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10 CFR 50.73

February 7, 2019

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

Calvert Cliffs Nuclear Power Plant, Unit No. 1
Renewed Facility Operating License No. DPR-53
NRC Docket No. 50-317

Subject: Licensee Event Report 2018-001, Revision 01
Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals

The attached report is being sent to you as required by 10 CFR 50.73.

There are no regulatory commitments contained in this correspondence.

Should you have questions regarding this report, please contact Mr. Larry D. Smith at (410) 495-5219.

Respectfully,

Todd A. Tierney

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Plant Manager

TAT/KLG/lmd

Attachment: As stated

cc: NRC Project Manager, Calvert Cliffs
NRC Regional Administrator, Region I
NRC Resident Inspector, Calvert Cliffs
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IE22
NRR

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EDMS

317/2018-001-01

NRC FORM 366
(02-2018)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by 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.

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. Facility Name	2. Docket Number	3. Page
Calvert Cliffs Nuclear Power Plant, Unit 1	05000 317	1 OF 6

4. Title

Pressurizer Safety Valve As-Found Settings Outside Technical Specification Limits Due to Damaged Internals

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	Docket Number
02	25	2018	2018	- 001	- 01	02	07	2019		05000
									Facility Name	Docket Number 05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*			
6	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. Power Level	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
0	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(ii)
	☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(iii)
		☐ 50.73(a)(2)(i)(C)	☐ Other (Specify in Abstract below or in NRC Form 366A)	

12. Licensee Contact for this LER

Licensee Contact	Telephone Number (Include Area Code)
Kenneth Greene, Principal Engineer	410-495-4385

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
B	AB	RV	D243	Y					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No				

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

During scheduled testing at the offsite testing facility, the as-found lift setting for the pressurizer safety valve previously installed in Unit 1 at the 1RV200 location was measured outside the Technical Specification allowable values (valve lifted low). The valve had been installed during the 2016 Unit 1 refueling outage and was removed during the 2018 Unit 1 refueling outage for scheduled testing and maintenance. As scheduled, a spare valve was installed in its place during the 2018 refueling outage. The failed valve was disassembled and inspected at an offsite facility. The apparent cause of the PSV failure identified that the expanded contact area between the valve's bellow nose and disc, which was caused by the presence of a bulge in the bellows nose, as a result of bellows stretch and compression, did not allow the disc to act normally which resulted in the valve lifting early. The valve will have damaged parts replaced, be rebuilt, tested, and re-certified for installation in the plant during the next Unit 1 refueling outage. Calvert Cliffs will require the vendor to employ a revised method for preparing a valve for its certification lifts whenever valve internals are replaced.

NARRATIVE

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

I. DESCRIPTION OF EVENT:

A. PRE-EVENT PLANT CONDITIONS:

Unit 1 was in Mode 6 (Refueling) when the condition was discovered. The valve was not installed in the system when the condition was discovered.

B. EVENT:

On February 25, 2018, during scheduled testing at the offsite testing facility, pressurizer [PZR] safety valve (PSV) [RV], previously installed at the 1RV200 location, failed it's as found lift setting test. The failed PSV (PSV Serial Number BN 04373) opened at a value of 2442 psig (2457 psia) which is below the low end Technical Specification Surveillance Requirement (SR) 3.4.10.1. The failed PSV had been installed at the 1RV200 location during the 2016 Unit 1 refueling outage and was removed during the 2018 Unit 1 refueling outage for scheduled testing and maintenance.

C. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT:

Unit 1 PSV 1RV200 (BN 04373) was determined to be inoperable. The inoperable condition for the valve provides the bases for this report.

D. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:

March 2016	BN 04373 (1RV200) installed during the 2016 Unit 1 refueling outage.
February 2018	BN 04373 (1RV200) removed during the 2018 Unit 1 refueling outage.
February 25, 2018	BN 04373 (1RV200) as-found lift tested at offsite vendor facility. As-found lift setting measured lower than Technical Specification allowable value. The valve was disassembled, inspected, and a bulge in the bellows nose was determined to be the cause of the failed as-found lift setting. Analysis for the cause of this condition is ongoing.

E. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

There were no other systems or secondary functions affected. This event is applicable to Calvert Cliffs, Unit 1 only.

F. METHOD OF DISCOVERY:

The condition was self-revealing during scheduled testing at the offsite testing facility.

G. MAJOR OPERATOR ACTION:

No operator action was required for the subject valve. The valve was not installed in the plant when the condition was identified.

H. SAFETY SYSTEM RESPONSES:

No safety system responses were expected. None occurred.

II. CAUSE OF EVENT:

The event is documented in station condition report number IR 04108119.

The apparent cause of the PSV failure identified that the expanded contact area between the valve's bellow nose and disc, which was caused by the presence of a bulge in the bellows nose, as a result of bellows stretch and compression did not allow the disc to act normally. This caused BN 04373 to lift below the lower Technical Specification as-found lift setting limit. Following a second failed lift, the valve was disassembled to determine the cause for the low lift, which led to the discovery of the bulge in the bellows nose. BN 04373 will have all damaged parts replaced, be rebuilt, tested, and re-certified for installation in the plant.

III. ANALYSIS OF EVENT:

Each unit at Calvert Cliffs has two PSVs (1/2RV200 and 1/2RV201) designed to limit Reactor Coolant System (RCS) [AB] pressure to a maximum of 110 percent of design pressure (design pressure = 2500 psia). The Unit 1 Technical Specification defined setpoints for these valves are as follows:

Valve	As-Found Lift Setting (psia)	As-Left Lift Setting (psia)
1/2RV200	>/= 2475 and </= 2575	>/= 2475 and </= 2525
1/2RV201	>/= 2475 and </= 2600	>/= 2500 and </= 2550

The as-found setpoints are the limits for operability, i.e., if a valve lifts outside of those setpoints it is considered inoperable. Calvert Cliffs owns eight PSVs, four sets of two that are rotated between a specific location. The as-found lift setting for BN 04373 measured in February 2018 was 2442 psig (2457 psia), which is lower than the Technical Specification SR allowed value of 2475 psia.

The valve was refurbished at the offsite facility in 2014 and subsequently passed as-left acceptance testing prior to being installed during the 2016 refueling outage. While installed in the plant (March 2016 through February 2018), there were no setpoint events associated with this valve. The valve was removed from its location for scheduled testing and refurbishment in February 2018 during the Unit 1 refueling outage. Although an exact duration cannot be determined, it is reasonable to conclude that for some period of time while the valve was installed in the plant, most likely its lift setting was not within the Technical Specification SR defined setpoint limit. With one PSV inoperable, the Technical Specification Condition 3.4.10.A Required Action is to restore the valve to operable status within a 15 minute Completion Time. If this required action cannot be met, or if two PSVs are inoperable, Technical Specification Condition 3.4.10.B requires the plant to be placed in Mode 3 within 6 hours and to reduce all RCS cold leg temperatures to </= 365 degree F (Unit 1) within 12 hours. The failure to recognize and meet the requirements of Technical Specification Condition 3.4.10.B also should have required entry into Technical Specification Limiting Condition for Operation 3.0.3. We believe that the subject condition (for the PSV) existed longer than the Technical Specification Completion Times for the associated Required Actions. Therefore, this event is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B).

There were no actual nuclear safety consequences incurred from this event. For some time, while installed, 1RV200 was susceptible to an early lift. Realizing that if challenged, the valve could have lifted at a pressure different than assumed in the applicable safety analyses, the Calvert Cliffs Updated Final Safety Analysis Report (UFSAR) was reviewed and a probabilistic risk assessment was performed.

The PRA model considers the pressurizer safety relief valve successful if it opens at a pressure greater than the PORV relief point, 2385 psig (2400 psia), and then re-seats. Therefore, three PRA functional failures are modeled for the pressurizer safety relief valves. They are as follows:

PRA Functional Failure	Analysis
Failure to Open	The valve did not fail to open. This PRA failure does not apply.
Open Prematurely	The valve would need to open prior to the PORV relief point of 2385 psig (2400 psia) for this failure to occur. The valve opened at 2442 psig (2457 psia), so this PRA failure does not apply.
Failure to Reseat	The valve did not fail to reseat. This PRA failure does not apply.

