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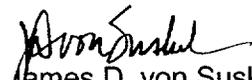
Braidwood Station, Unit 1
Facility Operating License No. NPF-72
NRC Docket No. STN 50-456

Subject: Submittal of Supplemental Licensee Event Report Number 2001-001-01, "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, "Licensee event report system", paragraph (a)(2)(i)(B). This LER is a Supplement to LER 2001-001-00 which was submitted in November, 2001. At the time of LER 2001-001-00 submittal, the root cause for the Main Steam Safety Valve (MSSV) failures had not yet been determined. A failure analysis has been completed on one of the failed MSSV disks. The results of that failure analysis and additional corrective actions are discussed in the supplemental LER.

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

Respectfully,


James D. von Suskil
Site Vice President
Braidwood Station

Enclosure: LER Number 2001-001-01

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

IE22

bcc: Braidwood Station Project Manager - NRR
Nicholas Reynolds - Winston & Strawn
Regulatory Assurance Manager - Braidwood Station
Regulatory Assurance Manager - Byron Station
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LICENSEE EVENT REPORT (LER)

1. FACILITY NAME Braidwood, Unit 1	2. DOCKET NUMBER STN 05000456	3. PAGE 1 of 5
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4. TITLE
Three Main Steam Safety Valves Exceeded The Technical Specification Limit by Greater Than 3%

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
09	19	2001	2001	001-01		6	7	2002	N/A	N/A
									N/A	N/A

9. OPERATING MODE	1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more)							
		<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)				
10. POWER LEVEL	82	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)				
		<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 73.71(a)(4)				
		<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(5)				
		<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A			
		<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)					
		<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)					
		<input type="checkbox"/> 20.2203(a)(2)(v)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)					
		<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)					
		<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)					

12. LICENSEE CONTACT FOR THIS LER

NAME Mike Smith, System Engineering Manager	TELEPHONE NUMBER (Include Area Code) (815) 417-2243
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	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					
YES (if yes, complete EXPECTED SUBMISSION DATE).				x	NO		MONTH	DAY	YEAR

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. Therefore 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 results of an industry survey conducted by Braidwood Station engineers and a failure analysis performed by Altran Corporation indicate that a thicker oxide layer may decrease oxide bonding and minimize the sticking characteristics of the MSSVs. However, Altran Corporation summarized that based on what was observed through laboratory investigation, no specific conclusions could be drawn or root cause identified as to why the X-750 disk from Braidwood exhibited the high lift setpoint phenomenon attributed to oxide bonding. The results of the industry survey suggest that long continuous runs contribute to valve sticking. Prior to the testing on September 19 and 20, 2001, Braidwood Unit 1 had completed a 535 day continuous run. The oxide bond appears to be broken when valves are subjected to a thermal cycle between tests.

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

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Braidwood, Unit 1	STN 05000456	2001	001	01	2 of 5

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

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 was performed by Altran Corporation and although the

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analysis was inconclusive, a correlation between oxide layer thickness and oxide bonding appears to exist. As part of the failure analysis, a comparison was made between the disks from a Diablo Canyon valve and the disk removed from Braidwood's 1MS014D. Both disks were of the same Inconel X-750 disk material. The analysis showed that the Diablo Canyon disk had an oxide layer approximately three times as thick as the disk from the 1MS014D. Diablo Canyon has 40 valves with the X-750 disk material installed and has not had test failures during insitu testing. However, Diablo Canyon's practice of periodic lifts of the safety valves at power along with a number of plant thermal cycles makes it difficult to correlate data from the two valves.

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. Safety Consequences:

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 $\leq 110\%$ 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. Corrective Actions:

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-113560, and have been utilized as the basis for the corrective actions that have been implemented at Braidwood.

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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 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 transients 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%

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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.

Failure analysis was performed on the disk that was removed from the 1MS014D during refueling outage A1R09. Based on the results of that analysis, a corrective action to prevent recurrence is implementation of an improved pre-oxidation process. Additional corrective actions include biasing the setpoint to the low side of the 1% tolerance for valves refurbished with X-750 disks and to perform mid-cycle insitu testing on the five valves that were refurbished during refueling outage A1R09. 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:

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