D. R. Madison (Dennis) Vice President - Hatch Southern Nuclear Operating Company, Inc. Plant Edwin I. Hatch 11028 Hatch Parkway, North Baxley, Georgia 31513

Tel 912.537.5859 Fax 912.366.2077



August 30, 2011

Docket No.: 50-366

NL-11-1720

U. S. Nuclear Regulatory Commission ATTN: Document Control Desk Washington, D. C. 20555-0001

> Edwin I. Hatch Nuclear Plant Licensee Event Report 2011-002-0 Corrosion-Induced Binding Results in Multiple Safety Relief Valves Setpoint Drift

Ladies and Gentlemen:

In accordance with the requirements of 10CFR 50.73(a)(2)(i)(B), Southern Nuclear Operating Company (SNC) hereby submits the enclosed Licensee Event Report which addresses setpoint drift in excess of that allowed by Technical Specification SR 3.4.3.1 occurring in eight Safety Relief Valves due to corrosioninduced binding between the pilot disc and associated seating surfaces.

This letter contains no NRC commitments. If you have any questions, please contact Doug McKinney at (205) 992-5982.

Respectfully submitted,

Jackin

D. R. Madison Vice President - Hatch

DRM/WEB/msc

Enclosure: LER 2011-002-0

U. S. Nuclear Regulatory Commission Log: NL-11-1720 Page 2

cc: <u>Southern Nuclear Operating Company</u> Mr. S. E. Kuczynski, Chairman, President & CEO Mr. J. T. Gasser, Executive Vice President Ms. P. M. Marino, Vice President – Engineering RTYPE: CHA02.004

> <u>U. S. Nuclear Regulatory Commission</u> Mr. V. M. McCree, Regional Administrator Mr. R. E. Martin, NRR Project Manager -Farley, Hatch and Vogtle Mr. E.D. Morris, Senior Resident Inspector – Hatch

Edwin I. Hatch Nuclear Plant

Corrosion-Induced Binding Results in Multiple Safety Relief Valves Setpoint Drift

Enclosure 1 to NL-11-1720

Licensee Event Report 2011-002-0

NRC FOR	NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013														
(9-2007)	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 burder estimate to the Records and FOLMPrivacy Service Bragarding burder e-mail to infocollects.resources@nrc.gov, and to the Desk Officer, Officer Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office Management and Budget, Washington, DC 20503. If a means used to import an information collection does not display a currently valid OMB conti- number, the NRC may not conduct or sponsor, and a person is not required respond to. the information collection.											by collection ted into the rrding burden 5 F53), U.S. or by internet cer, Office of 4), Office of ed to impose OMB control ot required to			
1. FACIL Edwi	n I. Ha	ME tch Nuc	lear Pla	ant Unit	2				2.	DOCKE 050	t numbi 00 366	ER	3. PAGE 1	OF 5	5
4. TITLE Corrosion Induced Bonding Results in Setpoint Drift for Multiple Safety Relief Valves															
5. EVENT DATE 6. LER NUMBER 7. REPORT DATE 8. OTHER FACILITIES INVOLVED															
MONTH	DAY	YEAR	YEAR	SEQUEN' NUMBE	TIAL RE	MONTH	DAY	YEAF	R	FACILITY	NAME			DOCKET 050	NUMBER
07	05	2011	2011	- 002	- 0	08	30	201	1	FACILITY	NAME			DOCKET 050	
9. OPER	ATING	MODE	11	. THIS RE	PORTI	SUBMITT	ED PURS	UANT 1	ro '	THE RE	QUIREM	ENTS OF 10	CFR§: (Che	ck all that	apply)
10. POW	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$														
12. LICENSEE CONTACT FOR THIS LER															
FACILITY NAME Edwin I. Hatch / Steven Tipps – Principal Engineer – Licensing 912-537-5880															
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT															
CAU	CAUSE SYSTEM COMPONENT MANU- FACTURER REPORTABLE TO EPIX CAUSE SYSTEM COMPONENT MANU- FACTURER REPORTABLE TO EPIX									ORTABLE O EPIX					
В		SB	R۱	/	T020	Y	es								
14. SUPPLEMENTAL REPORT EXPECTED 15. EXPECTED SUBMISSION DAY YEAR □ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☑ NO ☑ DATE ☑ MONTH DAY YEAR															
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) On July 5, 2011, at approximately 1000 EDT, Unit 2 was at 100 percent rated thermal power (RTP) when the "as-found" testing results of the 2-stage main steam safety relief valves (SRVs) were received which indicated that eight of eleven SRVs had experienced setpoint drift which resulted in their allowable Tech Spec limits being exceeded. The root cause of the SRV setpoint drift is attributed to corrosion-induced bonding between the pilot disc and seating surfaces. This conclusion is based on previous root cause analyses and the repetitive nature of this condition at Hatch and within the BWR industry. The 2-stage SRVs were removed from Unit 2 in April 2011, and preemptively replaced with 3-stage SRVs as the long term corrective action for the historically observed setpoint drift. The use of 3-stage SRVs is regarded as an industry-wide solution for the corrosion-induced bonding phenomenon which has been a historic industry issue since the early 1980s.															

