



APR 07 2011

LR-N11-0102

10 CFR 50.73

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-001

Hope Creek Generating Station Unit 1
Facility Operating License Number NPF-57
Docket Number 50-354

Subject: Licensee Event Report 2010-002-01

In accordance with 10 CFR 50.73(a)(2)(i)(B), PSEG Nuclear LLC is submitting Supplemental Licensee Event report (LER) Number 2010-002-01.

Should you have any questions concerning this letter, please contact Mr. Philip J. Duca at (856) 339-1640.

No regulatory commitments are contained in the LER Supplement.

Sincerely,

A handwritten signature in black ink, appearing to read "L. M. Wagner", written over a faint, larger version of the same signature.

Lawrence M. Wagner
Plant Manager
Hope Creek Generating Station

Attachment: Licensee Event Report 2010-002-01

Lead
NRK

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Hope Creek Commitment Tracking Coordinator (H02)

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1. FACILITY NAME: Hope Creek Generating Station
 2. DOCKET NUMBER: 05000 354
 3. PAGE: 1 of 5

4. TITLE: As Found Values for Safety Relief Valve Lift Setpoints Exceed Technical Specification Allowable

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
10	25	2010	2010	- 002 -	01	04	07	2011	N/A	
									N/A	DOCKET NUMBER

9. OPERATING MODE: 5
 10. POWER LEVEL: 000

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

<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 50.73(a)(2)(xi)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME: Philip J. Duca, Compliance Engineer
 TELEPHONE NUMBER (Include Area Code): (856) 339-1640

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
B	SB	RV	T020	Y					

14. SUPPLEMENTAL REPORT EXPECTED: YES (If yes, complete 15. EXPECTED SUBMISSION DATE) NO

15. EXPECTED SUBMISSION DATE: MONTH: DAY: YEAR:

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

On November 2, 2010, PSEG received the initial results for the safety relief valve (SRV) pilot valve 'as-found' setpoint testing. The results indicated that two SRV pilot valve setpoints exceeded Technical Specification (TS) allowable tolerance specified in TS 3.4.2.1. This specification requires SRV setpoint limits to be within +/- 3% of the specified value. The valves failing to meet limits were Target Rock Model 7567F two-stage SRVs. As planned all 14 SRV pilot valves were removed and replaced with pre-tested, certified spare pilot valves during refueling outage H1RF16. All 14 removed SRV pilot valves were "as found" tested at an offsite test facility. A total of six of the 14 SRV pilot valves experienced setpoint drift outside of the TS 3.4.2.1 limit.

The cause of the setpoint drift for five of six SRVs is corrosion bonding, which is consistent with industry experience. The materials combination for the pilot disc & the pilot seat has been a known industry issue since the design of the Target Rock 2 stage SRV. The cause of the setpoint drift of the sixth SRV was failure of the pilot spring to impart an even loading causing a misalignment of parts.

This condition is reportable under 10CFR50.73(a)(2)(i)(B) as any operation or condition prohibited by the plant Technical Specifications.

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PLANT AND SYSTEM IDENTIFICATION

General Electric – Boiling Water Reactor (BWR/4)
 Main Steam – EISS Identifier {SB}*
 Safety Relief Valves – EISS Identifier {SB/RV}*

* Energy Industry Identification System {EISS} codes and component function identifier codes appear as {SS/CCC}

IDENTIFICATION OF OCCURRENCE

Event Date: October 25, 2010

Discovery Date: November 2, 2010

CONDITIONS PRIOR TO OCCURRENCE

Hope Creek was in Operational Condition Five (OPCON 5) for the sixteenth refueling outage. No structures, systems or components were inoperable at the time of discovery that contributed to the event.

DESCRIPTION OF OCCURRENCE

Between November 2, 2010 and November 29, 2010 engineering personnel received the results of the Main Steam Safety Relief Valve (SRV){SB/RV} (Target Rock Model 7567F) setpoint testing required by Technical Specification 4.4.2.2. The initial report documented the failure of SRVs 'A', and 'L' to meet the TS 3.4.2.1 limit of +/- 3% (initial testing performed on October 25, 2010). Action a. of TS 3.4.2.1 specifies "With the safety valve function of two or more of the above listed fourteen safety/relief valves inoperable, be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours". At the time, Hope Creek was in OPCON 5 (refueling) with the reactor head removed and the reactor cavity flooded and connected to the spent fuel pool for refueling operations. As scheduled for H1RF16 all 14 SRV pilot valves were removed and replaced with pre-tested, certified spare pilot valves. All 14 removed SRV pilot valves were "as found" tested at an offsite test facility. A total of six of the 14 SRV pilot valves experienced setpoint drift outside of the TS 3.4.2.1 limit.

