



March 26, 1992

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Subject: Arkansas Nuclear One - Unit 1  
Docket No. 50-313  
License No. DPR-51  
Revision to Reactor Coolant Pump Augmented  
Inservice Inspection Commitment

Gentlemen:

The NRC's Safety Evaluation (dated April 25, 1989) granted relief concerning additional examination of the reactor coolant pumps (RCPs) of Arkansas Nuclear One, Unit 1 (ANO-1). Entergy Operations committed to conduct an augmented RCP inspection plan. As part of this augmented plan, Entergy Operations was to perform single-wall radiography of the pump casing welds in the event of a pump is completely disassembled for maintenance, repair, or examination. This submittal provides information to change Entergy Operations' commitment to perform single-wall radiography of the pump casing and instead conduct RCP casing structural integrity examinations and evaluations using the methodology contained in ASME Code Case N-481.

On February 29, 1992, during the shutdown of ANO-1 to commence the 1R10 refueling outage, a series of flow coastdown tests of the RCPs was performed. After testing of the "D" RCP had been completed, the "D" RCP was restarted to allow flow testing of another RCP. Approximately thirty minutes after restarting the pump, an alarm occurred due to high temperature on the controlled bleedoff for the "D" RCP. In accordance with operating procedures, the pump was tripped.

Subsequent evaluation of the available instrumentation indicated that the motor thrust bearing may have failed and that the motor/pump rotating element was stuck in an "up" position. The pump and motor were decoupled on March 20, 1992, and the RCP seal removed. Dimensional information and visual inspection indicated that the pump rotating assembly was still in the "up" position. Subsequent attempts to move the shaft were unsuccessful. A decision was made on March 21, 1992, to remove the motor and disassemble the RCP to inspect for potential damage.

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Activities are currently underway to remove the RCP cover and rotating assembly. A remote inspection of these components will occur during removal. However, a detailed examination will be deferred until after the outage. The results of this examination will be made available on completion of the detailed examination. A detailed root cause evaluation for the pump/motor failure is pending.

Since the current teardown of the "D" RCP was not a planned outage evolution, single-wall radiography cannot be practically performed without excessive outage and man-rem impact. Previous pump casing examinations of the "A" and "B" RCPs, as described in Attachment 1 of this letter, have been performed. These previous RCP examinations have not detected any flaw growth or identified any service induced defects.

In lieu of performing single-wall radiography for the casing welds of the "D" RCP during the current IR10 outage, Entergy Operations plans to conduct RCP casing structural integrity examinations and evaluations using the methodology contained in ASME Code Case N-481. The use of the methodology described in the Code Case represents a change in commitment to the ANO-1 augmented inspection plan and is not a change to the ASME Code required inspections.

The approach applied by the Code Case requires that a VT-1 visual examination of the external surfaces of the weld of the pump casing and a VT-3 visual examination of the internal surfaces whenever a pump is disassembled be performed. The results of these examinations for the "D" RCP will be communicated to the Staff at the conclusion of the examinations. A VI-2 visual examination of the exterior of all pumps during a hydrostatic pressure test is also required by the Code Case. Entergy Operations will perform this examination prior to returning the unit to power operations.

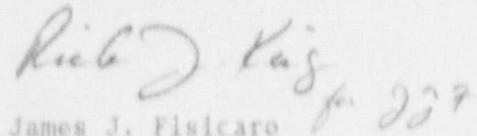
An evaluation will also be performed to confirm the safety and serviceability of the pump casing as discussed in the Code Case. This evaluation is currently being performed. However, the evaluation will not be complete until May 22, 1992. A report of this evaluation will be submitted to the Staff by June 5, 1992. Fracture mechanics and stress analysis evaluations were performed in 1986 and 1988 for the ANO-1 "A" and "B" RCPs. It was concluded, based on these evaluations, that significant flaw growth will not occur over the life of the pump. Based on these evaluations, Entergy Operations expects that the current evaluation will demonstrate the integrity of the casing under postulated flawed conditions.

Using the methodology contained in Code Case N-481 in lieu of single-wall radiography, Entergy Operations believes that the intent of the augmented inservice inspection plan described in the NRC April 15, 1989, Safety Evaluation will be met without increasing the radiation exposure (20-25 man-rem) due to this unexpected RCP work. Entergy Operations is performing the remaining portions of the augmented plan described in the April 25, 1989, Safety Evaluation.

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This revision to the ANO-1 augmented inspection plan was discussed with members of the Region IV and NRR Staff on March 24, 1992. Should you have any questions regarding this issue, please contact me.

