



A. J. Camp, Jr.
Plant Manager

April 2, 2013

WO 13-0021

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

Subject: Docket No. 50-482: Licensee Event Report 2013-002-00, Pressure Boundary Leakage on a Seal Water Injection Drain Line due to Low Stress High Cycle Fatigue

Gentlemen:

The enclosed Licensee Event Report (LER) 2013-002-00 is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(A) and 10 CFR 50.73(a)(2)(i)(B) regarding Reactor Coolant System leakage at Wolf Creek Generating Station.

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4110, or Mr. Mike Westman at (620) 364-8831, extension 4009.

Sincerely,

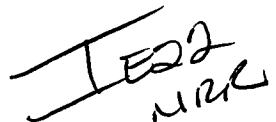


A. J. Camp, Jr.

AJC/rlt

Enclosure

cc: A. T. Howell (NRC), w/e
C. F. Lyon (NRC), w/e
N. F. O'Keefe (NRC), w/e
Senior Resident Inspector (NRC), w/e



IE22
NRC

NRC FORM 366 (10-2010)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB: NO. 3150-0104		EXPIRES: 10/31/2013												
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)										Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Service Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov , and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose 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.									
1. FACILITY NAME WOLF CREEK GENERATING STATION					2. DOCKET NUMBER 05000 482			3. PAGE 1 OF 4											
4. TITLE Pressure Boundary Leakage on a Seal Water Injection Drain Line due to Low Stress High Cycle Fatigue																			
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED										
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME										
02	04	2013	2013 - 002 - 00			04	02	2013	DOCKET NUMBER 05000										
9. OPERATING MODE 4			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)																
10. POWER LEVEL 0			<input type="checkbox"/> 20.2201(b)				<input type="checkbox"/> 20.2203(a)(3)(i)				<input type="checkbox"/> 50.73(a)(2)(i)(C)				<input type="checkbox"/> 50.73(a)(2)(vii)				
			<input type="checkbox"/> 20.2201(d)				<input type="checkbox"/> 20.2203(a)(3)(ii)				<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(A)				<input type="checkbox"/> 50.73(a)(2)(viii)(A)				
			<input type="checkbox"/> 20.2203(a)(1)				<input type="checkbox"/> 20.2203(a)(4)				<input type="checkbox"/> 50.73(a)(2)(ii)(B)				<input type="checkbox"/> 50.73(a)(2)(viii)(B)				
			<input type="checkbox"/> 20.2203(a)(2)(i)				<input type="checkbox"/> 50.36(c)(1)(i)(A)				<input type="checkbox"/> 50.73(a)(2)(iii)				<input type="checkbox"/> 50.73(a)(2)(ix)(A)				
			<input type="checkbox"/> 20.2203(a)(2)(ii)				<input type="checkbox"/> 50.36(c)(1)(ii)(A)				<input type="checkbox"/> 50.73(a)(2)(iv)(A)				<input type="checkbox"/> 50.73(a)(2)(x)				
			<input type="checkbox"/> 20.2203(a)(2)(iii)				<input type="checkbox"/> 50.36(c)(2)				<input type="checkbox"/> 50.73(a)(2)(v)(A)				<input type="checkbox"/> 73.71(a)(4)				
<input type="checkbox"/> 20.2203(a)(2)(iv)				<input type="checkbox"/> 50.46(a)(3)(ii)				<input type="checkbox"/> 50.73(a)(2)(v)(B)				<input type="checkbox"/> 73.71(a)(5)							
<input type="checkbox"/> 20.2203(a)(2)(v)				<input type="checkbox"/> 50.73(a)(2)(i)(A)				<input type="checkbox"/> 50.73(a)(2)(v)(C)				<input type="checkbox"/> OTHER							
<input type="checkbox"/> 20.2203(a)(2)(vi)				<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)				<input type="checkbox"/> 50.73(a)(2)(v)(D)				Specify in Abstract below or in NRC Form 366A							
12. LICENSEE CONTACT FOR THIS LER																			
FACILITY NAME Michael Westman, Manager Regulatory Affairs										TELEPHONE NUMBER (Include Area Code) (620) 364-8831 ext. 4009									
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT																			
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX										
B	AB	PSF	N/A	Yes															
14. SUPPLEMENTAL REPORT EXPECTED										15. EXPECTED SUBMISSION DATE									
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE)										<input checked="" type="checkbox"/> NO									
										MONTH DAY YEAR									
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)																			
<p>On February 4, 2013, during the Reactor Coolant System (RCS) pressure boundary integrity walk down, an active through-wall leak was discovered in the pipe-to-valve circumferential butt weld upstream of valve BBV0130, reactor coolant pump 'A' seal water injection drain line. Leakage at this location is considered not isolable from the RCS, and is considered RCS pressure boundary leakage, which exceeds the limit of "No Pressure Boundary Leakage" defined by Technical Specification (TS) 3.4.13. At 1340 Central Standard Time (CST) on February 4, 2013, Limiting Condition of Operation 3.4.13 was declared not met and Condition B entered. The unit was in Mode 4 at the time of entry into Condition B, as such, the unit was required to be in Mode 5 by 0140 CST on February 6, 2013. The unit entered Mode 5 on February 4, 2013 at 1815 CST.</p> <p>The cause of leakage was determined to be low stress high cycle fatigue. The drain valve and pipe were replaced on March 11, 2013.</p>																			

