Entergy

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Jeffery S. Forbes
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1CAN120401

December 20, 2004

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: License Amendment Request
Proposed Operating License Amendment Regarding Uprating of the Tripod Special Lifting Device
Arkansas Nuclear One, Unit 1
Docket No. 50-313
License No. DPR-51

REFERENCES:
1. Entergy letter dated June 8, 1984, *Interim Response to 0CNA038405 Control of Heavy Loads at ANO-1 & 2* (0CAN068402)
2. NRC letter dated October 11, 1984, *Control of Heavy Loads* (0CNA108406)

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Entergy Operations, Inc. (Entergy) hereby requests an Operating License Amendment for Arkansas Nuclear One, Unit 1 (ANO-1) to use the lifting Tripod under increased loads when lifting the new reactor vessel head using the reactor building polar crane. The Tripod is classified as a Special Lifting Device which is used to remove and reinstall the reactor vessel head and certain vessel internals during refueling outages. The polar crane and the lifting devices are being uprated during the 1R19 refueling outage, scheduled for the fall of 2005. A license amendment has been determined to be required under 10 CFR 50.59 since the Tripod requires a change for compliance to the regulatory required design standards. Details of this request are provided in Attachment 1. A proposed change is being made to language in the ANO-1 Safety Analysis Report to reflect this change (Attachment 2).

The proposed change has been evaluated in accordance with 10 CFR 50.91(a)(1) using criteria in 10 CFR 50.92(c) and it has been determined that this change involves no significant hazards consideration. The proposed change includes new commitments as identified in Attachment 3.

Entergy requests approval of the proposed amendment by August 1, 2005. This amendment will be used to support activities associated with the Unit One fall 2005 refueling outage.

A001

If you have any questions or require additional information, please contact Steve Bennett at 479-858-4626.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 20, 2004.

Sincerely,

JSF/sab

Attachments:
1. Analysis of Proposed Operating License Amendment Change
2. Proposed Safety Analysis Report Changes (mark-up)
3. List of Regulatory Commitments

cc: Dr. Bruce S. Mallett
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Attachment 1

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Analysis of Proposed Operating License Amendment Change

Analysis of Proposed Operating License Amendment Change

1.0 DESCRIPTION

The proposed change revises the Arkansas Nuclear One, Unit One (ANO-1) Operating License to allow the use of a Lifting Tripod (Special Lifting Device) which is used to remove and install the reactor vessel head and certain vessel internals during refueling outages. This license amendment request is required by 10 CFR 50.59(c)(2) since Entergy has determined that the Tripod will not meet criterion (c)(2)(vi), *Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the Final Safety Analysis Report.*

Specifically, Entergy will be revising Section 9.6.1.7.1, *Control of Heavy Loads Requirements,* of the ANO-1 Safety Analysis Report (SAR) to state:

> *The reactor vessel head and internals lifting tripod is classified as a special lifting device in accordance with NUREG-0612 which requires these devices to meet ANSI N14.6-1978. ANSI N14.6-1978 specifies that minimum yield strength of the material be used to determine the yield and ultimate strengths. Instead of the minimum yield strength of the material, the actual tripod Certified Materials Test Reports were used to ensure a safety factor of 3 for yield strengths.*

This proposed SAR change is provided in Attachment 2.

2.0 PROPOSED CHANGE

The lifting Tripod which is suspended from the reactor building polar crane is classified as a Special Lifting Device in accordance with NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants.* NUREG-0612 invokes ANSI N14.6-1978, *Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More for Nuclear Materials.* ANSI N14.6-1978, Section 3.2.1.1 states that Special Lifting Devices shall have safety factors of 3 times the yield strength and 5 times the ultimate strength. Section 3.2.1.1 states that this analysis should be performed with minimum material yield strengths (interpreted to not allow actual component material strengths). In addition, NUREG-0612, Section 5.1.1(4) requires that a dynamic factor be included to the static load stresses. As a result, Entergy is unable to meet the specific requirements of ANSI N14.6-1978 when using typical minimum yield material strengths. Therefore, in using actual Tripod Certified Material Test Reports (CMTRs) a safety factor of 3.57 is obtained and Entergy is able to comply with the NUREG-0612 committed requirements.