Very truly yours,

  
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Director, Licensing

JJF/RWC/sjf  
Attachments

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## ATTACHMENT 1

### HISTORY OF RCP CASING WELD FLAW INDICATIONS AT ANO-1

During 1R7 (1986 refueling outage) Arkansas Nuclear One, Unit 1 (ANO-1) conducted an inservice inspection of the "A" Reactor Coolant Pump (RCP) casing weld using conventional radiography (RT). The RT indicated the presence of a flaw which exceeded the ASME Code acceptance standards for an allowable flaw size. The indication was described as a series of slag inclusions located in the vertical weld which connects the upper and lower scroll welds of the pump casing. Supplemental ultrasonic testing (UT) in the region of the flaw indication was performed.

The original radiographs taken at the time of fabrication were reviewed to determine whether the flaw existed prior to service. Five small inclusions that were part of the current indication were found. However, these five inclusions were acceptable per the ASME Code during the preservice examinations. The original construction radiographs for the remaining three pumps were also reviewed for preservice flaw indications or weak areas in film density. These areas were computer-enhanced in an attempt to identify any unacceptable flaws that were not identified previously.

From this review, "C" and "D" pump casings were determined to have no unacceptable preservice flaw indications. However, the computer enhancement of "B" pump revealed an unacceptable flaw indication in the same general weld area as the "A" pump. The original construction radiograph showed a flaw that was acceptable per the ASME Code. UT techniques were used in an attempt to better characterize the flaw. Due to the material of the casing and the small size of the flaw, UT was unable to specifically size the flaw. Fracture mechanics analyses and a pump case stress analysis were performed assuming conservative values for the size of the indication, and demonstrated compliance with the acceptance criteria of the Code. As a result, the NRC granted relief from the Code to allow examination of the "B" RCP during 1R8, using advanced state-of-the-art external surface volumetric techniques without pump disassembly.

UT examinations of the "A" and "B" RCPs in the areas of the previous RT indications were performed during 1R8 (1988 refueling outage). These examinations utilized a Babcock and Wilcox automated ultrasonic data acquisition and imaging system (ACCUSONEX). The previous slag indications were not detectable with this UT technology; therefore, it was determined that the indications were very small, occupy very little volume, and are below the limit of detection for present-day UT technology.

In accordance with the ASME Code, Entergy also conducted a complete volumetric external surface examination of the "B" RCP casing weld during 1R8. This examination was performed using double-wall RT and advanced UT. The areas of the casing weld examined by RT showed no rejectable indications. Sections of the upper and lower scroll welds near the discharge end of the pump, which could not be successfully examined by RT, along with the remainder of the vertical weld were examined by UT. In the lower scroll weld several indications were detected (using ACCUSONEX). These indications were considered to be slag inclusions. The upper scroll weld could not be examined with ACCUSONEX due to insufficient access for the robot; however, a manual scan was performed which identified three indications. These indications were considered to consist of slag inclusions resulting from the original construction welding process and not a service induced condition. The "B" RCP factory radiographs for the areas of the indications and the low density radiographs taken during 1R8 were computer enhanced. The analysis of these enhanced radiographs showed no rejectable indications in the welds.

A fracture mechanics analysis and a pump case stress analysis were also performed for the "B" RCP. These evaluations concluded that no significant flaw growth would occur over the life of the pump and the pump casing is capable of maintaining its pressure retaining capability with the flaws that were sized for the life of the pump.

Since flaw indications were initially identified for the "A" RCP, the Code requires an examination of the remaining components ("C" and "D" RCPs). If flaw indications are evaluated in accordance with the Code and the component qualifies as acceptable for continued service, the Code requires that these areas shall be examined during three inspection periods. Entergy Operations requested relief from these requirements for the RCPs for ANO-1 in letter dated October 27, 1988 (1CAN108805). The ANO-1 Inservice Inspection Program was revised to schedule augmented examinations of the "A" RCP during 1R10 and 1R12 and the "B" RCP during 1R10, 1R12, and 1R14. These augmented examinations are being performed with enhanced UT techniques.

In their Safety Evaluation report dated April 25, 1989, the NRC granted the relief request with the provision that ANO-1 conduct an augmented inservice inspection program that consisted of 1) performing successive inspections required by the Code on "A" and "B" RCP in the areas containing the flaw indications (external UT may be used); 2) single-wall radiography be performed in the event that any RCP is completely disassembled for maintenance, repair or examination; 3) additional examinations are not required during this inspection interval unless these examinations detect actual flaw growth or service induced degradation; and 4) in the future, use the most conservative published values (or fracture toughness properties). ANO-1 agreed to perform the augmented inspections.

The enhanced UT of the "B" RCP during the current outage (1R10) has not detected any flaw growth or identified any service induced flaws. The examination of the "A" RCP is currently being performed.