CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9902250072 DOC.DATE: 99/02/12 NOTARIZED: NO DOCKET #
FACIL:50-296 Browns Ferry Nuclear Power Station, Unit 3, Tennessee 05000296
AUTH.NAME AUTHOR AFFILIATION
ROGERS,A.T. Tennessee Valley Authority
SINGER,K.W. Tennessee Valley Authority
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 99-001-00:on 990114,Unit 3 HPCI was noted inoperable. Caused by oil leak on stop valve.Corrective maint was performed to repair oil leak.With 990212 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 7
TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

Karl W. Singer
Vice President, Browns Ferry Nuclear Plant

February 12, 1999

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

10 CFR 50.73

Dear Sir:

BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 3 - DOCKET NO. 50-296 - FACILITY OPERATING LICENSE DPR-68 - LICENSEE EVENT REPORT (LER) 50-296/1999001

The enclosed report provides details concerning Unit 3 High Pressure Coolant Injection System becoming inoperable during surveillance testing.

This report is submitted in accordance with 10 CFR 50.73 (a)(2)(v)(D) as a condition that alone could have prevented the fulfillment of the safety function of a structure or system needed to mitigate the consequences of an accident.

Sincerely,

Karl W. Singer

cc: See page 2

230040

9902250072 990212
PDR ADOCK 05000296
S PDR

Enclosure
cc (Enclosure):

Mr. Paul Fredrickson, Branch Chief
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NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Browns Ferry Nuclear Plant Unit 3	05000296	1 of 5

TITLE (4)

Unit 3 High Pressure Coolant Injection Inoperable As A Result Of An Oil Leak On The Stop Valve

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER				FACILITY NAME	DOCKET NUMBER
									NA	
01	14	99	1999	001	00	02	12	99	NA	DOCKET NUMBER

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	100		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(viii)
			20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)	X	50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Anthony T. Rogers, Senior Licensing Project Manager	(256) 729-2977

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B	BJ	SHV	S075	NA						

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On January 14, 1999, at 1640 hours CST, during routine surveillance testing, the Unit 3 High Pressure Coolant Injection (HPCI) [BJ] system was declared inoperable as a result of an oil leak on the HPCI turbine inlet stop valve. As required by Technical Specifications, Browns Ferry entered a fourteen day Limiting Condition for Operation for an inoperable HPCI system. Following corrective maintenance and subsequent surveillance testing, the HPCI system was returned to an operable status at 1907 hours on January 15, 1999. The oil leak was attributed to an overload failure of one of the four stud bolts which attach the pilot relay valve to the stop valve (Model J53) cylinder supplied by Schutte and Koerting. The failed stud bolt was subsequently determined to be fabricated from improper material in the original installation. Corrective actions included replacing the stud bolts on the Unit 3 HPCI system stop valve with ASTM A193 Grade B7 which has a higher strength and ductility than the original bolts. TVA plans to replace the stud bolts on the Unit 2 HPCI system stop valve as soon as practicable.

This condition is reportable in accordance with 10 CFR 50.73(a)(2)(v)(D) as a condition that alone could have prevented the fulfillment of the safety function of a structure or system needed to mitigate the consequences of an accident.

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION	
Browns Ferry Nuclear Plant - Unit 3	05000296	1999	-- 001	-- 00	2 of 5

TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

I. PLANT CONDITION(S)

At the time of the discovery of this condition, Unit 2 and Unit 3 were operating at 100 percent power, and Unit 1 was shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event:

On January 14, 1999, at 1640 hours CST, during routine surveillance testing, the Unit 3 High Pressure Coolant Injection (HPCI) [BJ] system was declared inoperable as a result of an oil leak on the HPCI turbine inlet stop valve supplied by Schutte and Koerting. As required by Technical Specifications, Browns Ferry entered a fourteen day Limiting Condition for Operation (LCO) for an inoperable HPCI system. Following corrective maintenance and subsequent surveillance testing, the HPCI system was returned to an operable status at 1907 hours on January 15, 1999.

This condition is reportable in accordance with 10 CFR 50.73(a)(2)(v)(D) as a condition that alone could have prevented the fulfillment of the safety function of a structure or system needed to mitigate the consequences of an accident.

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

C. Dates and Approximate Times of Major Occurrences:

January 14, 1999, 1357 hours CST	Unit 3 HPCI system declared inoperable to perform surveillance test (prior to oil leak).
1640 hours CST	An oil leak on a fitting between the HPCI pilot relay valve and stop valve cylinder was observed. Consequently, an LCO was entered retroactive to the start of the surveillance test.
1926 hours CST	Made four hour non-emergency notification to the NRC.
January 15, 1999, 1907 hours CST	Following corrective maintenance and testing, Unit 3 HPCI system declared operable and LCO exited.

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

Personnel in the immediate area observed the oil leak during the performance of routine surveillance testing.

F. Operator Actions

Operators secured the HPCI system and stopped the auxiliary oil pump once the HPCI pump shaft had coasted to a stop.

G. Safety System Responses

None.

III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause of this event was an oil leak resulting from the failure of a stud bolt securing the pilot valve to the stop valve cylinder.

B. Root Cause

The root cause of this event was attributed to the stud bolt being fabricated from improper bolting material.