LICENSEE EVENT REPORT (LER)

U.S. NUCLEAR REGULATORY COMMISSION

CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
WOLF CREEK GENERATING STATION	05000 482	YEAR	SEQUENTIAL NUMBER	REV NO.	2 OF 4
		2013	-- 002 --	00	

PLANT CONDITIONS AT THE TIME OF THE EVENT

Mode 4

0 % power, approximately 350 degrees F and 175 psig

No structures, components and systems were inoperable that contributed to the event.

DESCRIPTION OF THE EVENT

During the performance of procedure STN PE-040D, "RCS Pressure Boundary Integrity Walkdown" on February 4, 2013, an accumulation of boron crystals was identified on the Loop 1 ("A" Train) reactor coolant pump seal injection drain line [EIS Code: AB-P-V], BBV0130. An active through-wall leak was later identified in the pipe-to-valve circumferential butt weld up-stream of valve BBV0130 [EIS Code: AB-PSF].

At 1340 Central Standard Time (CST) on February 4, 2013, Limiting Condition of Operation (LCO) 3.4.13 was declared not met and Condition B entered. The unit was in Mode 4 at the time of entry into Condition B, as such, the unit was required to be in Mode 5 by 0140 CST on February 6, 2013. The unit entered Mode 5 on February 4, 2013 at 1815 CST.

The original drain pipe and valve at this location operated without problems from plant startup in 1985 until 2008. The valve and pipe were replaced in 2008 because of leakage past the valve seat. The replacement scope included both valve BBV0130 and the ¾ inch pipe up-stream from the valve. The replacement used a pipe and valve meeting the same specifications as the original equipment pipe and valve. A through-wall crack and leak developed in the replacement drain pipe and valve that had been in service since 2008. The leak was identified at the pipe-to-valve circumferential butt weld.

Upon completion of the replacement drain pipe and valve in 2008, Quality Control personnel performed radiographic examination (RT) of the field circumferential pipe-to-valve butt weld configuration. The results of the examination noted a small flaw identified as root weld undercut on the inside diameter (ID) surface. The root weld undercut was acceptable in accordance with the ASME Code.

The drain valve and pipe were cut out and replaced on March 11, 2013. A hardware failure analysis was conducted of the failed weld. The results of the analyses and testing indicated the cause of the crack to be low stress high cycle fatigue initiated at ID surface discontinuities (not associated with the root weld undercut identified in the 2008 RT examination).

