Entergy Operations

Entergy Operations, Inc.
Route 3 Box 137G
Russellville, AR 72801
Tel 501-964-8888

Neil S. "Buzz" Carns
Vice President
Operations ANO

July 22, 1992

2CAN079203

U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Technical Specification Change Request
Steam Generator Tube Sleeving

Gentlemen:

Attached for your review and approval is a proposed Technical Specifications (TSs) change revising the Surveillance Requirements for the Arkansas Nuclear One, Unit 2 (ANO-2) steam generator (SG) tubing, TS 4.4.5. By letter dated April 22, 1992 (2CNA049203), the NRC issued license amendment number 133 for ANO-2. This amendment revised the Surveillance Requirements for the ANO-2 SG tubing to allow SG tube repair by use of Babcock and Wilcox (B&W) sleeves. This revision would also allow the use of Combustion Engineering Nuclear Services (CENS) leak tight sleeves for tube repair in the ANO-2 SGs.

CENS provides three types of leak tight 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 and the ECS sleeves are welded to the SG parent tube near each end of the sleeve. The ETZ sleeve is welded at the upper end of the sleeve. The lower end of the sleeve is hard rolled into the tubesheet. The welds used are essentially the same for all the sleeves. The hard roll is essentially the same as is used by CENS for their mechanical tube plug.

Extensive analysis and testing were performed on the CENS sleeves and sleeve-to-tube joints to demonstrate that the required design criteria was satisfied under normal operating and postulated accident conditions. The details of the sleeve qualification are discussed in report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July, 1992, and are provided in Attachment 1. This attachment contains information proprietary to Combustion Engineering,

A001

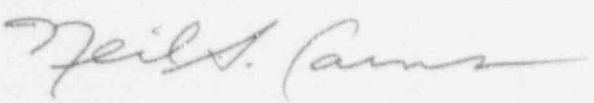
therefore an affidavit is provided. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and specifically addresses the considerations listed in paragraph (b)(4) of Section 2.790 to the Commission's regulations. Accordingly, it is respectfully requested that Attachment 1 be withheld from public disclosure in accordance with Title 10 of the Code of Federal Regulations Section 2.790.

The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 10CFR50.92(c) and it has been determined that this change involves no significant hazards considerations. The bases for these determinations are included in the enclosed submittal.

Approval of this proposed change is required prior to plant heatup following the upcoming ninth refueling outage. This outage is currently scheduled to start on September 4, 1992, and be completed by October 25, 1992. Accordingly, Entergy Operations requests your prompt review and approval.

This request has been discussed with the NRR Project Manager. Entergy Operations requests that the effective date for this change be upon NRC issuance of the amendment to allow the tube repair to proceed without delay.

Very truly yours,



NSC/sjc
Attachments

cc: Mr. James L. Milhoan
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One - ANO-1 & 2
Number 1, Nuclear Plant Road
Russellville, AR 72801

Mr. Thomas W. Alexion
NRR Project Manager, Region IV/ANO-1
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-H-3
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

Ms. Sheri Peterson
NRR Project Manager, Region IV/ANO-2
U. S. Nuclear Regulatory Commission
NRR Mail Stop 13-H-3
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

Ms. Greta Dicus, Director
Division of Radiation Control
and Emergency Management
Arkansas Department of Health
4815 West Markham Street
Little Rock, AR 72201

STATE OF ARKANSAS)
) SS
COUNTY OF LOGAN)

Affidavit

I, N. S. Carns, being duly sworn, subscribe to and say that I am Vice President, Operations ANO for Entergy Operations, that I have full authority to execute this affidavit; that I have read the document numbered 2CAN079203 and know the contents thereof; and that to the best of my knowledge, information and belief the statements in it are true.

N. S. Carns

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for the County and State above named, this 22nd day of July, 1992.

Notary Public

My Commission Expires:

May 11, 2000

AFFIDAVIT PURSUANT

TO 10 CFR 2.790

Combustion Engineering, Inc.)
State of Connecticut)
County of Hartford) SS.:

I, C. B. Brinkman, depose and say that I am the Acting Director, Nuclear Systems Licensing, of Combustion Engineering, Inc., duly authorized to make this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.790 of the Commission's regulations in conjunction with Entergy Operations, Inc. for withholding this information.

The information for which proprietary treatment is sought is contained in the following document:

CEN-601-P, Revision 01-P, "Arkansas Nuclear One Unit 2 Steam Generator Tube Repair Using Leak Tight Sleeves," July 1992.

This document has been appropriately designated as proprietary.

I have personal knowledge of the criteria and procedures utilized by Combustion Engineering in designating information as a trade secret, privileged or as confidential commercial or financial information.

