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November 14, 2001
BW010118

U. S. Nuclear Regulator Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Braidwood Station, Unit 1
Facility Operating License No. NPF-72
NRC Docket No. STN 50-456

Subject: Submittal of Licensee Event Report Number 01-001-00, "Three Main Steam Safety Valves Exceeded The Technical Specification Limit By Greater Than 3%"

The enclosed Licensee Event Report (LER) is being submitted in accordance with 10 CFR 50.73(a)(2)(iv). 10 CFR 50.73(a) requires an LER to be submitted within 60 days after discovery of the event. Therefore, this report is being submitted by November 19, 2001.

Should you have any questions concerning this letter, please contact Amy Ferko, Regulatory Assurance Manager, at (815) 417-2699.

Respectfully,

G K Schwartz for

James D. von Suskil
Site Vice President
Braidwood Station

Enclosure: LER Number 01-001-00

cc: Regional Administrator - Region III
NRC Braidwood Senior Resident Inspector

IE22

Rec'd 01/14/02

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004
LICENSEE EVENT REPORT (LER)	Estimated burden per response to comply with this information collection request: 50.0 hrs. 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, NOEB-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.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE
Three Main Steam Safety Valves Exceeded The Technical Specification Limit by Greater Than 3%

5. EVENT DATE MO	DAY	YEAR	6. LER NUMBER (YEAR - SEQUENTIAL NUMBER - REV NO)	7. REPORT DATE MONTH	DAY	YEAR	8. OTHER FACILITIES INVOLVED: FACILITY NAME	DOCKET NUMBER
							N/A	N/A
09	19	2001	2001-001-00	11	19	2001	N/A	N/A

9. OPERATING MODE	1
10. POWER LEVEL	82

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more)

☐ 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 Specify in Abstract below or in NRC Form 366A
☐ 20.2203(a)(2)(iii)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	
☐ 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)
Mike Smith, System Engineering Manager	(815) 417-2243

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	HBC	Valve	C568	Yes	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
x	YES (If yes, complete EXPECTED SUBMISSION DATE).	NO		03	29	2002

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

During testing of the Unit 1 Main Steam Safety Valves (MSSVs) on September 19 and September 20, 2001, three valves lifted in excess of their setpoints by greater than the 3% Technical Specification (TS) tolerance. For each case where the MSSV lifted greater than the 3% tolerance, the appropriate TS Condition was entered. The valves were tested sequentially, so only one valve was known to be inoperable at any time. The valves were adjusted as necessary and retested to place them in the required tolerance range prior to exiting the TS Condition. An evaluation has been performed by Nuclear Fuels Management with the results indicating the limits of the UFSAR accident scenarios impacted by the MSSVs have not been exceeded.

The root cause of two of the MSSV failures has not yet been determined; however, the suspected cause of this event is the result of oxide bonding occurring between the nozzle and disk seating surfaces resulting in an increase in the valve's as found set point. The high lift phenomenon has been an industry wide issue with respect to Consolidated Dresser 3700 series steam safety valves. Based on the multiple industry wide events a consortium of utilities along with Electric Power Research Institute (EPRI) funded a project to investigate the root cause of this phenomenon. The findings of the root cause are published in EPRI Technical Report, TR-1135600, and have been utilized as the basis for the corrective actions that have been implemented at Braidwood. The high lift setpoints identified at Braidwood during refueling outage A1R09 insitu testing are the first case in the industry of high lifts since the implementation of X-750 disk material. The third failure is attributed to setpoint drift.

This event is being reported pursuant to 10CFR50.73(a)(2)(i)(B).

A. Plant Operating Conditions Before The Event:

Unit: 1 Event Date: 9/19/2001 Event Time: 1200

MODE: 1 Reactor Power: 82 percent

Reactor Coolant System (AB) Temperature: 580 degrees F, Pressure: 2235 psig

B. Description of Event:

There were no systems or components inoperable at the beginning of this event that contributed to the severity of the event

On September 19, 2001, with Unit 1 at approximately 82% reactor power and after more than 530 days of continuous operation, testing of the 20 Unit 1 Main Steam (SB) Safety Valves (MSSVs) was initiated in preparation for the A1R09 refueling outage scheduled to begin on September 22, 2001. The MSSVs are tested each cycle to meet the In-Service Testing (IST) program. These MSSV tests verify that the actual MSSV lift settings are in accordance with Technical Specification 3.7.1.1, table 3.7.1-2. The Technical Specification allows a +/- 3% tolerance on the as found lift setting but requires all tested valves be reset within a +/- 1% tolerance. The test determines each valve's actual lift setting by utilizing system pressure with assistance from a hydraulic testing device. The MSSV testing is performed using the Furmanite Trevitest System. There are five MSSV valves on each of the four steam generator loops.

The MSSV tests were initiated on September 19, 2001 and completed on September 20, 2001. Valves not meeting acceptance criteria were adjusted and satisfactorily tested before proceeding to the next valve.

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

Valve	Tech Spec Setpoint	3% Limit	Init. Lift	% Diff.	Second Lift	As-Left Lift	1% Limit
1MS014D	1220 psi	1184-1256	1270.2	+4.11%	1202.7	1220.6	1208-1232
1MS016B	1190 psi	1155-1225	1228.6	+3.24%	1197.8	1180.3	1179-1201
1MS017B	1175 psi	1140-1210	1219.0	+3.74%	1215.8	1178.8	1164-1186

C. Cause of Event:

The cause of the 1MS014D and 1MS016B valves to lift in excess of their setpoint by more than the +3% Technical Specification limit is believed to be due to oxide bonding between the nozzle and disk seating surfaces. A failure analysis of the disk from the 1MS014D is being performed to substantiate the suspected cause.

