

Mr. Jerry W. Yelverton
Vice President, Operations ANO
Entergy Operations, Inc.
Route 3 Box 137G
Russellville, Arkansas 72801

Dear Mr. Yelverton:

SUBJECT: ISSUANCE OF AMENDMENT NO. 142 TO FACILITY OPERATING LICENSE
NO. NPF-6 - ARKANSAS NUCLEAR ONE, UNIT NO. 2 (TAC NO. M84099)

The Commission has issued the enclosed Amendment No. 142 to Facility Operating License No. NPF-6 for the Arkansas Nuclear One, Unit No. 2 (ANO-2). This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated July 22, 1992, as supplemented by letter dated September 11, 1992.

The amendment revises the surveillance requirements for steam generator (SG) tubing, TS 4.4.5 and associated Bases, to allow the use of Combustion Engineering Nuclear Services (CENS) sleeves for tube repair in the SGs.

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

Sincerely,

Original signed by
Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:

- 1. Amendment No. 142 to NPF-6
- 2. Safety Evaluation

cc w/enclosures:
See next page

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Docket File NRC/Local PDR PD4-1 Reading
T. Alexion(2) M. Virgilio J. Larkins
P. Noonan ACRS(10)(MSP315) OGC(MS15B18)
D. Hagan(MS3206) G. Hill(4) Wanda Jones(MS7103)
C. Grimes(MS11E22) PD4-1 Plant File OPA(MS2G5)
OC/LFMB(MS4503) W. Johnson, RIV R. Young
H. Conrad

CP-1

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NAME	PNoonan	RYoung	TAlexion	JStrosnider	J / K	GHubbard
DATE	9/22/92	9/22/92	9/23/92	9/24/92	9/29/92	1/22/93

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

January 26, 1993

Docket No. 50-368

Mr. Jerry W. Yelverton
Vice President, Operations ANO
Entergy Operations, Inc.
Route 3 Box 137G
Russellville, Arkansas 72801

Dear Mr. Yelverton:

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

Sincerely,

A handwritten signature in cursive script that reads "Thomas W. Alexion".

Thomas W. Alexion, Project Manager
Project Directorate IV-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:

1. Amendment No. 142 to NPF-6
2. Safety Evaluation

cc w/enclosures:
See next page

Mr. Jerry W. Yelverton
Entergy Operations, Inc.

Arkansas Nuclear One, Units 1 & 2

cc:

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Pope County Courthouse
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Ms. Greta Dicus, Director
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4815 West Markham Street
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ENERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 142
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 22, 1992, as supplemented by letter dated September 11, 1992, 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. 142 , 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.

FOR THE NUCLEAR REGULATORY COMMISSION

Paul W. Oleno

for George T. Hubbard, Acting Director
Project Directorate IV-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: 1/26/93

ATTACHMENT TO LICENSE AMENDMENT NO. 142

FACILITY OPERATING LICENSE NO. NPF-6

DOCKET NO. 50-368

Revise the following pages of the Appendix "A" Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

REMOVE PAGES

3/4 4-9

3/4 4-10

B 3/4 4-3

INSERT PAGES

3/4 4-9

3/4 4-10

B 3/4 4-3

REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

10. Preservice Inspection means an inspection of the full length of each tube in each steam generator performed by eddy current techniques prior to service to establish a baseline condition of the tubing. This inspection shall be performed after the field hydrostatic test and prior to initial POWER OPERATION using the equipment and techniques expected to be used during subsequent inservice inspections.

b. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug or repair all tubes exceeding the plugging or repair limit and all tubes containing through-wall cracks) required by Table 4.4-2. Defective tubes may be repaired in accordance with:

- 1) B&W Topical Report BAW-2045PA-00 as supplemented by the information provided in B&W Report 51-1212539-00, "BWNS Kinetic Sleeve Design-Application to ANO Unit 2".
- 2) CENS Report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July, 1992

4.4.5.5 Reports

a. Following each inservice inspection of steam generator tubes the number of tubes plugged or sleeved in each steam generator shall be reported to the Commission within 15 days.

b. The complete results of the steam generator tube inservice inspection shall be reported on an annual basis for the period in which the inspection was completed. This report shall include:

1. Number and extent of tubes inspected.
2. Location and percent of wall-thickness penetration for each indication of an imperfection.
3. Identification of tubes plugged or sleeved.

c. Results of steam generator tube inspections which fall into Category C-3 shall be reported in a Special Report pursuant to Specification 6.9.2 as denoted by Table 4.4-2. Notification of the Commission will be made prior to resumption of plant operation. The written Special Report shall provide a description of investigations conducted to determine cause of the tube degradation and corrective measures taken to prevent recurrence.

