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November 15, 2002

LTR: BYRON 2002-0118
File: 2.01.0700

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Byron Station, Unit 1
Facility Operating License No. NPF-37
NRC Docket No. STN 50-454

Subject: A Supplemental Report to Licensee Event Report (LER) 454-2002-001-00

Enclosed is a Supplemental Report to an LER involving the March 8, 2002, event involving multiple Main Steam Safety Valves on Unit 1 exceeding acceptance criteria for their Inservice Testing setpoint test.

Should you have any questions concerning this matter, please contact Mr. William Grundmann, Regulatory Assurance Manager, at (815) 406-2800.

Respectfully,

Richard P. Lopriore
Site Vice President
Byron Nuclear Generating Station

Attachment LER 454-2002-001-01

cc: Regional Administrator, NRC Region III
NRC Senior Resident Inspector– Byron Station
NRC Project Manager – NRR – Byron Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

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NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Byron Station, Unit 1	05000454	1 OF 6

4. TITLE Multiple Main Steam Safety Valve Relief Tests Exceeded Required Tolerance Due to Disk to Nozzle Metallic Bonding and Setpoint Drift

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
03	08	2002	2002	001	01				FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	1
10. POWER LEVEL	92

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

20.2201(b)		20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
20.2201(d)		20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
20.2203(a)(1)		50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)
20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
20.2203(a)(2)(ii)		50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER
20.2203(a)(2)(iii)		50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	Specify in Abstract below or in NRC Form 366A
20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
20.2203(a)(2)(v)	✓	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
William Grundmann, Regulatory Assurance Manager	(815) 406-2800

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
X	SB	SV	C568	YES					

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
✓ YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		06	15	2003

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

During setpoint testing of the Unit 1 Main Steam Safety Valves (MSSVs) on March 7 and 8, 2002, three of the 20 MSSVs (i.e., 1MS014D, 1MS015C, and 1MS014C) failed to meet Technical Specification (TS) required lift setpoint tolerances. Operations personnel entered the applicable TS Action Condition until each valve was tested satisfactorily. Because the MSSVs were tested sequentially, only one valve was known to be inoperable at any one time. The cause of the 1MS014C and 1MS015C test failures is attributed to metallic bonding between the disk and the nozzle. This phenomenon is characterized by MSSVs experiencing a high initial lift setting followed by a significant drop in the lift setpoint, with no intervening adjustments. The 1MS015C had the new Inconel X-750 disk material, which is believed to be less susceptible to metallic bonding. The evaluation for this valve failure continues and a supplemental report will be issued. The cause of the third valve's test failure is attributed to setpoint drift. Corrective actions include replacing the 1MS014C and 1MS014D valves' disks with the X-750 Inconel material. An engineering analysis concluded that the design basis analyses bounded the out-of-tolerance MSSV condition. The condition of multiple MSSVs being outside of their required lift setting tolerance band is reportable in accordance with 10 CFR 50.73(a)(2)(i)(b), "Any operation or condition prohibited by the plants Technical Specifications."

The evaluation is still in progress and expected to continue into 2003. Another supplemental report will be issued when the evaluation is completed.

A. Plant Conditions Prior to Event:

Event Date / Time: March 8, 2002 / 1129 hours

Unit 1 – Mode 1 – Power Operations, Reactor Power – 92%

Reactor Coolant System [AB]: Normal operating temperature and pressure

No structures, systems or components were inoperable at the start of the event that contributed to the event.

