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November 18, 2002

U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Unit - 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/2002-001-00

Dear Sir or Madam:

In accordance with 10CFR50.73(a)(2)(i)(B), enclosed is the subject report concerning Main Steam Safety Valves. The enclosure contains no commitments.

Sincerely,

Sherrie R. Cotton

Sherrie R. Cotton
Director, Nuclear Safety Assurance

SRC/tfs

enclosure

IE22

cc: Mr. Ellis W. Merschoff
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NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Arkansas Nuclear One - Unit 1	05000313	1 OF 5

TITLE (4) Main Steam Safety Valve As-Found Lift Settings Were Not Within Technical Specifications Limits

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
09	25	2002	2002	001	00	11	18	2002	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	1
POWER LEVEL (10)	080

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

20.2201(b)	20 2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(vii)		
20.2201(d)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(A)		
20.2203(a)(1)	20.2203(a)(4)	50 73(a)(2)(ii)(B)	50.73(a)(2)(viii)(B)		
20.2203(a)(2)(i)	50.36(c)(1)(i)(A)	50 73(a)(2)(iii)	50.73(a)(2)(ix)(A)		
20.2203(a)(2)(ii)	50.36(c)(1)(ii)(A)	50.73(a)(2)(iv)(A)	50.73(a)(2)(x)		
20.2203(a)(2)(iii)	50.36(c)(2)	50 73(a)(2)(v)(A)	73.71(a)(4)		
20.2203(a)(2)(iv)	50.46(a)(3)(ii)	50 73(a)(2)(v)(B)	73 71(a)(5)		
20.2203(a)(2)(v)	50 73(a)(2)(i)(A)	50.73(a)(2)(v)(C)	OTHER		
20.2203(a)(2)(vi)	X 50.73(a)(2)(i)(B)	50 73(a)(2)(v)(D)	Specify in Abstract or		
			NRC Form 366A		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Thomas F. Scott, Nuclear Safety and Licensing Specialist	479-858-4623

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	SB	RV	D243	Y						

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

ABSTRACT (16)

Prior to a scheduled refueling outage, testing revealed that the lift settings of eight of the sixteen Main Steam Safety Valves (MSSVs) were outside the plus or minus three percent Technical Specifications requirement. MSSVs that were not within one percent of their setpoint were adjusted and retested until repeatable lifts were within tolerance. Since lift values were both high and low, no single root cause for the condition could be determined. Potential failure modes were spring relaxation, seat bonding, excessive spindle run out, a change to a different type of test device and steam header pressure oscillations during the testing. An evaluation determined that the MSSVs would have performed their required safety functions with the as-found lift points, and safety analysis results would not have been invalidated. Additional testing and inspection of the MSSVs is planned in order to identify actions to improve performance.

A. Plant Status

At the time this condition was discovered, Arkansas Nuclear One Unit 1 (ANO-1) was operating in Mode 1 with power coasting down prior to a scheduled refueling outage. When testing of Main Steam Safety Valves (MSSVs) [SB] started, the reactor power was approximately 81 percent power. When testing was completed, reactor power was approximately 78 percent.

B. Event Description

As-found lift settings of MSSVs were outside the requirements of Technical Specifications (TS).

ANO-1 has eight MSSVs per header. During Modes 1, 2, and 3, TS 3.7.1 requires that seven MSSVs be operable on each header. The Bases of Surveillance Requirement 3.7.1.1 specify an as-found lift setting within plus or minus three percent of the setpoint. Routine MSSV surveillance testing began on September 24, 2002, and was completed on September 27, 2002. MSSVs that were not within one percent of their setpoint were adjusted and retested until repeatable lifts were within tolerance. Results of the initial as-found tests are provided below. Set point and as-found pressure values are in psig units.