Therefore, Entergy is proposing to use actual material strength data from the Tripod CMTRs that were provided with the original Tripod procurement.

3.0 BACKGROUND

On December 22, 1981, the NRC issued NUREG-0612 for licensees to expedite review for ensuring proper handling of heavy loads. In a subsequent letter dated February 3, 1981, the NRC issued Generic Letter 81-07 which corrected and extended the date for compliance to Section 2.1 through 2.4 of the NUREG guidance. Section 5.1.1(4) of NUREG-0612 invoked ANSI N14.6-1978 for special lifting device qualification. This included an additional dynamic

load factor in addition to the static load of the limiting load being lifted.

Entergy discussed in letter dated June 8, 1984 (Ref. 1), that the Tripod did not meet the ANSI N14.6-1978 factors of safety to yield and ultimate. However, the NRC staff in letter dated October 11, 1984 (Ref.2) determined that the Tripod still retained a high degree of load handling reliability for meeting NUREG-0612.

As a result of primary water stress corrosion cracking found on the control rod drive mechanism (CRDM) nozzles and welds in the last several outages, Entergy has scheduled replacement of the ANO-1 reactor vessel (RV) closure head during the fall 2005 refueling outage. The new RV head is of similar design to the current head. In addition, Entergy is providing a new service structure and new control rod drive mechanisms (CRDMs). However, the new head, service structure, CRDMs, shield blankets, and most of the RV closure head studs will result in a total Tripod lift weight of approximately 184 tons. This is in excess of the current 150 ton rating of the polar crane and special lifting devices. Therefore, Entergy has chosen to uprate the polar crane to move this load without having to disassemble the components prior to making a move from and onto the head stand during refueling outages. A revised head drop analysis has been performed under the heavier loads and was found to be acceptable with no damage to the fuel or loss of function of operable safety related systems, structures or components.

Since the Tripod is classified as a Special Lifting Device its design and qualification is subject to the requirements of NUREG-0612 and ANSI N 14.6-1978. The following are the key regulatory considerations that are applicable to this license amendment request.

NUREG-0612, Section 5.1.1(4) requests that licensees who are handling loads in excess of 2,000 lbs follow the requirements of ANSI N14.6-1978 for Special Lifting Devices.

ANSI N14.6-1978 states in,

- Section 3.2.1.1 that special lifting devices have a material strength which has a safety factor of 3 to yield and 5 to ultimate.
- Section 3.2.1.1 that this analysis should be performed with minimal material yield strengths (interpreted to not allow actual component CMTR strengths),
- Section 5.2.1, *Acceptance Testing*, that each device shall be subjected to a load test equal to 150% of the maximum load to which the device is to be subjected.

In addition, NUREG-0612, Section 5.1.1(4) requires that the stress design factor stated in Section 3.2.1.1 of ANSI N14.6 should be based on the combined maximum static and dynamic loads that could be imparted on the handling device based on characteristics of the crane which will be used. However, NUREG-0612 does not provide a specific dynamic factor, but states that the overall stress design factor should be based on the combined maximum static and dynamic loads that could be imparted on the handling device. Therefore, CMAA (Crane Manufacturers Association of America) 70-1983, Specifications for Electric Overhead Traveling Cranes, will be used to provide guidance on determining appropriate dynamic factors. Section 3.3.2.1.1.4.2 of CMAA 70-1983, *Hoist Load Factor*, states that hoist load factor is 0.005 times the hoisting speed in feet per minute (fpm), but not less than 0.15 times the static load. The hoisting speed of the ANO-1 polar crane is approximately 4 fpm, which results in a load factor of 0.02 well below the 0.15 minimum dynamic factor. Therefore, Entergy is applying a dynamic factor of 0.15 to the static load.

