

AUG 19 2002



LR-N02-0291

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

LER 354 / 2002- 004 - 00
HOPE CREEK GENERATING STATION
FACILITY OPERATING LICENSE NPF- 57
DOCKET NO. 50-354

Gentlemen:

This Licensee Event Report entitled "Engineered Safety Feature Actuation – Reactor Scram Caused by Turbine Trip from Moisture Separator High Level following Intermediate Runback of Reactor Recirculation Pumps" is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv)(A) as an automatic reactor scram. The attached LER contains no commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "D. F. Garchow".

D. F. Garchow
Vice President - Operations

Attachment

/KMB

C Distribution
RTL 3E.111

IED2

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME Hope Creek Generating Station	2. DOCKET NUMBER 05000354	3. PAGE 1 OF 6
--	-------------------------------------	--------------------------

4. TITLE
Engineered Safety Feature Actuation – Reactor Scram Caused by Turbine Trip from Moisture Separator High Level following Intermediate Runback of Reactor Recirculation Pumps

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
06	22	02	2002	004	00	08	19	02		

9. OPERATING MODE	1	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)(ii)	<input type="checkbox"/> 50 73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
10. POWER LEVEL	100	<input type="checkbox"/> 20 2201(d)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50 73(a)(2)(iii)	<input type="checkbox"/> 50 73(a)(2)(x)
		<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 50 36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 73.71(a)(4)
		<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50 36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(5)
		<input type="checkbox"/> 20 2203(a)(2)(ii)	<input type="checkbox"/> 50 36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> OTHER
		<input type="checkbox"/> 20 2203(a)(2)(iii)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50 73(a)(2)(v)(C)	<input type="checkbox"/> Specify in Abstract below or in NRC Form 366A
		<input type="checkbox"/> 20 2203(a)(2)(iv)	<input type="checkbox"/> 50 73(a)(2)(i)(A)	<input type="checkbox"/> 50 73(a)(2)(v)(D)	
		<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50 73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	
		<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50 73(a)(2)(viii)(A)	
		<input type="checkbox"/> 20 2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50 73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME William McTigue, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) 856-339-1033
---	--

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
X	SD	IMOD	B045	Y	B	SM	LT	F130	Y

14. SUPPLEMENTAL REPORT EXPECTED

YES (If yes, complete EXPECTED SUBMISSION DATE)	<input type="checkbox"/> X	<input type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
---	----------------------------	-----------------------------	-------------------------------------	-------	-----	------

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

On June 22, 2002 at approximately 1417, Hope Creek Generating Station experienced an automatic reactor scram as a result of a turbine trip due to high moisture separator (MS) level. The high MS level resulted from failure of the level controls to adequately respond to the transient, due in part to two phase flow in the drain path. The initiating event that ultimately resulted in the scram was failure of a logic card that caused a secondary condensate pump (SCP) to trip. The automatic reactor scram was successful, but anomalous control rod position indications immediately after the scram prompted operators to initiate alternate rod insertion in accordance with procedures. Condensate flow to feedwater heaters 1 and 2 isolated due to high heater feedwater level; operators manually established bypass flow. Cooldown was in accordance with Technical Specification limits and there were no safety consequences as a result of this event.

Corrective actions include replacement of the SCP logic card, corrective maintenance of the normal MS drain control loop and adjustments to the MS dump valve controls to improve response time.

This event is reportable under 10 CFR 50.73 (a)(2)(iv)(A) as an actuation of the reactor protection system.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)				PAGE (3)	
		YEAR	SEQUENTIAL NUMBER		REVISION NUMBER		
Hope Creek Generating Station	05000354	2002	0	0	4	00	2 OF 6

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

PLANT AND SYSTEM IDENTIFICATION

- Control Rod Drive System {AA/--}
- General Electric – Boiling Water Reactor (BWR/4)
- Reactor Recirculation System {AD/--}
- Reactor Water Cleanup System – EIIS Identifier {CE/--}*
- Hydrogen Water Chemistry Injection System – EIIS Identifier {KD/--}*
- Condensate System {SD/--}*
- Condenser System {SG/--}
- Feedwater System – EIIS Identifier {SJ/--} *
- HP Heaters MSR Drains and Vents System {SM/--}
- Electrohydraulic Control System – EIIS Identifier {TG/--}*

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

IDENTIFICATION OF OCCURRENCE

Date of occurrence: June 22, 2002

CONDITIONS PRIOR TO OCCURRENCE

Mode 1 – 100% power. No structures, systems, or components were inoperable at the time of the occurrence that contributed to the event.