"A" HEADER

Valve Number	Setpoint	As-Found	Percent Deviation
PSV-2692	1100	1141.4	+3.77
PSV-2693	1100	1107.5	+0.68
PSV-2694	1090	1122.8	+3.01
PSV-2695	1090	1094.9	+0.45
PSV-2696	1070	1060.8	-0.86
PSV-2697	1070	1016.3	-5.02
PSV-2698	1060	1041.5	-1.75
PSV-2699	1050	1038.3	-1.11

"B" HEADER

Valve Number	Setpoint	As-Found	Percent Deviation
PSV-2684	1050	1015.9	-3.25
PSV-2685	1060	1072.4	+1.17
PSV-2686	1070	1081.5	+1.07
PSV-2687	1070	1077.4	+0.69
PSV-2688	1090	1032.0	-5.32
PSV-2689	1090	1052.9	-3.40
PSV-2690	1100	1138.4	+3.49
PSV-2691	1100	1059.6	-3.68

C. Root Cause

No single root cause that explained all test results could be determined. Five potential failure modes were identified during failure mode analysis. They are spring relaxation, seat bonding, excessive spindle run out, a change to testing using the Crosby Set Point Verification Device (SPVD), and steam header pressure oscillations.

Spring relaxation is typically associated with springs that have been in service for an extended period of time. During the evaluation of this condition it was noted that valves purchased in 1996 as spares might also be subject to this mechanism. Spring assemblies for these valves may not have been preset since the vendor may not have specified presetting and it was not an ASME Code requirement at the time these springs were manufactured. Changes in the spring can result in setpoint drift after a plant trip and result in subsequent lifts being below the setpoint for valves that cycled open.

The 316SS disc material is susceptible to seat bonding that can cause high initial lifts. Seat bonding occurs on a molecular level between the dissimilar stainless steel metals of the seat and nozzle. This phenomenon has been experienced in similar valve designs used by other licensees. Additionally, the 316SS spindle is susceptible to run out that can also affect valve lift point and repeatability.

The testing associated with this condition was the first use of the Crosby SPVD test method for ANO-1 MSSVs. There are inherent accuracy differences between test methods and the change of test method is expected to have introduced some difference in results.

The power level at which the testing was conducted resulted in steam header pressure oscillations larger than those normally experienced during MSSV testing. Since the SPVD does not average header pressure readings, a pressure not representative of the average value could have been used in the lift point calculation.

D. Corrective Actions

All MSSVs were adjusted using the SPVD to within the required as-left tolerance.

Additional in-situ testing of certain MSSVs, as determined by failure mode selection criteria, is planned following startup from the current outage. Selected spare MSSVs have been tested at an off-site facility. Results of these tests will be used to determine further actions.

An activity will be added to the forced outage plan to test MSSVs that lift during future transients.

Actions to minimize the effects of steam header pressure oscillations on test results will be evaluated.

NARRATIVE (17)

ANO plans to use the SPVD to re-certify a spare MSSV after it is installed to ensure that the same test device is used for as-left and as-found testing.

E. Safety Significance

The as-found lift settings of the MSSVs were evaluated with respect to the safety analysis events that would be negatively impacted by these values being above or below the nominal setpoints by more than three percent. These safety analysis events are Steam Generator Tube Rupture (SGTR), Loss of Load, and Loss of All AC Power for low lift settings and Small Break Loss of Coolant Accident (SBLOCA) and Turbine Trip for high lift settings.

The Loss of Load transient assumes that steam is relieved by the MSSVs and Atmospheric Dump Valves (ADVs) [JI] following turbine stop valve closure at 100 percent power. After the turbine trip, excess steam is relieved to the atmosphere until the Reactor Coolant System (RCS) [AB] pressure is below the ADV setpoint of 1020 psig. The Once Through Steam Generators (OTSGs) [AB] cannot be isolated until the lowest MSSV reset point is reached. Since the as-found lift points of 1015.9 psig for PSV-2684 on the "B" header and 1016.3 psig for PSV-2697 on the "A" header are slightly below the ADV setpoint, the OTSGs would continue to relieve steam until these MSSVs closed. All other MSSV lift settings were above 1020 psig and, therefore, do not affect the Loss of Load results. The analysis assumption, as stated in the Safety Analysis Report (SAR), is that the whole body dose consequence does not change based on steam relief since the major contributing isotopes are negligible; however, the thyroid dose consequence will change due to Iodine 131 release. The analysis calculated thyroid dose of 12 mRem is due to an assumed one gpm primary to secondary leak rate with one percent failed fuel. The cool down to the lowest MSSV reset point would allow more steam to be relieved to the atmosphere. Since the condition of the ANO-1 core was "clean" (the RCS activity was 2.85E-1 µCi/ml) when the MSSVs were tested, the SAR analysis continues to be bounding. Dose consequences for the Loss of All AC Power transient are not specifically considered. The SAR states that this event is not part of the ANO-1 licensing basis. In any case, the results would be similar.