I. FACILITY NAME 2. DOCKET 6. LER NUMBER 3. PAGE Edwin I. Hatch Nuclear Plant Unit 2 05000-366 YEAR SEQUENTIAL NUMBER 2 OF NARRATIVE PLANT AND SYSTEM IDENTIFICATION 2011 - 002 - 0 2 OF MARRATIVE PLANT AND SYSTEM IDENTIFICATION General Electric - Boiling Water Reactor Energy Industry Identification System codes appear in the text as (EIIS Code XX). DESCRIPTION OF EVENT On July 5, 2011, at approximately 1000 EDT, Unit 2 was at 100 percent rated thermal power (RTP) when the "as-found" testing results of the 2-stage main steam safety relief valves (SRVs) were received which indicated that eight of eleven SRVs (EIIS Code SB) had experienced setpoint drift which resulted in their allowable Tech Spec limits of 1150 + /- 34.5 psig (± 3 percent) being exceeded. The following is a tabulation of the test results of the eleven SRVs: MPL Number Pilot Serial Number As-Found Lift Pressure Percent Drift 2821-F013B 1001 1183 102.87 2821-F013B 1011 1183 102.87 2821-F013B 11227 1276 110.96 2821-F013B 1127 104.96 2821-F013B 1127 102.52 2821-F013B 1127 102.52 2821-F013H 1190 1243 108.09 2821-F013L 1008 1309 113.83 2821-F013L 1008	LICE	FORM 366A 10}			PORT (LI SHEET	ER) ^{0.8. NUC}	LEAR REG	JULAIOF		15510		
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2B21-F013D3121207104.962B21-F013E12271276110.962B21-F013F3111271110.522B21-F013G11881179102.522B21-F013H11901243108.092B21-F013L10081309113.832B21-F013M3011226106.61These eleven valves were removed from service during the Spring 2011 refueling outage and preemptively replaced with 3-stage SRVs that had been properly setup and tested at Wyle Laboratories prior to installation.CAUSE OF EVENTThe root cause of the SRV setpoint drift is attributed to corrosion-induced bonding between the pilot disc and seating surface. This conclusion is based on previous root cause analyses	10	2B21-F013C	1009		1195		1	03.91				
2B21-F013E12271276110.962B21-F013F3111271110.522B21-F013G11881179102.522B21-F013H11901243108.092B21-F013K3051177102.352B21-F013L10081309113.832B21-F013M3011226106.61These eleven valves were removed from service during the Spring 2011 refueling outage and preemptively replaced with 3-stage SRVs that had been properly setup and tested at Wyle Laboratories prior to installation.CAUSE OF EVENTThe root cause of the SRV setpoint drift is attributed to corrosion-induced bonding between the pilot disc and seating surface. This conclusion is based on previous root cause analyses	31	2B21-F013D	312		1207		1	04.96				
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2B21-F013M3011226106.61These eleven valves were removed from service during the Spring 2011 refueling outage and preemptively replaced with 3-stage SRVs that had been properly setup and tested at Wyle Laboratories prior to installation.CAUSE OF EVENT The root cause of the SRV setpoint drift is attributed to corrosion-induced bonding between the pilot disc and seating surface. This conclusion is based on previous root cause analyses	10	2B21-F013L	1008		1309		1	13.83				
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<u>CAUSE OF EVENT</u> The root cause of the SRV setpoint drift is attributed to corrosion-induced bonding between the pilot disc and seating surface. This conclusion is based on previous root cause analyses	tallat	Laboratories prior to	allation.									
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The root cause of the SRV setpoint drift is attributed to corrosion-induced bonding between the pilot disc and seating surface. This conclusion is based on previous root cause analyses		CAUSE OF EVENT										
the pilot disc and seating surface. This conclusion is based on previous root cause analyses	V se	The root cause of the	V setpoint drift is a	attribute	d to corro	osion-induced	bonding	, betwe	en			
	g surf	the pilot disc and sea	surface. This con	clusion	is based o	on previous ro	ot cause	analys	es			
and the repetitive nature of this condition at Hatch and in the industry. In General Electric	of th	and the repetitive nat	of this condition a	t Hatch	and in the	industry. In	General	Electri	с			
(GE) service information letter (SIL) 196, Supplement 16, GE determined that condensation	n lett	(GE) service information	letter (SIL) 196, S	Supplem	ent 16, G	E determined	that con	densati	ion			
of steam in the pilot chamber of Target Rock 2-stage SRVs can cause oxygen and hydrogen	mber	of steam in the pilot	nber of Target Roc	ck 2-stag	ge SRVs o	can cause oxy	gen and	hydrog	en.			
dissolved in the steam to accumulate. As steam condenses in the relatively stagnant pilot) acci	dissolved in the stear	accumulate. As st	team con	ndenses in	n the relativel	y stagnar	nt pilot				
chamber, the dissolved gases are released. In a volume such as the pilot chamber which is	zases	chamber, the dissolv	ases are released.	In a voli	ime such	as the pilot ch	namber w	vhich is	5			
normally at approximately 1000 psig and temperature of 545 degrees F, the total pressure	elv 10	normally at approxir	v 1000 psig and te	emperati	re of 545	degrees F, th	e total p	ressure				
consists primarily of water vapor partial pressure because 544.6 degrees F is the saturation	ter va	consists primarily of	er vapor partial pre	essure b	ecause 54	4.6 degrees F	is the sa	turatio	n			
temperature at 1000 psig. This wet, hot, high-oxygen atmosphere can be very corrosive and	, Th	temperature at 1000	This wet, hot, hi	gh-oxyg	en atmos	phere can be	verv corr	osive a	nd			