SAFETY CONSEQUENCES AND IMPLICATIONS

Using a technical evaluation prepared to address SRV pilot valve setpoint drift during the previous refueling outage (H1RF15), the setpoint drifts experienced during H1RF16 were fully bounded.

The Technical Evaluation performed during H1RF15, was used to assess the aggregate impact of H1RF15 setpoint failures. The analysis performed by GE (NEDC-32511P, "Safety/Relief Valve Tolerance Analysis") to assess the impact of the SRV Tech Spec setpoint tolerance change from +/-1% to +/-3% was used as a basis to perform this evaluation. There were two parts to the evaluation. The first is the actual lift setpoints being less than 1250 psig for the reactor vessel overpressure protection. The second is the increase in mechanical stresses on the torus & torus attached piping due to the higher lift setpoints.

The six valves that experienced a setpoint drift above the allowable +3% value would have lifted below the 1250 psig limit, thus the reactor vessel overpressure protection was not affected by the SRV pilot valve setpoint drifts. The ECCS/LOCA & High Pressure System Performance were included in this part of the evaluation. It was determined that the setpoint drift would not have impacted the design functions of these systems.

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The analysis performed by GE (NEDC-32511P) remains valid for the existing plant configuration and the maximum allowable percent increase (MAPI) above the SRV nominal setpoints can still be applied. For the H1RF16 testing the as-found setpoints of SRV-C, G, K, L and P remained below the value which is the lesser of 1250 psig or MAPI limit. Thus the as-found setpoints remained within the analyzed limits (NEDC-32511P). SRV-A drifted above the MAPI value of 3.0%. The Technical Evaluation concluded that if the setpoint drift of SRV A reached +5.8%, that the stresses imposed by the increased lift setpoint would have been below the ASME Section III, Appendix F, value for failure. For the Cycle 16 drift of +4.2%, this value is bounded by the +5.8% drift previously evaluated in the H1RF15 Technical Evaluation.

Therefore, the increase in the six SRV setpoints would not have impacted the vessel overpressure protection or the torus and torus attached piping.

The final test results for the SRVs that had setpoint drift outside the tolerance were as follows:

Valve ID	As Found	TS Setpoint	Acceptable Band (psig)	% Difference	
	(psig)	(psig)		Actual	Limit [#]
F013A	1177	1130	1096 – 1163	4.20%	3.00%
F013C	1186	1130	1096 – 1163	5.00%	21.80%
F013G	1199	1120	1087 – 1153	7.10%	8.70%
F013K	1172	1108	1075 – 1141	5.80%	22.40%
F013L	1192	1120	1087 – 1153	6.40%	16.30%
F013P	1157	1120	1087 – 1153	3.30%	27.4%

[#]The limit is based on the SRV discharge piping mechanical stress limit identified in Table 7-1 of GE analysis (NEDC-32511P) and is known as the "Maximum Allowable Pressure Increase" (MAPI).

A review of this event determined that a Safety System Functional Failure (SSFF) did not occur as defined in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Indicator Guideline".

CAUSE OF OCCURRENCE

An oxide forms between the mating surfaces of the Pilot Disc (solid Stellite 21) and the seat in the Pilot Body (Stellite 6 overlay). This bridging oxide fractures when the pilot disc lifts. The load required to fracture this bridging oxide increases the lift point and can lead to pilots failing high during lift tests.

The apparent cause of the setpoint drift for five of the six SRV pilot valves that failed is corrosion bonding, which is consistent with industry experience. The materials combination for the pilot disc and the pilot seat have been a known industry issue since the design of the Target Rock 2 stage SRV. The oxygen content of the steam, in the pilot disc area, aggravates the natural corrosive reaction in the pilot disc seating area. Numerous industry attempts to resolve the oxide formation have failed to improve performance. A summary of the BWROG recommendations to improve SRV reliability with regard to setpoint drift was documented in NRC Regulatory Issue Summary 2000-12 dated August 7, 2000: "Resolution of Generic Safety Issue B-55, Improved Reliability of Target Rock Safety Relief Valves". The three modification options recommended were: (1) the installation of ion beam implanted platinum (IBAD Process) pilot valve discs, (2) the installation of Stellite 21 pilot valve discs, and (3) the installation of additional pressure actuation switches. Hope Creek has implemented options 1 and 2 with

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limited success. Option three has not been considered due to mixed industry results/performance.

