PSEG Nuclear LLC
P.O. Box 236, Hancocks Bridge, New Jersey 08038-0236

PSEG
Nuclear LLC

DEC 2 1 2010

LR-N10-0443 **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

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

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.

Sincerely,

Lawrence M. Wagner
Plant Manager
Hope Creek Generating Station

Attachment: Licensee Event Report 2010-002

IE22
NRR

cc: Mr. W. Dean, Administrator – Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. R. Ennis, Project Manager Salem and Hope Creek
U.S. Nuclear Regulatory Commission
One White Flint North
Mail Stop 08 B1A
11555 Rockville Pike
Rockville, MD 20852

USNRC Senior Resident Inspector – Hope Creek (X24)

P. Mulligan, Manager IV
Bureau of Nuclear Engineering
PO Box 415
Trenton, NJ 08625

Hope Creek Commitment Tracking Coordinator (H02)

INPO – LEREvents@INPO.org

NRC FORM 366 (10-2010)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Hope Creek Generating Station	05000 354	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: N/A	DOCKET NUMBER
10	25	2010	2010	- 002 -	00	12	21	2010	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)*

☐ 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)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Philip J. Duca, Compliance Engineer	(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		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)*	☐ NO		04	01	11

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 will be "as found" tested at an offsite test facility. To date, 13 of the 14 valves have been tested and a total of six of the 14 SRV pilot valves experienced setpoint drift outside of the TS 3.4.2.1 limit. Results of the setpoint drift for the last valve, if above the TS limit, will be reported in the supplement to this LER.

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 most probable cause of the setpoint drift of the sixth SRV is a parts misalignment condition. The final cause determination will be made during disassembly and inspection.

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

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Hope Creek Generating Station	05000354	2010	0 0 2	00	2 of 5

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

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

* Energy Industry Identification System {EIIS} 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 14 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 will be "as found" tested at an offsite test facility. To date 13 of 14 valves have been tested and a total of six of the 14 SRV pilot valves experienced setpoint drift outside of the TS 3.4.2.1 limit. Results of the setpoint drift for the last valve, if above the TS limit, will be reported in the supplement to this LER.

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.

NARRATIVE

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 (psig)	TS Setpoint (psig)	Acceptable Band (psig)	% Difference	
				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 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 & 2 with limited success. Option three has not been

NARRATIVE

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. The most probable cause of the setpoint drift of the sixth SRV is a parts misalignment condition. SRV-G will be disassembled and inspected to determine the cause.

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.

NARRATIVE

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 will be disassembled and inspected to validate that the cause is corrosion bonding.

4. SRV-G will be 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.

COMMITMENTS

This LER contains no commitments.