the amendment, would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, or (2) create the possibility of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. As required by 10 CFR 50.91(a), the licensee has provided its analysis of the issue. The NRC staff's analysis is set forth below.

The proposed amendments would allow the use of the upgraded L-3 crane for loads up to 130 tons, and an upgraded crane will now prevent the load from being dropped given a single malfunction or failure of a portion of the L-3 crane. The transport height of the cask has been increased to a minimum of 1.5 feet and the impact limiters used under the previous cask transport process have been eliminated. The transport of a loaded spent fuel cask is the maximum load that the crane is designed to handle.

This change does not increase the probability of an accident previously evaluated because the probability of a load drop is reduced from that previously analyzed since the crane has been upgraded. The upgraded crane system is designed such that if a portion of the crane lifting devices malfunctions or fails, the load will move a limited distance downward prior to backup restraints becoming engaged. The change does not increase the consequences of an accident because the reasonably probable failures that could cause a load drop result in redundant components in the crane system catching the load prior to the load striking safety-related equipment. Also, the radiological consequences from the impact of the spent fuel contained in the cask has been analyzed under an assumed (albeit incredible) dropped cask event, and they have been determined to be within design basis limits.

The process for transporting a cask is essentially unchanged from that previously performed. Once a cask is loaded with spent fuel, it is lifted from the cask loading pit, transported to the hatch, and lowered to the railroad bay. The cask is never carried over the spent fuel pool. Therefore, the change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

The L-3 crane has been upgraded to comply with the single-failure-proof requirements of NUREG-0554 and NRC-approved Ederer Topical Report EDR-1, Revision 3, dated October 8, 1982. The upgrade includes modifications to provide additional load carrying capability up to 130 tons and additional safety features to prevent a cask drop. The safety margins provided by the upgraded crane have either remained the same or increased to prevent failure of the crane or any lifting devices associated with it. Therefore, the change does not involve a significant reduction in a margin of safety.

Based on the above considerations, the NRC staff concludes that the amendments meet the three criteria of 10 CFR 50.92. Therefore, the staff has made a final determination that the proposed amendments do not involve a significant hazards consideration.

6.0 REGULATORY COMMITMENTS

The following table identifies those actions committed to by the licensee in Attachment 3 of its March 25, 2003, supplemental letter (for Commitment Nos. 1 and 2) and Attachment 5 of its June 30, 2003 supplemental letter (for Commitment No. 3).

No.	Commitment	Type	Completion Date
1	In the interim, the crane minimum operating temperature while operating with the main hoist will be 65°F.	Continuous compliance	Prior to moving loads using the main hoist
2	The licensee will perform additional surface NDE of the critical welds connecting the end trucks of the box girder. This MT surface examination of these welds will be performed consistent with AWS D1.1.	One-time action	Prior to lifting the MCL
3	The licensee will modify appropriate crane operating procedures and will update Ederer Appendices B and C to reflect the completed procedure revisions.	Continuous compliance	Upon NRC Approval of the ANO L-3 Crane proposed license amendment

By supplemental letter dated June 30, 2003, the licensee indicated that Commitment No. 2 had been completed.

The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitments are best provided by the licensee's administrative process, including its commitment management program. The above regulatory commitments do not warrant the creation of regulatory requirements (items requiring prior NRC approval of subsequent changes).

7.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arkansas State official was notified of the proposed issuance of the amendments. The State official had no comments.

8.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The

Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (68 FR 11157, dated March 7, 2003 and 68 FR 41020, dated July 9, 2003). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

9.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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Date: July 25, 2003

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