BASIS FOR REPORTABILITY

This event is being reported to the NRC pursuant to 10 CFR 50.73(a)(ii)(A), "any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded." Conditions that represent welding or material defects in the primary coolant system, which cannot be found acceptable under ASME Section XI standards, are reportable to this criterion. This event is also being reported pursuant to 10 CFR 50.73 (a)(2)(i)(B), "any operation or

LICENSEE EVENT REPORT (LER)

U.S. NUCLEAR REGULATORY COMMISSION

CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
WOLF CREEK GENERATING STATION	05000 482	YEAR	SEQUENTIAL NUMBER	REV NO.	3 OF 4
		2013	-- 002 --	00	

condition prohibited by the plant's Technical Specifications." Technical Specification (TS) LCO 3.4.13.a. limits reactor coolant system (RCS) operational leakage to "No pressure boundary LEAKAGE" while in Modes 1 through 4. Condition B of TS 3.4.13 requires that if pressure boundary leakage exists, the unit is to be in Mode 3 within 6 hours and to be in Mode 5 within 36 hours.

Because the leakage of reactor coolant through the drain line was estimated to be less than 0.03 gpm and located within the boundary of the bio-shield wall, it was not detected during power operation. Leakage was only detected after entrance within the bio-shield wall boundary, after reactor shutdown, by the visual observation of boric acid crystals. Therefore, Wolf Creek Generating Station operated in a condition prohibited by Technical Specifications.

ROOT CAUSE

The results of the analyses indicates the cause of the failure is low stress high cycle fatigue. This is evident by the presence of thumbnail features and fine fatigue striations noted by electron microscopy across the fracture surface. The thumbnail features start at root weld discontinuities at the pipe ID surface confirm the cracking was ID initiated. Metallographic analysis shows the crack then propagated through the heat affected zone and finally through the weld to the outside diameter surface. The planar/non-branching nature of the crack also confirms fatigue as the fracture mode. The discontinuities from the hardware analysis were not associated with the root weld undercut identified in the 2008 installation RT examination.

CORRECTIVE ACTIONS

The drain valve and pipe was replaced on March 11, 2013. Radiography examination of the welds was performed with no rejectable indications identified.

Seventy-eight locations within the RCS and the systems interfacing with the RCS, with the same configuration as BBV0130, were reviewed for potential susceptibility. The review identified five susceptible locations. Nondestructive Examination (NDE) was performed to verify that initiation of fatigue cracking had not occurred. The examinations were completed and all welds were found acceptable (no cracks identified).

SAFETY SIGNIFICANCE

The safety significance is low for this event. The leak rate was well within the makeup capacity of one centrifugal charging pump due to the failure being downstream of a flow restricting orifice. Plant operation was within the TS operational limits for unidentified leakage, and the unidentified operational leakage limit of 1 gpm considers that the potential source of the unidentified leakage may be pressure boundary leakage.

The tight nature of the crack and lack of damage on the crack faces indicates the through-wall failure to be short term and/or with very low leakage rate. The minor RCS leakage affected a localized area of the containment building at the 2000 ft elevation inside the bio-shield. The water from the leak was radioactive, but the leak occurred in an area that is not in a normal travel path for personnel during normal operation (inside the bio-shield wall perimeter). Therefore, there was no reduction in the margin of safety and no adverse impact on the health and safety of the public.

LICENSEE EVENT REPORT (LER)

U.S. NUCLEAR REGULATORY COMMISSION

CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
WOLF CREEK GENERATING STATION	05000 482	YEAR	SEQUENTIAL NUMBER	REV NO.	4 OF 4
		2013	-- 002 --	00	

OPERATING EXPERIENCE/PREVIOUS SIMILAR OCCURRENCES

LER 2005-002-00 reported a condition where evidence was found of boric acid deposits indicating a leak in a weld in the steam generator (SG) "C" and "D" lower head bowl drain lines. These conditions were attributed to primary water stress corrosion cracking (PWSCC) of the bowl drain to SG connection. The lower head bowl drain lines were repaired. In addition, the same preventative measure was taken for the lower head drain lines on SGs "A" and "B".

LER 2006-003-00 reported the identification of five circumferential flaw indications during pre-planned In-service examination of the pressurizer nozzle to safe end dissimilar metal (DM) welds. There was no evidence of RCS pressure boundary leakage. The most probable mechanism responsible for the indications is PWSCC. Planned weld overlay repairs of the flaw indications were performed prior to the unit's return to power operations.