The portion of the lifting Tripod that does not meet the ANSI N14.6-1978 criteria is the lifting eye as shown on the attached diagram. The lifting eye provides the interface between the frame of the Tripod and the load cell that provides weight measurements of the lifting devices and the load below the polar crane. The lifting eye is constructed of a single machined billet of steel. The legs of the Tripod are directly welded to the lower part of the lifting eye. Entergy has determined that the lifting eye portion of the Tripod cannot be modified or redesigned without creating additional structural and alignment concerns. Entergy believes that the existing Tripod retains sufficient design margin to warrant continued use with the new loads being planned.

4.0 TECHNICAL ANALYSIS

An analysis of the stresses on the Tripod has been performed under the guidance of NUREG-0612 and ANSI N14.6-1978. The design load for the Tripod is the nominal static lift load of the reactor vessel closure head and support structure with an additional 15% dynamic loading factor due to vertical hoisting. The polar crane and lifting devices are being conservatively uprated to 190 tons.

Nominal Static load = 190 Tons = 380,000 lbs. = 380 kips.

Design Load = 1.15 times 380 kips = 437 kips.

The following allowable stresses are based on the ratio of the allowable stresses provided in ANSI N14.6-1978, Paragraph 3.2.1, which are 1/3 Yield Strength (S_y) or 1/5 of Ultimate Tensile Strength (S_u) and the allowable stresses in ASME Code, Section III, Paragraph NF-3322-1.

Given:

- Tensile Stress, F_t = 1/3 S_y but not to exceed 1/5 S_u
- Tensile Stress at pin holes $F_{t@ph}$ = 3/4 F_t
- Shear Stress, F_v = 2/3 F_t
- Bearing Stress, F_p = 1 ½ F_t
- Compressive Stress = [Allowable Compressive Stress ÷ 0.6 S_y] x F_t
- Bending Stress = [Allowable Bending Stress ÷ 0.6 S_y] x F_t
- Design Temperature = 100° F ambient temperature

The steel shall meet the requirements of the ASTM A36.

Minimum Yield Strength:	F_y or S_y= 36 ksi at ambient temperature
Ultimate Tensile Strength:	F_u or S_u = 58 ksi at ambient temperature (lowest value),

Minimum edge distance requirements were applied per ASME Section III, NF-3324.6 (b) (1): *"Minimum Edge Distance in Line of Load*: In both bearing and friction type joints, the minimum distance from the center of the end bolt in a connection to that edge of the connected part towards which the load is directed is determined in accordance with either NF-3324.6 (b)(1)(a) or (b)(1)(b).

Results of analysis:

At pinhole of Tripod eye using the minimum material yield strengths of ASTM A36 steel:

Max. Tensile Stress = 8.35 ksi < 0.75 x (1/5) x 58 ksi = 8.7 ksi allowable.
Interaction Ratio (IR) = 0.96 <1.0 [safety factor of 3.125 to yield] Acceptable

Max. Bearing Stress = 11.65 ksi < 1.50 x (1/5) x 58 ksi = 17.40 ksi allowable.
Interaction Ratio = 0.67 <1.0 [safety factor of 4.478 to yield] Acceptable

Max. Shear Stress = 8.35 ksi > 7.73 ksi allowable based on (2/3) x [minimum of (1/3) x 36 ksi, (1/5) x 58 ksi]

= IR =8.35 ÷ 7.73 = 1.08 > 1.0 [safety factor of 2.78 to yield] Not Acceptable.

At pinhole of Tripod eye using the allowable stresses based on Certified Material Test Report data:

CMTR Yield Strength: F_y or S_y = 46.5 ksi at ambient temperature
CMTR Ultimate Tensile Strength: F_u or S_u = 74.3 ksi at ambient temperature,

Allowable Shear Stress based on 1/3 of Test Certificate Yield Strength =
(2/3) x (1/3) x 46.5 = 10.33 ksi.