REACTOR COOLANT SYSTEM

BASES

Wastage-type defects are unlikely with proper chemistry treatment of the secondary coolant. However, even if a defect should develop in service, it will be found during scheduled inservice steam generator tubes examinations. Plugging or sleeving will be required for all tubes with imperfections exceeding the plugging or repair limit as defined in Surveillance Requirement 4.4.5.4.a. Defective tubes may be repaired by sleeving in accordance with the B&W Topical Report BAW-2045PA-00 as supplemented by the information provided in B&W Report 51-1212539-00, "BWNS Kinetic Sleeve Design-Application to ANO Unit 2" or CENS Report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July, 1992. Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect degradation that has penetrated 20% of the tube wall thickness. For sleeved tubes, the adequacy of the system that is used for periodic inservice inspection will be validated. Additionally, upgraded testing methods will be evaluated and appropriately implemented as better methods are developed and validated for commercial use.

Whenever the results of any steam generator tubing inservice inspection fall into Category C-3 certain results will be reported in a Special Report to the Commission pursuant to Specification 6.9.2 as denoted by Table 4.2-2. Notification of the Commission will be made prior to resumption of plant operation. Such cases will be considered by the Commission on a case-by-case basis and may result in a requirement for analysis, laboratory examinations, tests, additional eddy-current inspection, and revision of the Technical Specifications, if necessary.

3/4.4.6 REACTOR COOLANT SYSTEM LEAKAGE

3/4.4.6.1 LEAKAGE DETECTION SYSTEMS

The RCS leakage detection systems required by this specification are provided to monitor and detect leakage from the Reactor Coolant Pressure Boundary. These detection systems are consistent with the recommendations of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems" May 1973.

3/4.4.6.2 REACTOR COOLANT SYSTEM LEAKAGE

Industry experience has shown that while a limited amount of leakage is expected from the RCS, the unidentified portion of this leakage can be reduced to a threshold value of less than 1 GPM. This threshold value is sufficiently low to ensure early detection of additional leakage.

The 10 GPM IDENTIFIED LEAKAGE limitation provides allowances for a limited amount of leakage from known sources whose presence will not interfere with the detection of UNIDENTIFIED LEAKAGE by the leakage detection systems.

The Surveillance Requirements for RCS Pressure Isolation Valves provide added assurance of valve integrity thereby reducing the probability of gross valve failure and consequent intersystem LOCA. Leakage from the RCS Pressure Isolation Valves is IDENTIFIED LEAKAGE and will be considered as a portion of the allowed limit.

ATTACHMENT TO LICENSE AMENDMENT NO. 142

FACILITY OPERATING LICENSE NO. NPF-6

DOCKET NO. 50-368

Revise the following pages of the Appendix "A" Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change.

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REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

4.4.5.4 Acceptance Criteria

a. As used in this Specification

1. Tubing or Tube means that portion of the tube or sleeve which forms the primary system to secondary system pressure boundary.
2. Imperfection means an exception to the dimensions, finish or contour of a tube from that required by fabrication drawings or specifications. Eddy-current testing indications below 20% of the nominal tube wall thickness, if detectable, may be considered as imperfections.
3. Degradation means a service-induced cracking, wastage, wear or general corrosion occurring on either inside or outside of a tube.
4. Degraded Tube means a tube containing imperfections $\geq 20\%$ of the nominal wall thickness caused by degradation.
5. % Degradation means the percentage of the tube wall thickness affected or removed by degradation.
6. Defect means an imperfection of such severity that it exceeds the plugging or repair limit. A tube containing a defect is defective.
7. Plugging or Repair Limit means the imperfection depth at or beyond which the tube shall be removed from service by plugging or repaired by sleeving because it may become unserviceable prior to the next inspection. The plugging or repair limit is equal to 40% of the nominal parent tube and sleeve wall thickness for sleeves installed in accordance with B&W Topical Report BAW-2045-PA-00 as supplemented by the information provided in B&W Report 51-1212539-00, "BWNS Kinetic Sleeve Design - Application to ANO Unit 2". The plugging limit is equal to 34% of the nominal sleeve wall thickness for sleeves installed in accordance with CENS Report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July, 1992.
8. Unserviceable describes the condition of a tube if it leaks or contains a defect large enough to affect its structural integrity in the event of an Operating Basis Earthquake, a loss-of-coolant accident, or a steam line or feedwater line break as specified in 4.4.5.3.c, above.
9. Tube Inspection means an inspection of the steam generator tube from the point of entry (hot leg side) completely around the U-bend to the top support of the cold leg.

REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS (Continued)

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 142 TO

FACILITY OPERATING LICENSE NO. NPF-6

ENERGY OPERATIONS, INC.,

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By letter dated July 22, 1992, as supplemented by letter dated September 11, 1992, Entergy Operations, Inc. (the licensee) submitted a request for changes to the Arkansas Nuclear One, Unit No. 2 (ANO-2) Technical Specifications (TSs). The requested changes would revise the surveillance requirements of Technical Specification (TS) 4.4.5, "Steam Generators," to reference CEN-601-P, Revision 01-P (proprietary), "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves," dated July 1992, to allow for the repair of defective steam generator (SG) tubes through the installation of SG tube repair sleeves of the type supplied by Combustion Engineering Nuclear Services (CENS).

The September 11, 1992, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

CENS will provide three types of sleeves for SG tube repair. These are a straight tubesheet sleeve, an eggcrate support (ECS) sleeve, and an expansion transition zone (ETZ) sleeve. The straight tubesheet sleeve and the eggcrate support sleeve are welded to the SG parent tubes near each end of the sleeve. The ETZ sleeve is hard-rolled into the tubesheet just below the expansion zone and welded to the parent tube above the tubesheet. After welding, the welded joints in all three types of sleeves are given a stress-relief heat treatment to improve their corrosion resistance.

The ETZ sleeve spans the expansion transition zone at the top of the tubesheet to above the first eggcrate, where it is welded to the parent tube. At the lower end there is a hard roll joint.

Analysis and testing were performed on the CENS sleeves and sleeve-to-tube joints to demonstrate that design criteria was satisfied under normal operating and postulated accident conditions. The details of the sleeve qualifications are discussed in report CEN-601-P, "ANO-2 Steam Generator Tube

Repair Using Leak Tight Sleeves," Revision 01-P, dated July 1992 (proprietary).

3.0 DISCUSSION

For the CENS sleeving process, analytical verification was performed using design and operating transient parameters selected to envelope loads imposed during normal operating, upset, and accident conditions. Fatigue and stress analysis of sleeved-tube assemblies were completed in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III. The results of the qualification testing, analyses, and plant operating experience were cited to demonstrate that the sleeving process is an acceptable means of maintaining SG tube integrity. The sleeve assemblies can be inspected by current techniques in accordance with the recommendations of Regulatory Guide (RG) 1.83, "Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes."

The function of the sleeves is to restore the integrity of the tube pressure boundary. The sleeves have been shown not to be subject to stress levels in excess of allowable limits for normal and postulated accident loading conditions. The sleeves have been designed and analyzed in accordance with the applicable sections of the ASME Boiler and Pressure Vessel Code. To determine the basis for the sleeve plugging limits, the minimum wall thickness of each of the sleeve designs was calculated in accordance with RG 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes."

The material of construction of the sleeves will be thermally treated (TT) nickel Alloy 690, which is widely accepted as an improvement over the Alloy 600 material used in the original SG tubing. Corrosion tests in primary and secondary side environments confirm improved corrosion resistance of TT Alloy 690 over that of Alloy 600. Alloy 690 is a Code approved material (ASME SB-163), covered by ASME Code Case N-20-3, and is acceptable to NRC under RG 1.85, Rev. 28, April 1992, "Materials Code Case Acceptability ASME Section III Division 1." The NRC staff has approved use of TT Alloy 690 tubing in replacement SGs as well as previous sleeving applications.

4.0. EVALUATION

The CEN-601-P report describes the CENS sleeve design and installation processes, the analytical methods, the laboratory testing programs, and the results that were used to verify the adequacy of their sleeving methodology for sleeving degraded or defective SG tubes. The sleeve dimensions, materials, and joints were designed to the applicable ASME Boiler and Pressure Vessel Code. An extensive analysis and test program was undertaken to prove the adequacy of the sleeves. The program determined the effect of normal operating and postulated accident conditions on the sleeve-tube assembly, as well as the adequacy of the assembly to perform its intended function.