Following H1RF15, Southwest Research was contracted to metallurgically evaluate the Pilot Body and Disc from SRV-K (setpoint failure at +9.4%) using both stereomicroscopy and scanning electron microscopy (SEM) to determine if evidence of bonding between the mating surfaces of the disc and body was present. The SEM examinations of the seating area on the Pilot Disc showed clear evidence of brittle oxide fracture along the seating line. These sharp fracture lines are typically produced as a brittle oxide grown between two surfaces fractures as the surfaces are separated, leaving islands of the oxide on each surface. Spectra taken from various regions along the seat confirmed that portions of the oxide were being removed from the Pilot Disc seat, i.e., left behind on the seat face, as the disc lifted off the seat. These results confirm that an oxide had formed between the mating surfaces of the Pilot Disc and the seat in the Pilot Body and that this bridging oxide fractured when the disc lifted. The load required to fracture this bridging oxide increases the lift point and can lead to pilots failing high during lift tests.

Based on these previous examinations and the fact that the second lift of five of the six SRVs was within the +/-3% tolerance, corrosion bonding is the apparent cause for five of the six SRVs.

SRV-G is the only SRV, where repeated lifts did not produce a satisfactory setpoint. For the other five pilots the second lift was within the +/-3% tolerance. SRV-G was as-found tested with the first three lifts above the +3% setpoint tolerance (first lift = +7.1%; second lift = +4.7%; third lift = +3.1%; fourth lift = +1.8%; fifth lift = +0.4%; sixth lift = +0.5%). With corrosion bonding, industry experience has shown that the first lift breaks the bond & all successive lifts are within setpoint. Five of the six setpoint failures during H1RF16 had the classical performance related to a corrosion bonding condition. SRV-G, however, had three successive lifts out of tolerance.

A full disassembly of the G SRV Pilot valve was performed March 8, 2011, at NWS Technologies in Spartanburg, SC. All parts were visually inspected, with all critical parts measured to validate each being within specification tolerances. All parts, except as noted below, were found to be within specification tolerances.

The as-found inspection documented that the spherical collar was wedged against the bellows rod, preventing the bellows rod from freely moving. The bellows rod is the upper section of the pilot stem and is required to move in unison with each pilot disc lift. The spherical collar rests on top of the pilot rod and imparts an upper thrust against the lower spring retainer (spring seat) with each lift. When compressed in the spring compression tester, the pilot spring shifted, imparting a side load onto the spherical collar. The pilot spring should compress evenly, with no side shifts. It was visually determined that the pilot spring caused the spherical collar wedging, which in-turn caused a misalignment of parts.

Based on these findings, the failure of the pilot spring to impart an even loading has been determined to be the apparent cause. The failure of the pilot spring to impart an even loading, caused the misalignment of parts, which subsequently caused the successive out of tolerance as-found lifts.

An operation has been entered into the corrective action program to mandate that spring load cell testing and a dimensional verification be performed on the pilot valve setpoint spring during each pilot valve rebuild.

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PREVIOUS OCCURRENCES

A review of LERs for the three prior years at Hope Creek was performed to determine if a similar event had occurred. There was a similar event during the 2009 Hope Creek refueling outage when six SRVs were found out of the TS required limits of +/- 3%. This event was reported as LER 354/2009-002-00 and its supplement 354/2009-002-01.

CORRECTIVE ACTIONS

1. During H1RF16 all 14 SRV pilot valves were removed and replaced with pre-tested, certified spare pilot valves.
2. All 14 SRV pilot valves will be removed, tested and replaced with pre-tested, certified spare pilot valves during the next refueling outage (H1RF17).
3. All six pilot valves that failed to meet the \pm 3% TS setpoint tolerances were disassembled and inspected to validate the cause for the failure to meet the setpoint.
4. SRV-G was disassembled and inspected to determine the cause of the successive out of tolerance as-found lifts.
5. A proposal to convert to 3-stage safety-relief valves is being considered through the plant modification process.
6. An operation has been entered into the corrective action program to mandate that spring load cell testing and a dimensional verification be performed on the pilot valve spring during each pilot valve rebuild.

COMMITMENTS

This LER contains no commitments.