Pursuant to the provisions of paragraph (b) (4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in

the above referenced document, should be withheld.

1. The information sought to be withheld from public disclosure, which is owned and has been held in confidence by Combustion Engineering, is the design, manufacture, installation and testing of the steam generator tube welded sleeve for repairing degraded tubes.

2. The information consists of test data or other similar data concerning a process, method or component, the application of which results in substantial competitive advantage to Combustion Engineering.

3. The information is of a type customarily held in confidence by Combustion Engineering and not customarily disclosed to the public. Combustion Engineering has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and where to hold certain types of information in confidence. The details of the aforementioned system were provided to the Nuclear Regulatory Commission via letter DP-537 from F. M. Stern to Frank Schroeder dated December 2, 1974. This system was applied in determining that the subject document herein is proprietary.

4. The information is being transmitted to the Commission in confidence under the provisions of 10 CFR 2.790 with the

understanding that it is to be received in confidence by the Commission.

5. The information, to the best of my knowledge and belief, is not available in public sources, and any disclosure to third parties has been made pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.

6. Public disclosure of the information is likely to cause substantial harm to the competitive position of Combustion Engineering because:

a. A simil r product is manufactured and sold by major pressurized water reactor competitors of Combustion Engineering.

b. Development of this information by C-E required thousands of manhours and millions of dollars. To the best of my knowledge and belief, a competitor would have to undergo similar expense in generating equivalent information.

c. In order to acquire such information, a competitor would also require considerable time and inconvenience to develop the methodology for steam generator tube repair using leak tight sleeves for degraded tubes.

d. The information required significant effort and expense to obtain the licensing approvals necessary for application of the information. Avoidance of this expense would decrease a competitor's cost in applying the information and marketing the product to which the information is applicable.

e. The information consists of the analyses of the methodology used to repair steam generator tubes using leak tight sleeves, the application of which provides a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with Combustion Engineering, take marketing or other actions to improve their product's position or impair the position of Combustion Engineering's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.

f. In pricing Combustion Engineering's products and services, significant research, development, engineering, analytical, manufacturing, licensing, quality assurance and other costs and expenses must be included. The ability of Combustion Engineering's competitors to utilize such information without similar expenditure of resources may enable them to sell at prices reflecting significantly lower costs.

g. Use of the information by competitors in the international marketplace would increase their ability to market nuclear steam supply systems by reducing the costs associated with their technology development. In addition, disclosure would have an adverse economic impact on Combustion Engineering's potential for obtaining or maintaining foreign licensees.

Further the deponent sayeth not.

C. B. Brinkman
Acting Director
Nuclear Systems Licensing

Sworn to before me
this 15th day of July, 1992

Laurie J. White
Notary Public

My commission expires: 3/31/94

ATTACHMENT

PROPOSED TECHNICAL SPECIFICATION

AND

RESPECTIVE SAFETY ANALYSES

IN THE MATTER OF AMENDING

LICENSE NO. NFP-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT TWO

DOCKET NO. 50-368

PROPOSED CHANGE

The proposed Technical Specifications (TSs) change revises the Surveillance Requirements for the Arkansas Nuclear One, Unit 2 (ANO-2) steam generator (SG) tubing, TS 4.4.5. This revision would allow the use of Combustion Engineering Nuclear Services (CENS) leak tight sleeves as an alternative to plugging or using a Babcock and Wilcox (B&W) methodology to repair defective SG tubes. The definition of "Plugging or Repair Limit" is also being revised for the use of CENS SG sleeves.

Additionally, the Basis for TS 4.4.5 has been revised to reference the applicable documents for SG tube sleeving.

BACKGROUND

The current TSs require a tube that exhibits a through-wall defect of 40% or greater be isolated from service by means of a tube plug or repaired by sleeving using a B&W methodology. The tube plug isolates flow through the tube, thereby removing the tube from service. As tubes are plugged, the effective heat transfer area of the SGs is reduced and the differential pressure across the SG is increased. This results in reduced coolant flow rate.

The purpose of a sleeve is to repair a defective SG tube in order to maintain the function and integrity of the tube. The sleeving methodology consists of inserting a sleeve inside the defective original tube, bridging the defect and forming a new pressure boundary. The sleeve functions in essentially the same manner as the original tube. The installation of the sleeves does not significantly affect the heat transfer removal capability of the tube being sleeved and a large number of sleeves can be installed without significantly affecting primary coolant flow rate.

The B&W sleeving methodology consists of a kinetic welding process to join the free-span joint of the sleeve to the tube wall and the lower tubesheet joint of the sleeve to the tube wall.

