50-395

POWER REACTOR	EVENT NUMBER: 30507

FACILITY: SUMMER REGION: 2 UNIT: [1] [ ] [ ] STATE: SC RX TYPE: [1] W-3-LP	NOTIFICATION DATE: 05/20/96 NOTIFICATION TIME: 16:48 [ET] EVENT DATE: 05/08/96 EVENT TIME: 00:00[EDT] LAST UPDATE DATE: 05/20/96
NRC NOTIFIED BY: MIKE ZACCONE HQ OPS OFFICER: RUDY KARSCH	NOTIFICATIONS
EMERGENCY CLASS: NOT APPLICABLE 10 CFR SECTION: CDEF 21.21(b)(2) DEFECTS/NONCOMPLIANCE	HODGE NRR

UNIT	SCRAM CODE	RX CRIT	INIT PWR	INIT RX MODE	CURR PWR	CURR RX MODE
1	N	N	0	HOT STANDBY	0	HOT STANDBY

EVENT TEXT

THE LICENSEE DISCOVERED THAT WELDS ORIGINALLY SPECIFIED AND PERFORMED BY WESTINGHOUSE ON COMPONENT COOLING WATER NOZZLES FOR REACTOR COOLANT PUMP SEAL INJECTION LINES ARE DEFECTIVE. ONE WELD HAD A CIRCUMFRENTIAL CRACK AND FIVE OTHERS ALSO SHOWED SIGNIFICANT CRACKING. THE LICENSEE SUSPECTS THAT TIG WELDING IS REQUIRED BUT NOT DONE.

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ENGINEERS

Serial 15150-120R3

D D Shue

TECHNICAL WORK RECORD

Engineer D. SHUE

Date 5/8/96

Project Title Summary of Reactor Coolant Pump Thermal Barrier Nozzle Reworks during Refuel-8 and 9 per NCNs 5166, 5415, 5429 and 5429A Tab RC Page 1 of 5

SCOPE: This TWR provides the cause and corrective action and the 10CFR21 evaluation for NCNs 5415, 5429 and 5429A. In addition, a summary discussion of Reactor Coolant Pump thermal barrier nozzle work is included.

DISPOSITION: Disposition is a "CLARIFICATION" to provide the 10CFR21 evaluation and address cause and corrective action.

POST DISPOSITION TESTING: None required for this Clarification.

DISPOSITION BASIS: No basis is required; however, the following summary of nozzle work is provided to enhance the understanding of the work performed on the Reactor Coolant Pump nozzle welds at the Thermal Barrier Flange.

The initial problem with the nozzle welds at the Reactor Coolant Pump (RCP) Thermal Barrier Flange was discovered in May of 1987. This problem was a through wall crack on the upper portion of the "C" RCP Seal Injection Line at the socket weld where it enters the pump thermal barrier. At that time the weld was partially excavated and rewelded. NCN-2765 contains the details on this work.

In December of 1994 during Refuel-8, the same "C" RCP Seal Injection Line again had a through wall leak on the same socket weld. This time the crack was on the lower portion of the weld. Again the weld was partially excavated and replaced. After the replacement of the affected portion of the weld, all of the original Westinghouse weld had been removed. The details of this work are contained in NCN-5166.

Subsequent to the second weld failure on the "C" Seal Injection line, EPRI was contacted to determine if a NDE method existed to properly examine the RCP Thermal Barrier nozzle welds for similar conditions. At the time there was no appropriate method; however, EPRI worked to provide an "information only" method to examine the December 1994 failure. This method was tested on the failure with some success in finding the known crack.

After Refuel-8 was completed, EPRI worked to provide an acceptable NDE method for examining all of the RCP Thermal Barrier nozzle welds. After appropriate testing, it was determined that the developed method was suitable for inspection of the nozzle to thermal barrier welds during Refuel-9. It was decided

that the EPRI method would be utilized to examine the Seal Injection nozzles on all of the RCPs. It is noted that this NDE technique is recognized to be a "go" or "no-go" type technique. The technique will determine if a flaw exists; however, it is unable to specifically size and locate the flaw in the weld.

The Seal Injection nozzle inspections were performed during the last week of April, 1996 during Refuel-9. The results of the inspection were somewhat surprising. The "C" RCP which was rewelded in 1987 and 1994 showed no indications. The "B" RCP also showed no indications. However, inspection of the "A" RCP showed that weld flaws existed and that corrective action was required. NCN-5415 was written and dispositioned to Rework the subject weld.

It was determined that per this Rework, the entire weld should be excavated and remade. This was done based on concerns with stressing the remaining portions of the weld should partial excavation and rewelding be performed. Additionally, it was known that partial excavation did not remove the entire problem on the "C" RCP when performed in 1987.

After removal of the nozzle assembly from the "A" RCP actions were taken to reuse the existing nozzle; however, upon closer examination it was discovered that there was significant pipe distortion and wall thinning of the existing nozzle. It was then determined that a new nozzle assembly would be fabricated. Disposition 2 to NCN-5415 provided for replacement of the entire nozzle assembly.

Based on the previous problems with the "C" RCP Seal Injection Line and the discovered problem on the "A" RCP Seal Injection Line, Engineering provided a recommendation to perform additional inspections. It was known that the Component Cooling Water (CCW) nozzles at the Thermal Barrier Flange are identical to the Seal Injection nozzles; therefore, after reviewing the stresses on the lines to each pump, Design Engineering recommended inspection of the RCP "C" CCW Inlet and "A" CCW Inlet. This was based on the fact that these two locations exhibited the highest bending stress ratios and were on pumps with previous weld flaws.