can increase the likelihood of corrosion-induced bonding of the pilot disk to its seat. It was also noted that proper insulation minimizes the accumulation rate of non-condensable gases

and the steady-state oxygen partial pressure. Despite improvements made in maintaining the integrity of insulation for the previously installed 2-stage SRVs the corrosion-induced bonding continued to occur as evidenced by the test results from this most recent outage.

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REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This event is reportable in accordance with (iaw) Title 10 of the Code of Federal Regulations (CFR), Part 50.73(a)(2)(i)(B) because an event occurred which is prohibited by the Technical Specifications (TS). Specifically, an example of multiple test failures is given in NUREG 1022, Revision 2, "Event Reporting Guidelines 10CFR50.72 and 50.73" which describes the sequential testing of safety valves. This example notes that "Sometimes multiple valves are found to lift with set points outside of technical specification limits."

NUREG 1022 further notes that "discrepancies found in technical specifications surveillance tests should be assumed to occur at the time of the test unless there is firm evidence, based on a review of relevant information (e.g., the equipment history and the cause of failure) to indicate that the discrepancy occurred earlier. However, the existence of similar discrepancies in multiple valves is an indication that the discrepancies may well have arisen over a period of time, and the failure mode should be evaluated to make this determination." Based on this guidance and the fact that the development of the corrosion occurred over a period of time of plant operation, the determination was made that this "as found" condition is reportable under the reporting requirements of 10CFR50.73(a)(2)(i)(B).