Since the straight tubesheet and ECS sleeves are welded at both ends to the tube being sleeved, this process should provide a leak-tight repair. The hard-rolled expansion zone sleeve uses a special technique to improve the sealing of the sleeve to the parent tube and is designed to be a leak-tight sleeve. Since the NRC has not required that sleeve repairs be leak-tight (only leak-limiting), the staff did not qualify the adequacy of the sleeve for leak-tightness; it has only satisfied itself that the sleeve meets the requirements for a leak-limiting sleeve equivalent to other types of sleeves that do not have a metallurgically bonded (fusion welded) joint. According to the licensee, the hard-rolled sleeve joint process is essentially the same as is used for the CENS mechanical SG tube plug and is based on experience with over 7000 plugs, used in over 24 units. This favorable service experience, in addition to corrosion tests, is cited to qualify the rolled joint as not being susceptible to primary or secondary side stress corrosion cracking. A post-weld stress relieving heat treatment has been developed that has been shown to increase the resistance of the welded joint to stress corrosion cracking. The licensee has stated that the welded joints in all sleeves will be given a stress-relief heat treatment after welding.

Basically, the sleeving process consists of cleaning the tube to be sleeved at the areas of the welds, insertion of the sleeve, expansion in the seal area, attaching by welding or hard rolling, and inspection. The installation of the tube sleeves will be performed in a manner consistent with the applicable standards, will preserve the existing design bases, and will not adversely impact any plant systems. The design, installation, and inspection of the sleeves will be done in accordance with ASME Boiler and Pressure Vessel Code criteria. By adherence to industry standards, the pressure boundary integrity will be preserved.

Three types of nondestructive examinations are used during the sleeving process. They are as follows: ultrasonic testing (UT), eddy current testing (ECT), and visual examination. Ultrasonic testing is used to confirm that there is full fusion of the sleeve to the tube. The licensee has stated that a lack of fusion areas can be reliably detected. The multi-frequency eddy current method will be used to perform a baseline inspection of the installed sleeves of all three designs for future reference.

An eddy current test technique has been qualified for the inspection of installed sleeves to detect flaws in the pressure boundary. The pressure boundary is considered to be the sleeve up to and including both joints and the SG tube above and below the joint. These techniques are capable of detecting the ASME calibration standard anywhere in the sleeve or tube including the weld region. Laboratory tests have demonstrated the detection of actual corrosion defects in the parent tube. These inspection capabilities are documented in Combustion Engineering Report CEN-601-P. The basis for the plugging limit of 32% is acceptable.

Visual examinations can be performed on the upper welds to support UT results and are performed on the lower welds to determine their integrity and acceptance. The welds are examined using a camera system or a borescope

examination system. The lighting is supplied as an integral part of the visual examination system. Each examination is recorded on videotape to provide a permanent record of each weld's condition. The inspections are performed to ascertain the mechanical and structural condition of each weld. Critical conditions which are checked include weld width and completeness and the absence of visibly noticeable indications such as cracks, pits, and burn-through. The acceptability of the lower seal weld of the full-length tubesheet sleeve is based on the absence of any cracks or other visible imperfections that would be detrimental to the integrity of the weld as examined by a borescope or micro-camera system.

Acceptance of the expansion zone hard-rolled joint is based on the control and monitoring of the process parameters. The staff requested additional information on the details and quality control of the process and found it to be acceptable based on the response.

Because the sleeves introduce changes in geometry and wall thickness, they challenge the eddy current testing technique, and special techniques must be used. The licensee has described a number of special techniques that have been demonstrated to give an adequate inspection of sleeved tubes. The techniques are used to qualify the original installation, and the eddy current techniques can be applied to periodic inspections also. The licensee has made a commitment, documented in the Bases section of the plant Technical Specifications, that the adequacy of systems used for periodic inservice inspections will be validated and that upgraded testing methods will be evaluated and appropriately implemented as better methods are developed and validated for commercial use.

5.0 SUMMARY

Based upon the results of the analytical and test program, the sleeve fulfills its intended function as a leak-limiting structural member and meets all the established design and operating criteria. The staff finds that the proposed sleeving repairs can be accomplished to produce a sleeved tube of acceptable metallurgical properties, strength and mechanical stability, leak-tightness and corrosion resistance. We also find that the pre-service integrity of the sleeved tubes can be assured by implementing the proposed sleeve installation examinations.

Based upon the review and evaluation of the information and data presented in CEN-601-P, Revision 01-P, "Arkansas Nuclear One Unit 2 Steam Generator Tube Repair Using Leak Tight Sleeves," the staff finds that the request by the licensee for a proposed license amendment to modify the Technical Specifications to permit repair of SG tubes by installation of sleeves using the Combustion Engineering methodology, is acceptable.

6.0 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.

7.0 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 in 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 (57 FR 37567). Accordingly, the amendment meets 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 amendment.

8.0 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: H. Conrad

Date: 1/26/93