It is important to note that the Design Engineering nozzle evaluation is contained in TWR-15053 by C. Barbier dated 2/29/96. It is noted that the date on the TWR should be 4/29/96. This TWR is contained in NCN-5429. As noted above, the TWR provides the bending stress ratio for each nozzle connection. It is noted that none of the nozzles are considered to be overstressed; however, the nozzles with

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the highest stresses were determined to have the highest probability of failure concurrent with potential weld flaws.

It is also noted that clarification is required to better understand the table at the bottom of page 2 of the subject TWR. In the right most column of the TWR entitled "VCS Observed Nozzle Defects In Pump" , "yes" means that the subject pump had a history of nozzle defects prior to inspection of the CCW nozzles. The "C" RCP had the work of NCNs-2765 and 5166, and the "A" RCP had the work of NCN-5415.

The "A" and "C" RCP CCW Inlets were subsequently inspected. The "A" Inlet was found to have existing weld flaws. The "C" Inlet was found to be acceptable. NCN-5429 was written to address the weld flaw in the "A" RCP CCW Inlet. Disposition 1 of this NCN provided a Rework to replace the nozzle with new material and remake the nozzle to pump weld. Additionally, Disposition 1 required that the "C" RCP CCW Outlet nozzle be inspected. This was based on the fact that the nozzle had the third highest bending stress ratio.

The "C" Outlet nozzle was inspected and found to be acceptable; however, Refuel-9 Outage Management made the decision to inspect all of the RCP CCW nozzles from a prudency standpoint. Suprisingly, out of these inspections, the "A" RCP Outlet nozzle and both nozzles on the "B" RCP were found to have weld flaws, although there bending stress ratios were very low.

It is additionally noted that the "B" RCP CCW Inlet exhibited signs of through wall leakage. Subsequently, this line was penetrant tested which confirmed the presence of the through wall indication; however, it is noted that during flange disassembly to correct the subject indication, a pipe snubber, CCH-1374, was found locked. See NCN-5442 for details concerning the snubber.

The "A" RCP CCW Outlet was replaced per Disposition 2 to NCN-5429. Associated NCN-5429A was written and dispositioned in Disposition 1 to allow for replacement of the Inlet and Outlet nozzles on the "B" RCP. After initial replacement, the CCW Inlet nozzle on "B" RCP failed the post replacement test utilizing the EPRI probe and was again replaced. This replacement occurred per Disposition 2 to NCN-5429A.

A summary of all the work performed to date and the associated work documents is included as Table I of this TWR. This table lists the NDE and corrective action work documents for the nozzles sorted by the applicable nozzle and RCP.

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10CFR21 EVALUATION: The subject condition appears to be a generic hardware defect in manufacturing of a basic component which has the potential to cause a loss of safety function and a major reduction in the degree of protection provided to public health and safety.

Because the nozzle weld defect are in both the Seal Injection and Component Cooling Water connections at the Reactor Coolant Pump Thermal Barrier Flange the potential exists that both could fail simultaneously. Should this occur there would be no cooling to the RCP seal or lower pump bearing. Both would be subjected to Reactor Coolant System cold leg temperature in excess of 550°F. This has the potential to initiate a RCS cold leg loss of coolant accident. See Westinghouse WCAP-10541 and NRC Generic Issue 23 for possible safety significance.

10CFR50.72/73 EVALUATION: Provided in a previous disposition.

10CFR50.59 EVALUATION: Not required for this type disposition.

CAUSE AND CORRECTIVE ACTION: The cause of the subject failures appears to be associated with the initial welding of these nozzles by the OEM. NCN-5166 provided an initial review of these nozzle problems and subsequently Root Cause 508-108 was issued to further address the issue. Currently, it appears that there may be evidence of incomplete penetration and subsequent flaw initiation. This has been corrected by removing and replacing the subject weld.

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TABLE I

REACTOR COOLANT PUMP
SEAL INJECTION & COMPONENT COOLING NOZZLE INSPECTIONS\REPLACEMENT

RC PUMP LOCATION	Seal Injection to Thermal Barrier		CCW Inlet to Thermal Barrier		CCW Outlet from Thermal Barrier	
	NDE	Nozzle Replacement	NDE	Nozzle Replacement	NDE	Nozzle Replacement
"A"		96D3051		96D3053		96D3053
	95Q3112	NCN-5415	96T3158	NCN-5429, #1	96T3158	NCN-5429, #2
		4/28/96	(Note 3)	5/1/96		5/4/96
"B"		Acceptable -		96D3056		96D3056
	95Q3118	Not	96T3161	NCN-5429A, #1,2	96T3161	NCN-5429A, #1
		Required		5/3/1996 (Note 5)		5/3/96
"C"	94Q3079	94D3240		Acceptable -		Acceptable
	96Q3024	NCN-5166	96T3159	Not	96T3159	Not
	(Notes 2 & 3)	12/5/94		Required		Required

Notes:
1 - All Lines were reinspected after corrective action utilizing the same EPRI Technique that found the weld flaws
2 - The remaining "C" Seal Injection Line OEM weld was replaced in 1994 due to failure and reinspected in 1996
3 - The "C" Seal Injection Line was partially replaced in 1987 per NCN-2765 due to through wall failure
4 - The "A" CCW Inlet Line was penetrant tested and found to have a minimal through wall leak in 1996
5 - The "B" CCW Inlet Line failed post weld inspection for Disposition 1 and the Rework was reperformed per Disposition 2

Nozzle Acceptable - Replacement not Required