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August 15, 1989

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BRUNSWICK STEAM ELECTRIC PLANT UNIT 1
DOCKET NO. 50-325
LICENSE NO. DPR-71
SUPPLEMENTAL LICENSEE EVENT REPORT 1-89-013

Gentlemen:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed Supplemental Licensee Event Report is submitted. The original report fulfilled the requirement for a written report within thirty (30) days of a reportable occurrence and is in accordance with the format set forth in NUREG-1022, September 1983.

Very truly yours,

J. L. Harness, General Manager
Brunswick Nuclear Project

TMJ/mcg

Enclosure

cc: Mr. S. D. Ebneter
Mr. E. G. Tourigny
BSEP NRC Resident Office

IE22
1/1

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4)
RWCU Isolation Due to Suspected High Discharge Temperature From Non-Regen Heat Exchanger

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
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0 4	1 0	8 9	8 9	—	0 1 3	—	0 1	0 8	1 5	8 9		0 5 0 0 0

OPERATING MODE (9)	2	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)					
POWER LEVEL (10)	0 0 1	20.402(b)	20.405(c)	X	50.73(a)(2)(iv)	73.71(b)	
		20.405(a)(1)(i)	50.36(c)(1)		50.73(a)(2)(v)	73.71(c)	
		20.405(a)(1)(ii)	50.36(c)(2)		50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
		20.405(a)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		
		20.405(a)(1)(iv)	50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
		20.405(a)(1)(v)	50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
T. M. Jones, Regulatory Compliance Specialist	9 1 9 — 4 5 7 - 2 0 3 9

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
X	C E	T S	M 2 3 5	Y							

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On April 10, 1989, at 1806 hours and on April 18, 1989, at 1350 hours, the Reactor Water Cleanup (RWCU) system Outboard Isolation valve closed on an isolation signal. It is believed that both isolations were the result of two independent conditions. An inoperable temperature switch and a high discharge temperature from the nonregenerative heat exchanger (which is a nonengineered safety feature). The high temperature was caused by low cooling water flow to the heat exchanger. The high temperature was not detected prior to the isolation because a warning annunciation was not initiated due to an inoperable temperature switch. The switch failed due to age, has been replaced, will be added to the preventative maintenance program and is not Q-listed. Cooling water flow is temperature monitored indirectly by a combination of alarms, recorders and daily checks. No further actions are planned.

These events had no safety significance. On April 10, 1989, the RWCU System was being utilized as a means of controlling vessel level and its isolation resulted in the amount of water covering the core being increased. On April 18, 1989, the system actuated as per design.

Event

April 10, 1989

While utilizing Unit 1 Reactor Water Cleanup (RWCU) (G31) (EIIS/CE) for vessel level control the RWCU Outboard Isolation valve (1-G31-F004) (EIIS/CG/ISV) closed on an isolation signal at 1806 hours.

April 18, 1989

While placing the RWCU filter-demineralizer (EIIS/CE/FDM) "A" in service, per Operating Procedure (OP)-14, the 1-G31-F004 isolated in response to a "nonregenerative heat exchanger discharge temperature high" signal at 1350 hours.

Initial Conditions

April 10, 1989

Unit 1 reactor startup was in progress following the 1988/1989 refuel and maintenance outage. The RWCU system was being used to maintain vessel level by taking suction from the vessel and rejecting the water to the condensor per OP-14. Reactor pressure was approximately 150 pounds per square inch (psi) and reject flow was approximately 125 gallons per minute (gpm). The Residual Heat Removal/Low Pressure Coolant Injection (RHR/LPCI) (EIIS/BO) and the Core Spray (CS) (EIIS/BM) systems were operable and in standby readiness.

April 18, 1989

Unit 1 reactor was operating at 27% power. The RWCU System was operating with the "B" filter-demineralizer in service and flow rejecting to the condenser at approximately 25 gpm as per OP-14. The "A" filter-demineralizer was being placed into service per procedure. The High Pressure Coolant Injection (HPCI) (EIIS/BJ), Reactor Core Isolation Cooling (RCIC) (EIIS/BN), Automatic Depressurization (ADS) (EIIS/*), RHR/LPCI and CS Systems were operable and in standby readiness.