Allowable Shear Stress based on 1/5 of Test Certificate Ultimate Tensile Strength =
(2/3) x (1/5) x 74.3 = 9.93 ksi. [controlling]

Max. Shear Stress = 8.35 ksi < 9.93 ksi allowable as shown above.

IR = 8.35 ÷ 9.93 = 0.84 <1.0 [safety factor of 3.57 to yield] Acceptable

The safety factor of 3 required by ANSI N14.6-1978 already provides a significant safety margin over the actual loads being lifted by the Tripod. Using actual CMTRs the ANO-1 Tripod will exceed the safety factor of 3 to yield, which provides a fully acceptable design margin for the Tripod material strengths. Entergy will also perform a load test of the Tripod at 150% of the static load increased by 1.15 for the dynamic load factor per ANSI N14.6-1978. The minimum edge distance requirements were confirmed to be met. Therefore, Entergy believes that the proposed change meets the intent of ANSI N14.6-1978 by assuring that the safety factor of 3 to yield is met.

5.0 REGULATORY ANALYSIS

5.1 Applicable Regulatory Requirements/Criteria

5.1.1 10 CFR 50, Appendix A General Design Criteria, The ANO-1 Tripod is not safety related and does not provide a fission product boundary or mitigate any design basis accidents. None of the General Design Criteria applies to the special lifting devices.

5.1.2 ANO-1 Safety Analysis Report (SAR) – The ANO-1 SAR in Section 9.6.1.7.1 *Control of Heavy Loads Requirements* states that the ANO-1 licensing basis for NUREG-0612 is based on the NRC's Safety Evaluation Report (SER) of October 11, 1984. In the SER, the NRC accepted a lower safety factor to yield and ultimate strengths for this same Tripod. The basis for the acceptance was that the actual loads of the RV head were well below the design rating. However, Entergy has determined with the uprating of the crane that the previous licensing basis should not be applied to new or uprated equipment. Therefore, a change to the SAR is being proposed that will allow the actual CMTRs to be used for the ANO-1 Tripod.

5.2 No Significant Hazards Consideration

The proposed change revises the Arkansas Nuclear One, Unit One (ANO-1) Operating License to allow the use of the existing Tripod (designed as a Special Lifting Device) which is used to remove and set the reactor vessel head during refueling outages. Specifically, Entergy will revise Section 9.6.1.7.1 of the ANO-1 Safety Analysis Report (SAR) to state:

> *The reactor vessel head and internals lifting tripod is classified as a special lifting device in accordance with NUREG-0612 which requires these devices to meet ANSI N14.6-1978. ANSI N14.6-1978 specifies that minimum yield strength of the material be used to determine the yield and ultimate strengths. Instead of the minimum yield strength of the material, the actual tripod Certified Materials Test Reports were used to ensure a safety factor of 3 for yield strengths.*

This license amendment request is required by 10 CFR 50.59(c)(2) since Entergy has determined that the Tripod will not meet criterion (c)(2)(vi), *Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the Final Safety Analysis Report.*

1. *Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?*

   Response: No

   The ANO-1 Tripod does not perform a safety function required by 10 CFR 50. The Tripod serves to perform heavy load movements during refueling outages including the reactor vessel head. Safe load paths have been established in accordance with NUREG-0612 to ensure that the fuel and safety related equipment required to be inservice are protected. Use of actual Tripod eyelet Certified Material Test Reports (CMTRs) demonstrates that a safety factor of 3 to yield is maintained and that the lifting devices will perform their design function under maximum lifted loads. The Tripod does not serve any mitigative functions to lessen accidents.

   Therefore, the proposed change does not affect the probability or consequences of any ANO-1 analyzed accidents.

