

April 11, 2002

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

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 2 - ISSUANCE OF AMENDMENT  
RE: REACTOR COOLANT PUMP FLYWHEEL INSPECTION INTERVAL  
(TAC NO. MB2552)

Dear Mr. Anderson:

The Commission has issued the enclosed Amendment No. 241 to Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit No. 2. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated July 31, 2001, as supplemented by letter dated February 5, 2002.

The amendment revises the TSs to allow an extension of the three-year inspection interval of the reactor coolant pump flywheel volumetric examination to 10 years. In addition, the inspection interval requirement would be moved to the administrative controls section of the TSs.

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/

Michael K. Webb, Project Manager, Section 1  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosures:

1. Amendment No. 241 to NPF-6
2. Safety Evaluation

cc w/encls: See next page

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OFFICIAL RECORD COPY

ENERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.241  
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 July 31, 2001, as supplemented by letter dated February 5, 2002, 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, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-6 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No.241, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. The license amendment is effective as of its date of issuance and shall be implemented within 60 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

Attachment: Changes to the Technical  
Specifications

Date of Issuance: April 11, 2002

ATTACHMENT TO LICENSE AMENDMENT NO. 241

FACILITY OPERATING LICENSE NO. NPF-6

DOCKET NO. 50-368

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove

3/4 4-26  
6-5

Insert

3/4 4-26  
6-5

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 241 TO

FACILITY OPERATING LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By letter dated July 31, 2001, as supplemented by letter dated February 5, 2002, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Arkansas Nuclear One, Unit No. 2 (ANO-2), Technical Specifications (TSs). The amendment revises the TSs to allow an extension of the three-year inspection interval of the reactor coolant pump (RCP) flywheel volumetric examination to 10 years. In addition, the inspection interval requirement would be moved to the administrative controls section of the TSs.

The February 5, 2002, supplemental letter provided additional information as a basis for demonstrating that the ANO-2 RCP flywheels have sufficient fracture toughness to defer their inspection interval to a 10-year frequency. The February 5, 2002, supplemental letter did not change the scope of the original *Federal Register* Notice (66 FR 44167, August 22, 2001) or the initial no significant hazards consideration determination.

2.0 BACKGROUND

The function of the RCPs in the reactor coolant system (RCS) of a pressurized water reactor (PWR) plant is to maintain an adequate cooling flow rate by circulating a large volume of primary coolant water at high temperature and pressure through the RCS. A concern over overspeed of the RCP and its potential for failure led to the issuance of Regulatory Guide (RG) 1.14, "Reactor Coolant Pump Flywheel Integrity," in 1971. Since then, all licensees for PWR plants, with very few exceptions, have adopted the guidelines of RG 1.14 to conduct their RCP flywheel examinations. These requirements are normally specified in the individual plant's TSs as is the case for ANO-2.

3.0 DISCUSSION

The periodicity of RCP inspections was addressed in the ABB Combustion Engineering (CE) Topical Report SIR-94-080A, "Relaxation of Reactor Coolant Pump Flywheel Inspection Requirements," which was approved by the United States Nuclear Regulatory Commission (NRC) with certain conditions. These conditions are specified in the safety evaluation (SE) dated May 21, 1997, for SIR-94-080A. The licensee intended to apply this topical report

to ANO-2 and change its RCP flywheels inspection intervals in accordance with the conclusion of the SE on SIR-94-080A.

#### 4.0 EVALUATION

In the SE to SIR-94-080A, the NRC staff concluded, "(1) all flywheels meet the proposed non-ductile fracture criteria and will have adequate fracture toughness during their service periods, and (2) all flywheels except those for Waterford 3 satisfy the excessive deformation criterion of RG 1.14." This conclusion was based on the fracture toughness ( $K_{Ic}$ ) values reported in SIR-94-080A for all participating plants, including ANO-2. In the SE on SIR-94-080A, the NRC staff required the applicant to verify the reference temperature  $RT_{NDT}$ , and to justify the use of the  $K_{Ic}$  versus  $(T-RT_{NDT})$  curve in Appendix A of Section XI of the American Society of Mechanical Engineers (ASME) Code for flywheels made of materials other than SA 533 B and SA 508.