Based on the table above, 1RV200 opening at 2442 psig (2457 psia) is not considered a PRA functional failure and therefore there is no change in risk. This issue would be "GREEN" using the NRC's Significance Determination Process.

The Calvert Cliffs UFSAR was reviewed to evaluate the design basis events impacted by a decreased lift setting for 1RV200. The evaluation determined that the results presented in the UFSAR were bounding for all impacted design basis events. In all cases, overpressure protection of the RCS was maintained. Therefore, the condition of 1RV200 would not have prevented the system from fulfilling its safety function.

Furthermore, 1RV201 (BM 07952) was also lift tested during the 2018 refueling outage and successfully lifted within the Technical Specification limits. No signs of bulging of the bellows nose was noted on this valve.

This event has no impact on the Nuclear Regulatory Commission Reactor Oversight Process Performance Indicators.

IV. CORRECTIVE ACTIONS:

A. ACTION TO RETURN AFFECTED SYSTEMS TO PRE-EVENT NORMAL STATUS:

The degraded valve will be refurbished, tested, and certified for use in the plant. As scheduled, another valve was installed during the 2018 Unit 1 refueling outage. BN 04373 is scheduled to be reinstalled into the 1RV200 location during the Unit 1 2020 refueling outage.

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

The causal investigation identified that the apparent cause of the out of tolerance lift was caused by the presence of a bulge in the bellows nose which caused an expanded contact area between the bellows nose and disc to exist. This expanded contact area between the bellows nose and disc meant that less pressure was required to overcome the spring force holding the valve shut thus resulting in the valve lifting prematurely.

The OEM vendor, during the investigation identified a best practice maintenance method to be followed to account for any seating deformation that may occur whenever a bellows, spindle or disc is replaced. This method consists of lifting the valve several times to get the bellows to form to the disc pocket, then disassemble and recondition the valve and associated bearing points based on the forming and setting that occurs. These actions will be done prior to performing the certification lifts. Calvert Cliffs will revise the purchase order to instruct the vendor to follow this method following replacement of a valve's bellows, spindle or disc. Calvert Cliffs will also instruct the overhaul vendor to replace the valve's spindle at first indication of run-out degradation.

V. ADDITIONAL INFORMATION:

A. FAILED COMPONENTS:

NARRATIVE

The subject valve is an American Society of Mechanical Engineers Boiler and Pressure Code approved PSV designed to limit RCS pressure to a maximum of 110 percent of design pressure. The safety valve is a totally enclosed, back pressure compensatory, spring-loaded valve. The valves are manufactured by Dresser Consolidated, Inc. (EPIX Identification number D243).

B. PREVIOUS LERS ON SIMILAR EVENTS:

A review of Calvert Cliffs' events over the past several years was performed. The site has had several instances of PSV setpoint testing (low and high) abnormalities. From this review it was noted that BN 04373 has now failed each of the last three times it was tested, although the apparent causes for previous times were due to different issues. The failure this time was the first time an issue with a bulging bellows nose was identified as the apparent failure cause. Inspection of BN 04373 valve's internals this outage eliminated past causes for PSVs failures, such as spring related or internal concentricity issues, as potential causes of this failure.

The following Licensee Event Reports (LERs) are identified from this review:

LER 317/2010-002-Setpoint (low [BN 04373] and high) failure on two separate valves-identified as setpoint variations.

LER 318/2011-002-Setpoint (high) failure-cause identified as greater than expected setpoint variation, License Amendment Request submitted to expand the allowable setpoint range.

LER 318/2013-002-Setpoint (high) failure-cause identified as inadequate margin, subsequent approval of License Amendment Request to increase allowed lift setting range occurred on December 30, 2015.

LER 317/2014-003 Setpoint (low [BN 04373]) failure on two separate valves – identified as the internal lift spring assemblies of a specific manufacturer lot failed to hold PSV set pressure.

LER 318/2017-001 - Setpoint (low) failure-cause identified as setpoint drift in unexpected direction.