There are eleven (11) SRVs located on the four main steam lines within the drywell (EIIS Code NH) between the reactor pressure vessel (EIIS Code AD) and the inboard main steam isolation valves (MSIV EIIS Code SB). These SRVs are required to be operable during Modes 1, 2 and 3 to limit the peak pressure in the nuclear system such that it will not exceed the applicable ASME Boiler and Pressure Vessel Code Limits for the reactor coolant pressure boundary. The SRVs are tested iaw TS surveillance requirement 3.4.3.1 in which the valves are tested as directed by the In-Service Testing Program to verify lift setpoints are within their specified limits to confirm they would perform their required safety function of overpressure protection. The SRVs must accommodate the most severe pressurization transient which, for the purposes of demonstrating compliance with the ASME Code Limit of 1375 psig peak vessel pressure has been defined by an event involving the closure of all MSIVs with a failure of the direct reactor protection system trip from the MSIV position switches with the reactor ultimately shutting down as the result of a high neutron flux trip (a scenario designated as MSIVF). This MSIVF event analysis was performed by the Nuclear Fuels Department for the H2C21 "as-found" condition of the SRVs. The results from this analysis showed a small increase in peak pressures relative to the Hatch-2 Cycle 21 reload licensing analysis (RLA) results. The higher peak pressures were due to the fact that eight of the eleven SRVs opened at pressures higher than that which was assumed in the RLA. It should be noted that in this analysis, the larger actual valve bore size was used in the calculations for nine of the valves rather than the smaller bore size which was conservatively assumed in the RLA. Therefore, higher steam flow capacities than those assumed in the RLA were used in this analysis for those nine valves. Based on the analysis, the calculated minimum margin to the 1375 psig ASME Boiler and Pressure Vessel Code overpressure limit for peak vessel pressure would have been 27.7 psig and the minimum margin to the 1325 psig Tech Spec Safety Limit for the reactor steam dome pressure would have been 2.9 psig during an MSIVF event during Cycle 21 operation. Therefore, the analysis of the "as found" test

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results showed that the	e peak pressure	at the bottom	of the ves	sel remained	d below th	e ASM	E				
Boiler and Pressure V remained within the 7	Boiler and Pressure Vessel code limit, and the peak reactor pressure vessel dome pressure remained within the Tech Spec Safety Limits.										
Additionally, a highly redundant, independe electrical logic syster	Additionally, a highly reliable though non-credited electrical actuation system serves as a redundant, independent method to actuate the SRVs. During the Cycle 21 this redundant electrical logic system was fully functional.										
Based on the analysis would have continued condition. Therefore	Based on the analysis by the Nuclear Fuels Department, the overpressure protection system would have continued to perform its required safety function if called upon in its "as found" condition. Therefore, this event had no adverse impact on nuclear safety.										
CORRECTIVE ACT All eleven 2-stage SF valves as the long term wide solution for the co since the early 1980s.	<u>CORRECTIVE ACTIONS</u> All eleven 2-stage SRV pilot valves were preemptively replaced with new 3-stage SRV pilot valves as the long term corrective action. The use of the 3-stage SRVs is regarded as an industry- wide solution for the corrosion-induced bonding phenomenon which has been a historic industry issue since the early 1980s.										
ADDITIONAL INFO	ADDITIONAL INFORMATION Other Systems Affected: None										
Other Systems Affec											
Failed Components I	nformation:										
Master Parts List N Manufacturer: Targ Model Number: 756 Type: Relief Valve Manufacturer Code	umber:2B21-F0 get Rock 7F : T020)13A, B, C, D Repor Root (EIIS (, E, F, G, table to I Cause Co Compone	H, K, L, M E PIX : Yes de: B nt Code: R	EIIS Syst V	em Co	de: SB	5			
Commitment Information Commitments.	ation: This repo	rt does not cre	ate any no	ew permanei	nt licensin	g					
Previous Similar Eve LER 1-2010-001, ide actions included refu discs with discs made SRV was upgraded to same actions that wer improved results had when these actions w	nts: ntified multiple bishment of the from Stellite 21 improve resista te taken followin been seen to sor ere implemented	SRV setpoint pilot valves a l material. Ac ance to corrosi ng similar failu ne degree in t l.	drift for 5 nd includ Iditionally on-induce ares repor- he industr	of the 11 S ed the replac , the insulat ed bonding. ted in LER 2 y for at least	RVs. Com ement of t ion surrou These wer 2-2009-001 one operation	rective the pilo nding e re the I, since ating cy	ot each vcle				

Multiple examples of SRV setpoint drift occurred and were also reported in LERs 2-2008-004, 1-2008-002, 2-2007-006 and 1-2006-003. These instances of SRV setpoint drift occurred due to like causes which have been noted to be similar to those of the ongoing industry issues with these type SRVs. In each of these cases SNC concluded that the

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overpressure protection syst challenged during its respec The replacement of the 2-st	em would have perform tive operating cycle. age SRVs with 3-stage	ned its red SRVs sho	quired safety f ould resolve th	unction h	industi	ry					
issue, and this assertion will during the next scheduled re	l be confirmed during the confirmed during the transformed by the second s	ne perform	nance of futur	e "as four	nd" tes	sting					