*EIIS component identifier not found

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

Event Description

April 10, 1989

The unit was in startup mode, increasing power and rejecting reactor water to the condenser for vessel level control. The flow through the "B" filter-demineralizer had begun to oscillate and the Control Operator (CO) was attempting to stabilize it by decreasing the amount of reject flow when the 1-G31-F004 closed at 1806 hours. The annunciation received was "Cleanup Leak High" (i.e., panel A-04 window 4-4) which does not initiate an automatic isolation of the RWCU System.

April 18, 1989

The unit was in run, holding at 27% power. Approximately 25 gpm of reactor water was being rejected to the condenser via RWCU per OP-14 for additional reactor water conductivity control. The "B" filter-demineralizer was in service and the "A" filter-demineralizer was being placed into service. During the latter evolution, 1-G31-F004 isolated due to "nonregenerative heat exchanger outlet temperature high" signal, as indicated by its associated annunciation on panel A-02 window 4-6.

Event Investigation

There are various flow path options for the RWCU system. Each option takes a suction off the reactor vessel via the inboard isolation valve, 1-G31-F001 (EIIS/CE/ISV), and the outboard isolation valve, 1-G31-F004. When the reactor is operating, the most common flowpath is from the vessel through the regenerative heat exchanger, the nonregenerative heat exchanger, the RWCU recirculation pump, the RWCU filter demineralizer, back through the regenerative heat exchangers and then to the vessel via a tie in to the Reactor Core Isolation Cooling (RCIC) system injection line which ties into the B feedwater line. Using this flow path, reactor water leaving the vessel transfers heat to water returning to the vessel in the regenerative heat exchanger. This provides initial cooling of the RWCU water. The water is further cooled by the Reactor Building Closed Cooling Water (RBCCW) (EIIS/*) system in the nonregenerative heat exchanger. The filter/demineralizer (F/D) resin is subject to melting if the inlet temperature of the water reaches 150 degrees Fahrenheit. The referenced cooling methods provide resin protection by reducing the inlet temperature of the water. The two alternate flow paths differ from the basic path in that after the F/Ds the water does not return through the regenerative heat exchanger to the vessel. Instead, the water bypasses the regenerative heat exchanger and is sent to the condenser or to radwaste, as desired. These flow paths result in increased thermal duty on the nonregenerative heat exchanger because the regenerative heat exchanger is not initially cooling the incoming water to the RWCU system.

Additional protection for the F/Ds is provided by two temperature switches located downstream of the nonregenerative heat exchanger. 1-G31-TS-N020

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(EIIS/CE/TS) initiates the Control Room annunciation "Cleanup Filter Inlet Temperature High" to provide warning to the operators that the inlet temperature is approaching the isolation setpoint. This switch provides annunciation only and does not initiate a system isolation. 1-G31-TS-N008 (EIIS/CE/TS) initiates both the annunciator "Nonregenerative Heat Exchanger Discharge Temperautre High" and the closure of the outboard isolation valve, 1-G31-F004. The purpose of this isolation is to prevent damage to the F/D resin. This is not a primary containment isolation and therefore, does not require that both the inboard and outboard isolation valves close.

During each of the referenced events, only the 1-G31-F004 valve isolated. In both events, all or part of the RWCU system flow was being rejected to the condenser resulting in an increased inlet temperature to the nonregenerative heat exchanger. There are two signals which will isolate only the 1-G31-F004, they are a Standby Liquid Control (SLC) initiation signal and a nonregenerative heat exchanger discharge temperature high signal. (Under previous LERs 2-88-003 and 2-88-010, a single primary containment isolation valve closed as a result of a signal from the RWCU Differential Flow Leak Detection System. Each of the two RWCU primary containment isolation valves, 1-G31-F001 and 1-G31-F004, receive separate isolation signals from two Agastat timers. The pre-set times for these timers was found to be slightly different but within acceptable tolerances required for the circuit. The time differences are inherent with these type of timers. The difference results in one of the isolation valves beginning to close with a corresponding pump trip on valve position. The pump trip rapidly decreases flow and subsequently clears the pending isolation signal for the second valve.) It is known that an SLC initiation signal was not present. A RWCU leak detection system isolation signal would have been obvious by the annunciation "Cleanup Leak Hi-Hi" for approximately 40 seconds prior to the isolation. The "hi-hi" annunciator is located directly above the observed annunciation "Cleanup Leak Hi" and was verified operable on April 10. In addition, the leak detection isolation signal is tested monthly, therefore, the isolations are believed to have been caused by a high temperature condition at the discharge of the nonregenerative heat exchanger. However, no warning annunciations indicating that a high temperature isolation was imminent, were received by the operator in either event and a nonregenerative heat exchanger high discharge temperature isolation annunciation was not observed in the first event.