During a recent ANO-2 steam generator tube leak outage, Entergy Operations selected B&W to perform the inspections and repairs to the SGs. Subsequent to that outage, ABB/Combustion Engineering (CE) was selected as the supplier for SG services. CE provides a welded or welded/rolled type sleeve for tube repair.

DISCUSSION

CENS provides three types of leak tight sleeves for SG tube repair. These are a straight tubesheet sleeve, an eggcrate support (ECS) sleeve, and an expansion transition zone (ETZ) sleeve. The sleeves are manufactured from thermally treated Alloy 690.

Extensive analysis and testing were performed on the CENS sleeves and sleeve-to-tube joints to demonstrate that the required design criteria were satisfied under normal operating and postulated accident conditions. The details of the sleeve qualification are discussed in report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July, 1992 (Attachment 1).

The straight tubesheet and the ECS sleeves are welded to the SG parent tube near each end of the sleeve. The ETZ sleeve is welded at the upper end of the sleeve. The lower end of the ETZ sleeve is hard rolled into the tubesheet. The welding methodology used is essentially the same for all the sleeves. The hard roll is essentially the same as is used by CENS for their mechanical tube plug.

To maintain tube or sleeve integrity consistent with the margin of safety used as the basis for the TS, allowable levels of wall degradation, referred to as plugging limits, are established. Tubes or sleeves which have indications of degradation in excess of the plugging limits must be repaired or plugged. A plugging limit of 40% throughwall for the parent tube and the B&W sleeve has previously been established. For CENS sleeves, the plugging limit is 34% throughwall. The limits for the sleeves is based on Regulatory Guide 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes".

Eddy current techniques were developed and qualified for the inspection of installed welded 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 steam generator tube above and/or below the joint. These inspection capabilities are documented in CENS report CEN-601-P.

A dual cross wound, conventional bobbin, motorized axial differential and/or segmented bobbin probe using a multi-frequency eddy current method will be used to perform a baseline inspection of the installed sleeve to determine if there is sleeve degradation in later operating years and to ensure no damage to the tube or sleeve occurred during installation. Ultrasonic testing will be performed on all welds to verify adequate bonding has taken place.

Requests for changes to TSs to allow the installation of CENS straight tubesheet sleeves in SGs at other nuclear facilities (i.e., Kewaunee, Ginna, Zion) have been previously submitted to NRC and approved.

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

An evaluation of the proposed change has been performed in accordance with 10CFR50.91(a)(1) regarding no significant hazards consideration using the standards in 10CFR50.92(c). A discussion of those standards as they relate to this amendment request follows:

Criterion 1 - Does Not Involve a Significant Increase in the Probability or Consequences of An Accident Previously Evaluated

The intent of this proposed change is to allow Entergy Operations to use CENS sleeves to repair the ANO-2 SG tubes showing degradation in regions of the tube sheet and the eggcrate support crevice areas that can be sleeved. To support this, changes are being proposed to TS 6.4.5 to reference the CENS report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July, 1992.

Report CEN-601-P, "ANO-2 Steam Generator Tube Repair Using Leak Tight Sleeves", Revision 01-P, dated July, 1992, demonstrates that repair of degraded tubes using the CENS sleeves will result in tube bundle integrity consistent with the original design basis.

Per Regulatory Guide 1.83 recommendations, the sleeved tube can be monitored through periodic inspections with present eddy current techniques. Plugging limit criterion are established in the Technical Specifications for the tubes and sleeves.

The sleeve design, materials, and joints were designed to the applicable ASME Boiler and Pressure Vessel Codes. An extensive analysis and test program was undertaken to prove the adequacy of the CENS welded sleeve. This 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. Design criteria were established prior to performing the analysis and test program which, if met, would prove that the sleeves are an acceptable repair technique. Based upon the results of the analytical and test programs described in detail in CEN-601-P, these sleeves fulfill their intended function as a leak tight structural member and meet or exceed all the established design and operating criteria. Therefore, the probability of an accident is not increased.

The consequences of accidents previously analyzed are not increased as a result of sleeving activities. In the case of a tube rupture, the sleeve may actually result in a slightly reduced leak/flow rate through the broken tube due to the smaller effective flow area. The minor reduction in flow area associated with a tube sleeve has no significant effect on SG performance with respect to heat transfer or system flow resistance and pressure drop. In any case, all analytical impacts are clearly bounded by evaluations which demonstrate the acceptability of tube plugging which totally removes the tube from service. Therefore, in comparison to plugging, tube sleeving is considered a significant improvement with respect to SG performance. The cumulative impact of multiple sleeved tubes has been evaluated to ensure the effects remain within the analytical design bases (both normal and accident).