The licensee indicated in its submittal that the original ANO-2 RCP flywheels were made from ASTM A-533, Grade B, Class 1, low carbon steel plate, partially fulfilling the requirements of the SE. However, due to the lack of Charpy test data, the licensee could not establish the  $RT_{NDT}$  value for the limiting flywheel material strictly according to the ASME Code. Instead, a plant-specific extrapolation has been used to extract information from the three Charpy values, 63, 65, and 68 ft-lb, tested at 150°F.

The licensee's extrapolation included the use of a selected test data (68 ft-lb, 150°F) as the reference point, a slope of 2°F/ft-lb for the postulated line representing the transition region of the Charpy curve, and the 50 ft-lb Charpy energy as the point to be extrapolated to. The slope was derived from studying a large number of full Charpy curves for A-533, Grade B and related materials. Using this approach, the licensee obtained a temperature of 114°F for the extrapolated point corresponding to an energy of 50 ft-lb on the Charpy curve. The licensee then adopted a conservative interpretation of NB-2331 of Section III of the ASME Code to arrive at the  $RT_{NDT}$  value of 54°F (114°F-60°F) for the limiting flywheel material. Based on the  $RT_{NDT}$  value and the operation temperature of 112°F for the flywheel, the licensee used the  $K_{Ic}$  versus  $(T-RT_{NDT})$  curve in the ASME Code (the ASME  $K_{Ic}$  curve) and obtained a value of 99.3 ksi $\sqrt{in}$  for the limiting flywheel material. Since this value is essentially the same as the 100 ksi $\sqrt{in}$  value, which was assumed in the fracture mechanics evaluation of the ANO-2 flywheels in SIR-94-080A, the licensee concluded that the  $RT_{NDT}$  and  $K_{Ic}$  values for the ANO-2 flywheels are acceptable and the inspection interval of the flywheels could be extended from approximately 3 to 10 years.

The NRC staff has examined the licensee's determination of  $RT_{NDT}$  values using limited Charpy energy data to determine whether the proposed methodology, while not completely in accordance with the ASME Code, is considered an acceptable variation in this case. The use of the test data with the highest energy, 68 ft-lb, as the reference point is acceptable because the percent shear and lateral expansion for the three data points at 150°F indicated that they are well in the upper-shelf region. Therefore, using the data point with the highest energy would offset some conservatism associated with assuming that the reference point is right at the top of the transition region line. The use of a slope of 2°F/ft-lb for the postulated line representing the transition region of the Charpy curve is also appropriate, considering the rather large database of vessel base materials with full Charpy curves (approximately 125) and A-533,

Grade B material with full curves (approximately 55), from which the slope was derived. The last step in determining the  $RT_{NDT}$  value for the limiting flywheel material involved a conservative interpretation of NB-2331; consequently, the NRC staff agreed with the licensee that the  $RT_{NDT}$  value of 54°F could be used in determining the fracture toughness for the limiting flywheel material.

The operating temperature of the flywheel, which is needed for the derivation of the fracture toughness of the material, was determined to be 112°F by the licensee. Although the operating temperature assumed in the CE Topical Report was 100°F, the NRC staff found that the licensee had presented a convincing qualitative analysis supported by a number of measured, plant-specific temperature data throughout the RCPs. Hence, the licensee has demonstrated that the plant-specific operating temperature for the ANO-2 RCP flywheels is 112°F. Since the fracture toughness (99.3 ksi√in) obtained for the limiting flywheel material using the ASME  $K_{Ic}$  versus  $(T-RT_{NDT})$  curve is essentially the same as that assumed in the CE Topical Report, the NRC staff concluded that the condition for applying the topical report is satisfied and the structural integrity of the RCP flywheels has been demonstrated.

#### Evaluation Summary

The NRC staff has determined that the analysis in the submittal meets the intent of the ABB CE Topical Report SIR-94-080A. Hence, the NRC staff concluded that the structural integrity of the RCP flywheels has been demonstrated and the inspection interval of the flywheels in the TSs could be extended from approximately 3 to 10 years.

#### 5.0 STATE CONSULTATION

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

#### 6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves 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 amendment involves no significant hazards consideration, and there has been no public comment on such finding (66 FR 44167, dated August 22, 2001). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and (c)(10). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

#### 7.0 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: S. Sheng

Date: April 11, 2002

Arkansas Nuclear One

cc:

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