DESCRIPTION OF OCCURRENCE

At approximately 1417 on June 22, 2002, the Hope Creek Generating Station (HCGS) experienced an automatic reactor scram due to a turbine trip caused by high water level in the A moisture separator {SM/MSR}.

Approximately 90 seconds prior to the reactor scram, an intermediate runback (i.e, to 45% speed) of the reactor recirculation pumps {AD/P} was initiated by a trip of the B Secondary Condensate Pump {SD/P}. The overhead alarm (OHA) for the secondary condensate pump trip did not respond. The first OHA received was "HWC System Trouble" (hydrogen water chemistry injection) due to isolation of hydrogen injection to secondary condensate. Control room operators observed the intermediate pump runback and corresponding reduction in reactor power. Approximately 15 to 20 seconds after the initiation of the intermediate runback, both A and B moisture separator drain tanks {SM/TK} were in the high level alarm range, with A moisture separator level higher than B moisture separator level. Although the A moisture separator's dump valve {SM/LCV} to the condenser {SG/COND} opened, its level increased.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)				PAGE (3)	
		YEAR	SEQUENTIAL NUMBER		REVISION NUMBER		
Hope Creek Generating Station	05000354	2002	0	0	4	00	3 OF 6

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

DESCRIPTION OF OCCURRENCE (Cont'd)

The main turbine tripped on high moisture separator level and the reactor subsequently scrammed from approximately 60% reactor power.

While verifying control rod insertion after the automatic scram, control room operators observed rod worth minimizer indications of rods not fully inserted, and responded by initiating alternate rod insertion (ARI) in accordance with operating procedures. Just prior to the ARI, the shift technical advisor observed indications on the core monitoring system that all rods except 22-31 had inserted. Control rod 22-31 initially indicated full out and later showed it was fully inserted. Based on these indications and evaluation of rod 22-31 position indication, it was concluded that the automatic scram was successful and the initial rod position indication was in error.

Upon initiation of the automatic reactor scram, the recirculation pumps tripped as expected from the end of cycle recirculation pump trip (EOC-RPT) signal. An unexpected trip of the A recirculation pump motor-generator (M-G) set motor breaker occurred shortly thereafter, but did not complicate response to the event.

Several seconds after the automatic scram, the condensate inlet valves {SD/FCV} to the number 1 and 2 feedwater heaters {SJ/HX} isolated due to high water level. Manual operator action was promptly taken to provide a feedwater suction flow path by opening the feedwater bypass valve {SJ/FCV}. Reactor water level and pressure stabilized and cooldown commenced. Cooldown was performed within Technical Specification limits.

A four hour notification was made to NRC on June 22, 2002 in accordance with 10 CFR 50.72 (b)(2)(iv)(b), for actuation of the reactor protection system. This event is also reportable pursuant to 10 CFR 50.73 (a)(2)(iv)(A) as an automatic actuation of the reactor protection system.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)				PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Hope Creek Generating Station	05000354	2002	0	0	4	00	4 OF 6

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

CAUSE OF OCCURRENCE

Failure of a Bailey logic card {SD/IMOD} that resulted in erroneous logic outputs caused the B secondary condensate pump trip that initiated the transient, with no overhead annunciation of the pump trip.

The A moisture separator high level that caused the turbine trip was due to the failure of the moisture separator drains to adequately respond to the level increase resulting from the runback transient, due in part to two phase flow in the drains. Each moisture separator has a normal drain path to the number 5 feedwater heaters, and a separate path through a dump valve to the condenser. The normal drain path valves and the dump valve are positioned by separate pneumatic control loops {SM/LC}. After the transient, output of the A moisture separator normal drain level transmitter was found to be lower than expected due to insufficient tightening of its mounting screws. During response time testing performed after the event, the A dump valve reached its full open limit in approximately 55 seconds, vice 35 seconds for the B dump valve, due to differences in controller proportional band settings. Design characteristics of the pneumatic controllers, including a small exhaust port that must vent control air for the dump valves to open, also tend to increase the valves' response time. The indication that the A moisture separator dump valve was open for several seconds before the high level setpoint was reached suggests that two phase flow conditions due to flashing contributed to the high level. The A moisture separator drains are more susceptible to two phase flow than the B moisture separator because there is more piping downstream of the A drain tank, and the slope of horizontal drain piping is less than the vendor's specified value of one-half inch per foot.