B. Description of Event:

On March 7, 2002, with Unit 1 at 92% power and 510 days of continuous power operation, the setpoint testing of the Unit 1 Main Steam Safety Valves (MSSVs) was initiated in preparation for the upcoming refueling outage (i.e., B1R11) scheduled to begin on March 9, 2002. The MSSVs are tested each cycle to meet the In-Service Testing (IST) program. Specifically, the IST program requires testing a minimum of four valves (20%) out of the 20 total MSSVs on the four steam generator loops, with all 20 valves being tested at least once every five years. Normally, an initial sample of six or seven valves are selected to ensure all 20 valves are tested every five years. For the most recent refuel outage (i.e., B1R11), the initial plan was to test nine valves to meet the code requirement of testing all 20 valves in five years, including an additional selection of valves experiencing performance concerns and valves previously refurbished with Inconel X-750 disk material. However, due to the test failures incurred, the testing sample was expanded to include all 20 valves. These MSSV tests verify that the actual MSSV lift settings are in accordance with Technical Specification (TS) 3.7.1, "Main Steam Safety Valves." The Technical Specification allows a 3% tolerance on the as-found lift setting and requires all tested valves to be set to a 1% as-left tolerance. The test determines each valve's actual lift setting using normal system pressure with assistance from a hydraulic testing device. The MSSV testing is performed in accordance with Byron Station Maintenance Procedure (BMP) 3114-15, "Main Steam Safety Valve Verification of Lift Point Using Furmanite's Trevitest Equipment." The procedure's as-left acceptance criteria require two consecutive lift tests within 1% of the valve's required lift setpoint with no adjustments performed between these tests.

The MSSV tests were initiated on March 7, 2002, and completed on March 9, 2002. The MSSV tests, and any required valve adjustments, were performed on only one valve at a time. Valves not meeting acceptance criteria were adjusted (if required) and satisfactorily tested before proceeding to the next valve.

B. Description of Event (continued):

The initial lift tests performed on three of the 20 MSSV valves exceeded the 3% Technical Specification as-found limit. However, the final two lift tests performed on two (i.e., 1MS014C and 1MS015C) of the three valves, before any adjustments, were within the 1% TS as-left limit. These two MSSV's did not require any setpoint adjustment to leave them within the 1% as-left criteria. Maintenance personnel had to adjust the remaining valve (i.e., 1MS014D) to put it within the 1% as-left tolerance.

Operations personnel were notified. TS 3.7.1 Action Condition entry and exit times were as follows:

Valve	Date/Time of TS Action Condition Entry	Date/Time of TS Action Condition Exit
1MS014D	03/07/02 @ 14:20	03/07/02 @ 15:15
1MS015C	03/08/02 @ 09:33	03/08/02 @ 09:57
1MS014C	03/08/02 @ 10:58	03/08/02 @ 11:29

The specified lift, initial, second, and as-left settings for each of the failed valves, the 1% and 3% Technical Specification limits, and the initial high lift tolerance % were as follows:

Valve	Tech Spec Setpoint (psi)	3% Tech Spec Limits (psi)	Initial Lift (psi)	% Diff.	Second Lift (psi)	As-Left Lift (psi)	1% Acc Crit Limits (psi)
1MS014C	1220	1183-1257	1266	+3.8%	1234	1218	1208-1232
1MS014D	1220	1183-1257	1264	+3.6%	1251	1218	1208-1232
1MS015C	1205	1169-1241	1255	+4.1%	1207	1211	1193-1217

The condition of multiple MSSVs being outside of their required lift setting tolerance band is reportable in accordance with 10 CFR 50.73 (a)(2)(i)(b), "Any operation or condition prohibited by the plants Technical Specifications."

C. Cause of Event:

The cause of the 1MS014C MSSV lifting in excess of the 3% TS as-found acceptance criteria is attributed to metallic bonding between the 400 series stainless steel disk and the nozzle resulting in an increase in the valve's lift setpoint. Industry experience has shown that Dresser MSSVs, model 3707R, can experience oxide bonding between the disk and the nozzle resulting in an increase in the valve's lift setpoint.