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

The cause of the 1MS017B to lift in excess of the +3% criteria is attributed to setpoint drift. The 1MS017B did not show signs of sticking and responded to adjustments in a predictable fashion. The 1MS014D, 1MS016B and 1MS017B were all successfully left within 1% of setpoint as required per the Technical Specification Surveillance, BwVSR 3.7.1.1.

D. <u>Safety Consequences:</u>

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 (AB) pressure boundary by providing a heat sink for the removal of energy from the Reactor Coolant System if the preferred heat sink, provided by the Condenser (SD) and Circulating Water (KE) System, is not available.

The design basis for the MSSVs is to limit the secondary system pressure to </=110% of design pressure for any Anticipated Operational Occurrence (AOO), or accident considered in the Design Basis Accident and transient analysis. The events that challenge the relieving capacity of the MSSVs, and thus RCS pressure, are those characterized as decreased heat removal events, which are presented in the Updated Final Safety Analysis Report (UFSAR), Section 15.2, "Decrease in Heat Removal by the Secondary System."

The LOCA Analyses and the Non-LOCA and Containment Analyses were evaluated by Exelon Nuclear Fuels Management with the results indicating the limits of the UFSAR accident scenarios impacted by the MSSVs remain bounding.

The event did not result in a Safety System Functional Failure.

E. <u>Corrective Actions:</u>

The high lift phenomenon has been an industry wide issue with respect to Consolidated Dresser 3700 series steam safety valves. Based on the multiple industry wide events a consortium of utilities along with EPRI funded a project to investigate the root cause of this phenomenon. The findings of the root cause are published in EPRI Technical Report, TR-1135600, and have been utilized as the basis for the corrective actions that have been implemented at Braidwood.

Prior corrective actions included the installation of X-750 disk material in refurbished valves to eliminate seat bonding. All three valves that lifted in excess of 3% had X-750 disk material installed during refueling outage A1R08. Four additional Unit 1 valves had X-750 disk material installed during refueling outage A1R08 with these four valves lifting within the 3% criteria during refueling outage A1R09 testing. The installation of X-750 disk material appears to have significantly reduced the magnitude of bonding but has not eliminated the condition entirely.

Braidwood Station refurbished four MSSVs during refueling outage A2R07 and installed X-750 disks in all valves. Insitu testing was performed just prior to refueling outage A2R08 on the four MSSVs that had X-750 disk material installed

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

during the previous outage, with all four valves lifting within acceptance criteria with initial lifts of -0.05%, +1.15%, +0.39%, and +0.85%. During refueling outage A1R08 seven Unit 1 MSSVs were refurbished with X-750 disks. Insitu testing was performed just prior to refueling outage A1R09 on the seven MSSVs that had X-750 disk material installed during the previous outage. Four of the seven valves lifted within acceptance criteria while three valves lifted outside of acceptance criteria. Therefore, three of the eleven valves tested with X-750 disk material installed exceeded the 3% acceptance criteria.

The Unit 1 and Unit 2 testing results of valves with X-750 disk material indicate that differences may exist. The operational characteristics of the Units appear to have a larger influence in testing results as opposed to maintenance characteristics or valve location. The maintenance refurbishment procedure and the surface finish applied to the disk and nozzle seats were the same for both Unit 1 and Unit 2 valves. All valves that were refurbished with X-750 disk material during refueling outages A1R08 and A2R07 had the same surface finish applied and were refurbished with onsite technical support from the valve manufacturer. No relationship has been identified regarding valve setpoint/location and high lifts. Unit operation was different between Unit 1 cycle nine and Unit 2 cycle eight. Unit 1's cycle nine was a 535-day breaker to breaker run with no thermal or plant pressure transient's occurring. Unit 2's cycle eight included a March 2000 unit trip and plant cool down due to control rod drive (AA) problems. Unit 2's cycle eight also included the turbine being taken off line to perform repairs to the Main Turbine Control Fluid System (TG) in July of 2000. Long continuous runs prevent thermal cycles from occurring on MSSVs and therefore do not allow bonds that have formed between seating surfaces to be broken. Long continuous runs along with refurbishment of seating surfaces have been identified by the industry to be directly related to high lifts/sticking.

The data from the two previous Unit 1 insitu testing indicates a substantial improvement with the X-750 material. The data from the refueling outage A1R08 insitu testing identified seven MSSVs that lifted in excess of the acceptance criteria. Of the seven valves that lifted high leading into the A1R08 outage, all had been refurbished within the past two cycles with the original 422SS disk material. The magnitude of the high lifts during A1R08 ranged from +4.71% to +17.02% above setpoint. The data from the A1R09 insitu testing of valves with X-750 disk material showed that not all valves lifted in excess of the 3% acceptance criteria and that the magnitude of the valves that lifted high were relatively low when compared to A1R08 data. This data indicates the X-750 disk material provided improvement but has not completely eliminated seat bonding.

At this time no corrective actions to prevent recurrence, can be provided. The recommendations detailed in the EPRI Technical Report, TR-113560, are at this time the best guidance available regarding the "High Lift Phenomenon" and will continue to be implemented. A corrective action has been initiated to perform a failure analysis on the disk that was removed from the 1MS014D during refueling outage A1R09. Based on the results of the failure analysis additional corrective actions will be implemented. Additionally, 1MS017B will be tested prior to refueling outage A1R10. If the valve lift setpoint is high, the valve will be refurbished.

F. **Previous Occurrences:**

Two previous events of MSSV high lifts have occurred at Braidwood Station. These events were reported under LERs 98-004-00 and 2000-002-00.

G. **Component Failure Data:**

Manufacturer	Nomenclature	Model	Mfg. Part Number
Dresser	Main Steam Safety Valve	3707R	N/A