Isolation of condensate flow to the 1 and 2 feedwater heaters was due to insufficient drain flow. The drain flow is driven by differential pressure between the heaters and condenser. The decrease in differential pressure as condenser vacuum decreased during the transient had the effect of reducing drain flow and increasing feedwater heater level.

The indication that control rods had not fully inserted after the automatic reactor scram was due to erroneous position indication for rod 22-31. This indication error led the operator to initiate alternate rod insertion when the automatic scram had been successful. The erroneous position indication for control rod 22-31 has been determined to be most likely due to moisture intrusion into the position indicating probe that caused spurious indication of reed switch closures.

The reactor recirculation pump M-G set drive motor breaker trip is attributed to inadequate field voltage regulation, exact causes of which are under evaluation.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)				PAGE (3)		
Hope Creek Generating Station	05000354	YEAR	SEQUENTIAL NUMBER		REVISION NUMBER	5	OF	6
		2002	0	0	4			

PRIOR SIMILAR OCCURRENCES

Prior Hope Creek LERs were reviewed for similar events. A similar event was reported in LER 354/1998-008-00, "Engineered Safety Feature Actuation – Automatic Reactor Scram Due to Turbine Trip Caused by High Moisture Separator Level." The cause of the high A moisture separator level was failure of the normal drain valves and dump valve to open. Control air to the normal drain valves was inadvertently isolated due to a drawing error. Failure of the A moisture separator dump valve to open during the 1998 event was attributed to excessive friction between the valve seat and plug. The dump valve internals were replaced with an improved design to improve valve performance. There were no indications of inadequate mechanical performance of the A moisture separator dump valve during the June 22, 2002 event. Corrective actions for 1998 event could not have prevented the June 22, 2002 event.

SAFETY CONSEQUENCES AND IMPLICATIONS

The reactor recirculation pump intermediate runback performed as expected following the trip of the B secondary condensate pump.

Although erroneous control rod position indication challenged the operators' initial confirmation of rod insertion, the automatic reactor scram performed as expected following the turbine trip due to high moisture separator level. The EOC-RPT trip performed as expected.

Isolation of the 1 and 2 feedwater heaters required manual operator action to establish condensate flow by opening the feedwater bypass valve. Reactor water level was stabilized and restored. Reactor pressure control via the electrohydraulic control (EHC) system was satisfactory. Cooldown was achieved within Technical Specification limits.

Based on the above, there were no safety consequences as a result of this event.

A review of this condition determined that a Safety System Functional Failure (SSFF) has not occurred as defined in Nuclear Energy Institute (NEI) 99-02.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)				PAGE (3)	
		YEAR	SEQUENTIAL NUMBER		REVISION NUMBER		
Hope Creek Generating Station	05000354	2002	0	0	4	00	6 OF 6

CORRECTIVE ACTIONS

1. The failed Bailey logic card for the B secondary condensate pump motor was replaced and tested satisfactorily. The card failure was evaluated as part of Bailey logic card failure trending that shows no adverse trend in failure rate.
2. The A moisture separator normal level control loop transmitter, displacer and torque tube were replaced, with the transmitter securely mounted. The level transmitter was successfully recalibrated.
3. The proportional band of the A moisture separator dump valve controller was set consistent with that of the B moisture separator to improve its response time.
4. PSEG will develop and implement changes to improve moisture separator level control during transients, with consideration of the potential for two phase flow.
5. PSEG will replace the position indicating probe for control rod 22-31.
6. PSEG is evaluating and will implement the appropriate changes for feedwater heater drains and the A reactor recirculation pump M-G set motor drive breaker.

The future actions identified above are being tracked in accordance with PSEG's corrective action program.

COMMITMENTS

The corrective actions cited in this report are voluntary enhancements and do not constitute commitments.