Corrosion testing has been performed to assess the corrosion resistance of the sleeve and weld, and to assess the effects of sleeve installation on the parent tube. This testing has shown that the sleeve and weld are more resistant to corrosion than the parent tube. In addition, the post-weld heat treatment of the welded region reduces residual stresses and enhances the corrosion resistance of the tube for both primary and secondary side corrosion. Additionally, inservice experience with welded sleeves and the CE rolled plug joint, which is essentially the same as the sleeve rolled joint, has shown no adverse corrosion associated with either the parent tube, sleeve, or sleeve/tube joint.

Therefore, based on extensive analysis and test programs performed and the ability to monitor and remove degraded sleeves from services, this change does not significantly increase the probability or consequences of an accident previously evaluated.

Criterion 2 - Does Not Create the Possibility of a New or Different Kind of Accident from Any Previously Evaluated

The installation of the sleeves will be performed in a manner consistent with the applicable standards, will preserve the existing design bases, and will not adversely impact the qualification of any plant systems. This will preclude adverse control/protection systems interactions. The design, installation and inspection of these sleeves will be done in accordance with ASME Code criteria. By adherence to industry standards, the pressure boundary integrity will be preserved.

Therefore, the use of CENS sleeves does not create the possibility of a new or different kind of accident from any previously evaluated.

Criterion 3 - Does Not Involve a Significant Reduction in the Margin of Safety

The applicable margins of safety for heat transfer and flow rate through the steam generator are defined in the ANO-2 TS.

The installation of a sleeve in a steam generator tube increases the flow resistance through the tube. The increased resistance will result in slightly reduced flow through the sleeved tube. To determine the effect of installing one or more of the different sleeve types in the steam generator tubes, an analysis was performed and is summarized in CEN-601-P. A conservative sleeve length was used in evaluating the effects of the sleeves on the heat transfer and hydraulic capabilities of the steam generators. Using the head and flow characteristics of each of the four primary pumps in conjunction with the primary system hydraulic resistances, the flow rate was calculated as a function of the number of sleeved tubes. The TS minimum allowable flow rate was used to determine the maximum number of tubes per steam generator which can be sleeved.

The effect of the change in flow rate on heat transfer between the primary and secondary sides of the steam generator was determined to be negligible. The overall resistance to heat transfer between the primary and secondary sides consists of the primary side film resistance, the resistance to heat transfer through the tube wall, and the secondary side film resistance. Since the primary side film resistance is only a portion of the total resistance and the change in flow rate is so small, the effect of the calculated maximum change in flow rate on heat transfer is negligible.

The loss in heat transfer area associated with sleeving was also determined to be small. When the sleeve is installed in the steam generator tube, there is an annulus between the sleeve and the tube except in the sleeve tube weld regions. Hence, there is effectively little primary to secondary heat transfer in the region where the sleeve is installed. Keeping the sleeve short minimizes the heat loss. Longer sleeves are used in the tubesheet portion of the tube. However, since negligible heat is transferred in the tubesheet region anyway, the loss in heat transfer area associated with sleeving is also negligible.

SG tube integrity is maintained under the same limits for sleeved tubes as for unsleeved tubes; i.e., ASME Section III and Regulatory Guide 1.121. The degradation limit at which a tube is considered inoperable remains unchanged. A degradation limit at which a sleeve is considered inoperable has been developed. The TSs continue to require monitoring and restriction of primary to secondary system leakage through the SGs, such that there remains reasonable assurance that a significant increase in leakage, due to failure of a sleeved (or unsleeved) tube, will be detected.

The TSs continue to contain reporting requirements for tubes which have had their degradation spanned (regardless whether the tube is plugged or sleeved).

Therefore, this change does not involve a significant reduction in the margin to safety.

The NRC has provided guidance, in 51 FR 7750 - 3/6/86, concerning the application of these 10CFR50.92 standards by providing examples of amendments which are likely to involve no significant hazards considerations. The proposed amendment modifying TS 4.4.5 most closely matches example B.(ix) from this guidance. "A repair or replacement of a major component or system important to safety, if the following conditions are met: (1) The repair or replacement process involves practices which have been successfully implemented at least once on similar components or systems elsewhere in the nuclear industry or in other industries, and does not involve a significant increase in the probability of a new or different kind of accident from any accident previously evaluated; and (2) The repair or replacement component or system does not result in a significant change in its safety function or a significant reduction in any safety limit (or limiting condition of operation) associated with the component or system."

Therefore, based on the reasoning presented above and the previous discussion of the amendment request, Entergy Operations has concluded that the requested change does not involve a significant hazards consideration.