The SGTR analysis assumes release of secondary inventory through the MSSVs at their nominal setpoints. If the valve lift points are below those assumed in the analysis, a larger dose rate would be predicted. Small increases in predicted dose rates are bounded by assumptions in the SAR where MSSVs are assumed to be open for some time after the reactor trip until the RCS is depressurized to below the lowest MSSV setpoint of 1050 psig when the affected OTSG is isolated. The major conservative assumption is that the RCS curie content results from one percent failed fuel. Since the RCS activity at the time of the MSSV testing was very low, the effect of the lower MSSV lift and reset points that would allow more primary coolant to leak into the secondary and to the environment is offset by the low actual RCS activity. Due to the low RCS activity and only two MSSV lift points being below 1050 psig, the SAR SGTR analysis remains bounding.

The SBLOCA analysis assumes that the OTSGs are removing heat from the reactor core at a saturation pressure consistent with the MSSV with the lowest lift point. If this accident had occurred with the as-found lift settings, the

OTSG pressures would have been controlled at a lower pressure with enhanced heat removal as compared to the analysis. Therefore, the SBLOCA analysis was not negatively affected by this condition

The Turbine Trip analysis assumes that only seven of the eight MSSVs on each header are available to relieve steam. Those valves assumed to be available on each header are a 1050 psig setpoint valve, two 1070 psig setpoint valves, two 1090 psig setpoint valves, and two 1100 psig setpoint valves, each with an opening tolerance of plus three percent applied. Both PSV-2692 and PSV-2694 opened greater than three percent above their nominal setpoint. Valve PSV-2692 can be assumed to be the valve that is not available for steam relief, and PSV-2694 opened within the setpoint of that assumed for the second 1100 psig nominal setpoint valve. Since the opening setpoint of the seven valves assumed available in the analysis was greater than seven of the eight MSSVs tested, the plant would have behaved conservatively as compared to the analysis, and the analysis remains bounding for the as-found condition of the MSSVs on the "A" header. Since seven of the eight valves on the "B" header lifted at less than the values assumed in the analysis, the analysis remains bounding for the as-found condition.

Based on these considerations, the MSSVs would have performed their required functions with the as-found lift points and no safety analysis results would have been invalidated. Therefore, this condition is considered to have had minimal actual safety significance.

F. Basis for Reportability

On September 25, 2002, the second MSSV on the "B" header was found to have its as-found lift point outside of the plus or minus three percent of setpoint tolerance. Guidance provided in Example (3) of Section 3.2.2 of NUREG-1022 Revision 2, "Event Report Guidelines - 10CFR50.72 and 50.73," states that the existence of similar discrepancies in multiple valves is an indication that the discrepancies may well have arisen over a period of time. Since the failure mode evaluation does not support a conclusion that the documented lift point condition occurred at the time of discovery, this condition is reportable in accordance with 10CFR50.73(a)(2)(i)(B) as operation prohibited by Technical Specifications.

G. Additional Information

The ANO-1 MSSVs are model Type 3707R six inch valves manufactured by Dresser Industries (Manufacturer Code D243).

There have been no previous similar events reported as Licensee Event Reports by ANO-1; however, until the implementation of Improved Technical Specifications in July 2002, an as-found lift point plus or minus three percent of the setpoint was not a TS requirement for MSSV operability.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].