On April 10, while rejecting the RWCU system flow to the condenser for vessel level control during startup, the system began to exhibit flow oscillations. These oscillations are the result of the filter flow control valve (1-G31-Z002-66B) operating 5 to 10 percent open - a very sensitive flow control region for the valve. Operation in this region is further aggravated by a relatively flat RWCU pump curve resulting in large flow rate changes with

small control valve position changes. In addition, the higher differential pressure existing across the control valve when RWCU is being rejected to the condenser results in the valve operating further closed than normal, thereby increasing its sensitivity. The precision of the valve positioner and actuator is less than that required to maintain a steady flow under these conditions. Flow oscillations occur as the valve attempts to maintain a steady, preset flow rate. These oscillations are not considered unusual and are part of the system operating characteristics. They do, however, significantly affect the RWCU Differential Leak Detection System because its analog system is slow to respond to transient impulses. (This has been recognized by the system designers and a delay of approximately 40 seconds has been placed in the RWCU "delta' flow leak detection circuit to prevent spurious isolations.) The "Cleanup Leak High" annunciation received during this event was a result of oscillations caused by the filter flow control valve's sensitivity.

After the first event, Operations initiated a Work Request & Job Authorization (WR&JO) on the temperature switch which gives the nonregenerative heat exchanger outlet temperature isolation signal. The switch was calibrated and found to be operating satisfactorily. During the second event, a small amount of system flow was being rejected to the condenser. While attempting to bring a second F/D on line a "Nonregenerative Heat Exchanger Outlet Temperature High" annunciation and isolation were received without any warning from the F/D inlet temperature switch and its associated annunciation. At the time of the second event, another WR/JO was initiated (89-AJIS1) to have the temperature switch which provides the warning annunciation (1-G31-TS-N020) calibrated.

During the investigation of the second event, it was discovered that RBCCW flow through the heat exchanger was approximately 100 gallons per minute (GPM) low. The reason for the low flow has not been determined but it is believed that some other RBCCW flows were increased resulting in less flow through the RWCU heat exchanger. In addition, it was determined that the N020 temperature switch was inoperable and would not send a signal to the annunciator. Therefore, no warning of an impending isolation due to a high inlet temperature to the F/D was provided to the operator by the annunciation. This switch, 1-G31-TS-N020, was not on a preventative maintenance program and it is not Q-list.

Root Cause

These events were the result of two independent conditions. First, a low RBCCW flow through the nonregenerative heat exchanger resulted in higher then normally experienced inlet temperatures to the F/D and, second, inoperable temperature switch, 1-G31-TS-N020, did not provide the operator with a warning that the isolation setpoint was being approached.

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Corrective Actions

The temperature switch, 1-G31-TS-N020, was replaced on 5/31/89 under WR/JO 89-AJIS1. The root cause of the switch failure was normal wear and age. The switch is being added to a computer generated route for preventative maintenance on a yearly basis as it is recognized to be a valuable warning device to the operators.

The temperature switch, 1-G31-TS-N008, is currently on a six month computer generated route. No further actions are planned as it functioned properly.

The isolation signal which initiates the "Nonregenerative Heat Exchanger Discharge Temperature High" annunciation is tested monthly and the annunciation capability is verified each shift. No further actions are planned.

The RBCCW flow rate was increased to the normal flow rate of 523 gpm by Operations personnel under the guidance of the system engineer on 4/19/89. The loads off of the RBCCW system are temperature monitored by a combination of alarms, temperature recorders and daily checks. If the involved temperature switch had been functioning properly these events would not have occurred. No further actions are planned.

Event Assessment

These events had no safety significance. On April 10, 1989, the RWCU System was being utilized as a means of controlling vessel level and its isolation resulted in the amount of water covering the core being increased. On April 18, 1989, the system actuated as per design.