IV. ANALYSIS OF THE EVENT

The HPCI system was being tested during the quarterly performance of Surveillance Procedure, 3-SR-3.5.1.7, HPCI Main and Booster Pump Set Developed Head and Flow Rate Test at Rated Reactor Pressure. When the HPCI system was initially started, an oil leak developed at a fitting between the pilot relay valve and the stop valve. The stop valve is located in the steam supply line close to the HPCI turbine. The primary function of the stop valve is to close quickly and stop the flow of steam to the HPCI turbine when a trip signal is received. The stop valve is hydraulically operated using a nominal 36 to 38 psig oil system to actuate the pilot relay valve and a 100 psig oil system to actuate the twelve inch hydraulic cylinder to open the stop valve. As a result, the HPCI system may not have been able to perform its safety function if required.

The pilot relay valve is attached to the stop valve using four 5/8 inch diameter stud bolts. Investigation found that one of the four stud bolts had fractured. The failed stud bolt and three remaining intact stud bolts were sent to TVA Central Laboratories for metallurgical evaluation. Visual examination using a stereo microscope revealed a relatively flat fracture surface with the failure initiating in the threaded area of the stud bolt. Scanning electron microscopy (SEM) analysis of the fracture surface of the fractured stud bolt revealed a transgranular brittle fracture with the fracture consisting almost entirely of cleavage. There were also a few ductile pockets observed on the fracture surface, but these ductility pockets accounted for less than five percent of the fracture surface. A low magnification SEM macrograph also showed that the fracture initiated in the root of a thread and progressed rapidly across the surface of the stud bolt. The microstructure in the longitudinal direction of the failed stud bolt consisted of ferrite and pearlite with manganese sulfide stringers present throughout the structure. The results of the chemical analyses performed on the stud bolts showed that the failed stud bolt and one of the intact stud bolts were not

IV. ANALYSIS OF THE EVENT (continued)

consistent with the vendor's specified bolting material requirements. These two stud bolts met the chemical requirements of ASTM A108 Grade 1215 material. This material is a free machining grade steel which has been resulfurized and rephosphorized. Additional sulfur is added to improve machinability of a free machining grade steel. The addition of phosphorus in this type of steel increases strength of the steel but decreases the ductility of ferrite. Steels which are high in phosphorus are notoriously notch sensitive. As a result, these two stud bolts were more susceptible to this type of failure than the material specified by the vendor. The other two stud bolts (ASTM A108 Grade 1022), while not fully consistent with the requirements specified by the vendor (ASTM A108 Grade 1020), would exhibit similar characteristics as those specified by the vendor. TVA reviewed the maintenance history involving the HPCI system and found no documentation which indicates that the stud bolts were ever replaced. Therefore, these stud bolts were most likely a part of the originally supplied equipment. All four hex nuts that were used on the stud bolts were tested and found to be consistent with the vendor supplied information. The valve supplier, Schutte and Koerting, has been notified of these findings.

Field observations identified marks and chipped paint on all four hex nuts which could have been caused by tightening the hex nuts to reduce oil seepage. This additional torquing coupled with a small flaw could have exacerbated this failure. However, this possible additional torque should not have resulted in bolt failure during system operation if the stud bolts had been fabricated from suitable material.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The HPCI system is provided to assure that the reactor is adequately cooled to limit fuel cladding temperature in the event of a small pipe break in the nuclear system and loss of coolant which does not result in rapid depressurization of the reactor vessel. The HPCI system permits the nuclear plant to be shut down, while maintaining sufficient reactor vessel water inventory until the reactor vessel is depressurized. The HPCI system continues to operate until the reactor vessel pressure is below the pressure at which Low Pressure Coolant Injection (LPCI) [BO] operation or Core Spray (CS) [SM] System operation maintains core cooling. In the event HPCI is not available or not sufficient to maintain reactor water level, the Automatic Depressurization System (ADS) [SB] functions to reduce reactor pressure so that flow from the LPCI and the CS systems enter the reactor vessel in time to cool the core and limit fuel cladding temperature.

BFN TS allow continued reactor operation for up to fourteen days, if HPCI is inoperable, provided ADS, CS, LPCI, and Reactor Core Isolation Cooling (RCIC)[BN] systems are operable. RCIC provides an alternate supply of high pressure makeup while ADS would depressurize the reactor to allow CS and RHR to provide adequate low pressure ECCS makeup to the reactor. The availability of these redundant and diversified systems provides adequate assurance of core cooling while the HPCI system is inoperable.

During the period that the HPCI system was inoperable, these required systems were operable and would have performed their designed function, if called upon. Additionally, had the HPCI system been required to mitigate the consequences of an accident prior to this event, the HPCI system would have initiated and operated for a limited period prior to the loss of oil pressure resulting from the leak.

Accordingly, there was no major reduction in the degree of protection provided to public health and safety. Furthermore, the safety of the plant, its personnel, and the public was not compromised.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

Corrective maintenance was performed to repair the oil leak.

B. Corrective Actions to Prevent Recurrence

The failed stud bolts were replaced with a higher strength and more ductile bolting material than the current specified bolting material. The vendor has provided documentation stating that this change in material for the subject stud bolts is acceptable.

Stud bolts in this application on the Unit 2 HPCI system stop valve will be replaced as soon as practicable.[1]

VII. ADDITIONAL INFORMATION

A. Failed Components

The failed component was a 5/8 inch diameter stud bolt manufactured from ASTM A108 Grade 1215 material. These stud bolts attach the pilot relay valve to the HPCI system hydraulically operated stop valve (Model J53) which was supplied by Schutte and Koerting.

B. Previous LERs on Similar Events

There have been no previous LERs involving the inoperability of HPCI due to a stud bolt failure.

C. Additional Information

None.

VIII. COMMITMENTS

None.

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[1] TVA does not consider this corrective action a regulatory commitment. The completion of this item will be tracked in TVA's Corrective Action Program.