The cause of the 1MS015C MSSV failure lifting in excess of the 3% TS as-found acceptance criteria is also believed to be oxide bonding between the X-750 Inconel disk and the nozzle resulting in an increase in the valve's lift setpoint. This valve had the X-750 disk installed during the previous refuel outage due to previous disk bonding performance. This is the first occurrence of oxide bonding at Byron Station of a MSSV with the X-750 disk material. Braidwood Station also experienced failures of MSSV's with the X-750 material installed during their last refueling outage. Byron and Braidwood Stations are the only two sites in the country to have substantiated X-750 disk bonding events. Braidwood Station recently completed a root cause evaluation and has concluded the reason as to why the X-750 disks showed signs of sticking/oxide bonding is indeterminant. However, two factors will continue to be evaluated by Exelon Corporate Engineering as possible contributing causes.

The affect from long continuous runs:

Both Byron and Braidwood Stations had continuous runs on the affected units for greater than 500 days. The lack of thermal cycles on the MSSVs may be conducive to providing optimum disk bonding conditions over time.

The thickness of the oxide layer:

The thickness of the oxide layer of a X-750 disk removed from Diablo Canyon which did not experience bonding was approximately three times thicker than the layer on a Braidwood Station X-750 disk that did experience the bonding phenomenon.

The evaluation is still inprogress and expected to continue into 2003. Another supplemental report will be issued at the completion of this evaluation.

The cause of the 1MS014D MSSV lifting in excess of the 3% TS as-found acceptance criteria is attributed to setpoint drift. It required adjustment to return to within the as-left tolerance of 1%, but did not exhibit the greater than 2% drop between the first and second lifts which would be indicative of disk bonding. 1MS014D was disassembled and no internal abnormalities were noted that would have explained the initial high out-of-tolerance as-found setpoint.

D. Safety Analysis:

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. These valves also provide protection against over-pressurizing the reactor coolant pressure boundary by providing a heat sink for the removal of energy from the reactor coolant if the preferred heat sink provided by the condenser (SD) is not available. The MSSVs also serve as containment isolation valves.

An engineering evaluation was conducted to determine the impact of the MSSV out of tolerance condition on the Chapter 15, "Accident Analyses," transients in the Updated Safety Analysis Report. This analysis concluded that considering the as-found MSSV setpoints, the conclusions of the Chapter 15 analyses still remain valid. Therefore, the overall impact on plant safety due to the identified condition was minimal.

E. Corrective Actions:

Maintenance immediately notified Operations after each of the initial MSSV lifts that exceeded the 3% TS limit and the appropriate TS Limiting Condition for Operations Action Condition was entered. Following additional lifts on the 1MS014C, 1MS014D, and 1MS015C valves, the valves were re-tested satisfactorily (i.e., within the 1% as-left tolerance limits), and the Action Condition exited.

The 1MS014C and 1MS014D valves were rebuilt with the X-750 Inconel disk material.

BMP 3114-15 will be revised to bias the as-left setpoints for valves refurbished with X750 disks to the low side of the 1% tolerance. This is not a corrective action to prevent bonding of MSSV's, but will allow additional margin to failure should the X-750 disk material exhibit disk bonding during future testing.

Test all six Unit 2 MSSV's with X-750 disk material during the upcoming fall 2002 outage. This will allow for more information concerning the extent of X-750 disk bonding and how it is affected by the plant operating conditions.

Results of Fall 2002 Unit 2 MSSV Testing

All six Unit 2 MSSVs with X-750 material were tested in the recent fall outage. All six MSSVs passed with no disc bonding noted. However, this testing occurred after only a 76 day continuous run following a Unit shutdown in June 2002 to repair a steam generator tube leak. This information will be factored into the ongoing engineering evaluation.

F. Previous Occurrences:

1) LER 455-1999-001-00, "Six of 20 Main Steam Safety Valve Relief Tests Exceeded Required Tolerance Due to Disk to Nozzle Metallic Bonding"

2) LER 455-2001-001-00, "Multiple Main Steam Safety Valve Relief Tests Exceeded Required Tolerance Due to Disk to Nozzle Metallic Bonding"

G. Component Failure Data:

Manufacturer	Nomenclature	Model Number
Dresser	Main Steam Safety Valves	3707R