2. *Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?*

   Response: No

   The only time that the Tripod is performing heavy loads movements is during Refueling operations. Safe load paths and load drop analyses have been performed to assure that heavy loads movements will not cause fuel damage or cause safety related equipment to become inoperable. The proposed use of CMTRs instead of minimum yield strength of the material still assures that the Tripod will perform its required function to not create an accident. In addition, there is no change to the operation of the Tripod that would create a new failure mode or possible accident.

   Therefore, the proposed change does not create the possibility of a new or different type of accident from any accident previously evaluated.

3. *Does the proposed change involve a significant reduction in a margin of safety?*

   Response: No

   The design margin for the Tripod is established by NUREG-0612 and ANSI N14.6-1978. A factor of safety of 3 for yield strength and 5 for ultimate strength for both the static and dynamic load factors is required to be met. These factors of safety provide sufficient margin to assure that the Tripod will perform its design function of maximum lifted loads. In addition, the use a dynamic load factor of 1.15 above the static load is well above the actual dynamic factor to be experienced from the design lift speed of the polar crane. The use of CMTRs does not result in a significant reduction in the margin of safety of the Tripod. In addition, the Tripod will be load tested to 150% of its design static and dynamic loading which will further assure adequate safety margin.

   Therefore, the margin of safety is not changed by the proposed change to the ANO-1 SAR.

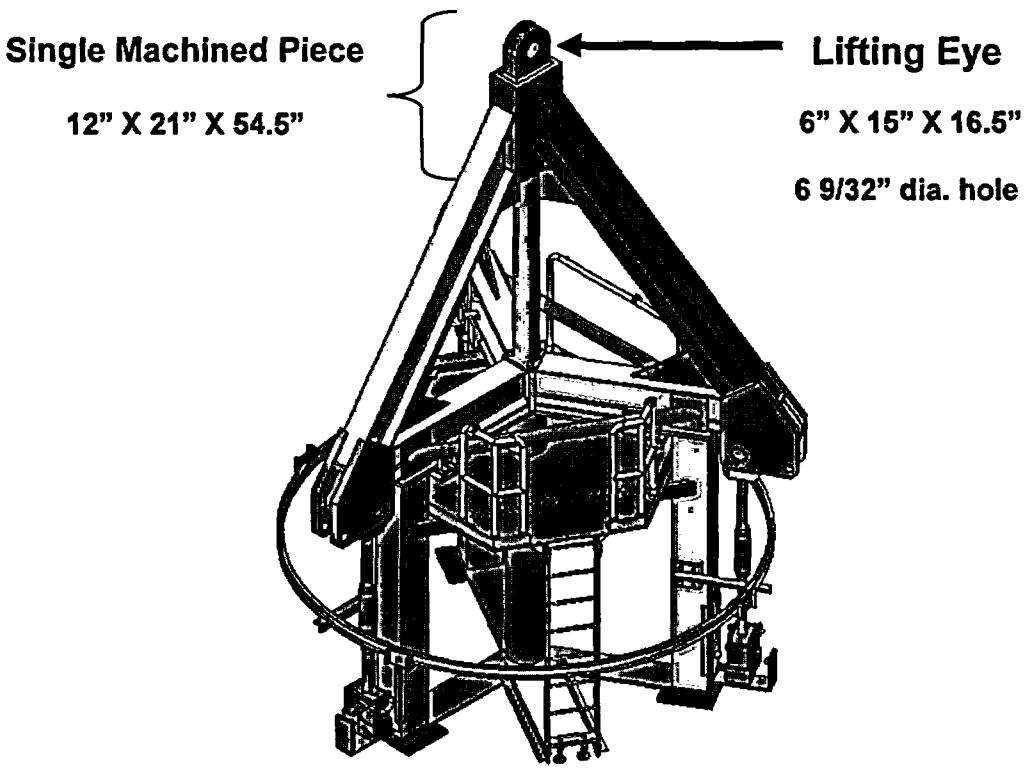
5.3 Environmental Consideration

The proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 PRECEDENCE

Entergy is not aware of other licensees who have sought approval for using CMTRs instead of minimum yield strength for Special Lifting Devices per ANSI N14.6-1978.

Diagram of RV Closure Head Lifting Tripod



Attachment 2

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Proposed Safety Analysis Report Changes (mark-up)

the emergency drum brake system sets, controlling load if all power is removed from the hoist and the load starts to lower. This system is normally not set during normal duty cycles.

9.6.1.7.1 Control of Heavy Loads Requirements

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" contains the NRC guidance to ensure that load handling systems are designed and operated such that their probability of failure is low and appropriate for the critical tasks in which they are employed. There are eleven (11) cranes installed in ANO-1 that fall under the guidelines of NUREG-0612. They are (1) the Reactor Building Polar Crane (Equipment No. L2); (2) the Fuel Handling Crane (L3); (3) the Auxiliary Fuel Handling Crane (a 2-ton monorail attached to L3); (4) the Intake Structure Gantry Crane (L7); (5 - 8) four (4) Reactor Coolant Pump Maintenance Jib Cranes (L32, L32B, L32C, L32D); the Reactor Building General Maintenance Crane (L37); and the Turbine Building Cranes (L-1 and 2L-1) when used to lift loaded spent fuel casks. ANO-1 has implemented the NUREG-0612 Phase 1 guidance for these load handling systems. In a Safety Evaluation issued in October 1984 (0CNA108406), the NRC concluded that the Phase I requirements of NUREG-0612 had been satisfied for ANO-1 for the Reactor Building Polar Crane, the Fuel Handling and Auxiliary Fuel Handling Cranes, and the Intake Structure Gantry Crane. In a June 26, 1985 generic letter (Generic Letter 85-11) (0CNA068520), the NRC further concluded that the NUREG-0612 Phase II effort was considered complete.

The four Reactor Coolant Pump Maintenance Jib Cranes are installed on top of the Steam Generator Cavities and are used to service the Reactor Coolant Pumps, Steam Generators, and Pressurizer. These cranes are 2-ton capacity wire rope hoists which are designed, operated and maintained in accordance with ANSI/ASME B30.11c-1992 and B30.16c-1992. The Reactor Building General Maintenance Crane is a 10-ton capacity, electromechanical boom crane which is designed in accordance with the requirements of API-2c, 4th Ed. and the applicable sections of ANSI/ASME B30.5b-1992. These cranes are seismically designed in their unloaded condition. The jib crane hoists are removed and stored outside the Reactor Building during power operations and the jib crane booms remain installed and are secured to withstand an SSE during power operations. The boom crane is stored in a secure position inside the Reactor Building during power operations with its boom secured to a boom storage structure.

The reactor vessel head and internals lifting tripod is classified as a special lifting device in accordance with NUREG-0612 which requires these devices to meet ANSI N14.6-1978. ANSI N14.6-1978 specifies that minimum yield strength of the material be used to determine the yield and ultimate strengths. Instead of the minimum yield strength of the material, the actual tripod Certified Materials Test Reports were used to ensure a safety factor of 3 for yield strengths.

9.6.2 SYSTEM DESCRIPTION AND EVALUATION

9.6.2.1 Receiving and Storing Fuel

New fuel assemblies are received in shipping containers and then transferred to dry storage racks or spent fuel storage racks which can then be transferred to the reactor building through the transfer canal. This is accomplished by lifting a new fuel assembly from the new fuel racks and placing it in the new fuel elevator which is attached to the side of the spent fuel pool. The elevator is in its highest position, such that the top of the fuel extends out of the water. When the elevator receives a new fuel assembly, it is lowered to the bottom of the pool where the fuel storage handling bridge can lift it from the container and place it in the spent fuel storage racks.

Attachment 3

1CAN120401

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONT COMPL	
Entergy will revise Section 9.6.1.7.1 of the ANO-1 SAR to allow use of CMTRs instead of minimum material yield strengths.	X		The next ANO-1 SAR amendment after NRC approval of the license amendment.