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FACIL:50-400 Shearon Harris Nuclear Power Plant, Unit 1, Carolina 05000400
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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 87-062-00:on 871107,personnel error in setting steam dump controller resulted in safety injection & reactor trip. W/8 ltr.

DISTRIBUTION CODE: IE22D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 8
TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:Application for permit renewal filed. 05000400

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
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	BUCKLEY,B	1	1			
INTERNAL:	ACRS MICHELSON	1	1	ACRS MOELLER	2	2
	AEOD/DOA	1	1	AEOD/DSP/NAS	1	1
	AEOD/DSP/ROAB	2	2	AEOD/DSP/TPAB	1	1
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	REG FILE 02	1	1	RES DEPY GI	1	1
	RES TELFORD,J	1	1	RES/DE/EIB	1	1
	RGN2 FILE 01	1	1			
EXTERNAL:	EG&G GROH,M	5	5	FORD BLDG HOY,A	1	1
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NRC Form 366
(9-83)

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

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1	0 5 0 0 0 4 0 0	1 OF 0 6

TITLE (4) PERSONNEL ERROR IN SETTING STEAM DUMP CONTROLLER RESULTED IN SAFETY INJECTION, MAIN STEAM ISOLATION, AND REACTOR TRIP WHEN MAIN STEAM ISOLATION VALVES WERE OPENED

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)
1 1	0 7	8 7	8 7	— 0 6 2 —	0 0	1 2	0 7	8 7		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 2

POWER LEVEL (10): 0 0 5

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

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)
JOSEPH R. JOHNSON SENIOR SPECIALIST - REGULATORY COMPLIANCE	9 1 9 3 6 2 1 - 2 0 0 7

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

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 November 7, 1987, at 0533, the plant was in Mode 2 at approximately 4.5% power. The Safety Injection System was actuated, the Main Steam Line Isolation actuated, and the reactor tripped due to low steam line pressure on "A" steam generator. The low pressure was due to excessive, rapid, automatic cycling of the Steam Dump System after the "A" Main Steam Isolation Valve opened. The cycling of the steam dump valves was caused by an incorrect setting on the steam header pressure controller. The safety injection was terminated, the plant was stabilized and returned to normal operating temperature and pressure.

During the event, the B Emergency Diesel Generator Fuel Oil Transfer Pump Room Exhaust Fan (E-85A-SB) tripped after starting due to a spurious low flow signal. The alternate fan (E-85B-SB) then started and continued to run as required. This failure did not contribute to the event.

The event was caused by personnel error and a procedural deficiency. Corrective action included procedure revisions and additional operator training covering this event. The plant was restarted and on line in Mode 1 by 1505 on November 8, 1987.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1	0 5 0 0 0 4 0 0	8 7	— 0 6 2	— 0 0	0 2 OF 0 6

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

DESCRIPTION

On November 7, 1987, at 0533 the plant was in Mode 2 at approximately 4.5% power. The control room operators were implementing steps in General Operating Procedure GP-005, "Power Operation Mode 2 to Mode 1." Reactor Coolant System (RCS) (EIIS:AB) temperature was 554°F and pressure was 2235 psig. The steam lines were being warmed with the Main Steam Isolation bypass valves, and all three Main Steam Isolation Valves (MSIV) were closed. The Steam Dump System (EIIS:SB) was set in the pressure control mode with the steam header pressure controller erroneously set at 74%, which is equivalent to 963 psig. This setting corresponds to a saturation temperature of 542°F. Computer archived data indicated that before the event, Steam Generator pressures were approximately 1030 psig, and the steam header pressure, downstream of the Main Steam Bypass valves, was 970 psig. Under normal circumstances the Steam Dump Controller would be set to maintain a pressure (1092 psig) equivalent to the saturation temperature of 557°F, the no load Tave from the Reactor Coolant System.

The event began when the operators were in the process of opening the MSIVs in accordance with General Operating Procedure, GP-005. The next step was to equalize pressure across the MSIVs and proceed to open them. This step is listed in General Operating Procedure, GP-002, "Normal Plant Heatup from Cold Solid to Hot Subcritical," but was not done prior to criticality because the low decay heat loads did not provide sufficient energy to warm the main steam system. General Operating Procedure, GP-005 references OP-126, "Main Steam, Extraction Steam and Steam Dump System," for performing this step if the MSIVs were not opened in GP-002.

Opening of "A" MSIV began at 0533; the open stroke time is approximately 5 minutes. As the valve stroked open, the steam header pressure increased beyond the setpoint of the pressure controller, and the steam dump valves opened to control steam pressure. This steam demand caused the average RCS temperature (Tave) to decrease. When the steam dumps opened, the control room operators observed a small amount of swell in the steam generator water levels as was expected. The control room operators heard increased steam flow to the condenser. At 0533:47, a Lo-Lo Tave (P-12) interlock closed the steam dump valves. The P-12 interlock results when 2 of 3 Protection Tave signals decrease to less than 553°F. The interlock disables the air supply to the steam dump valves, but does not reset the controller or eliminate the controller's output signal. The controller for the Steam Dump System is a proportional integral controller. The computer archived data indicated that the steam header pressure had remained above 970 psig, so the controller continued to increase output signal even with the steam dumps blocked shut by the P-12 interlock.

DESCRIPTION (continued)

The closure of the steam dump valves caused the steam generator water levels to shrink. At 0534:32, the Lo-Lo Tave signal cleared, and the steam dump valves opened a second time. This second cycle was noted by the operators as having an even larger swell, and alarms came in on steam generator water level error and delta steam pressure alarms between steam generators. The operators took manual action to prevent reaching the high steam generator water level setpoint.

At 0534:47, Lo-Lo Tave again closed the steam dump valves. At 0535:38, Lo-Lo Tave cleared, and the steam dump valves opened a third time. This initiated a third cycle in Tave and steam generator water levels.

At 0535:45, 2 of 3 rate compensated low steam line pressure bistables on "A" steam generator tripped. Actual steam generator pressure remained above 900 psig. This completed the logic for an automatic reactor tip, automatic actuation of the Safety Injection System (EIIS-BQ), and Main Steam Line Isolation. This resulted in the actuation of the following: Containment Phase "A" Isolation, Auxiliary Feed Water, Feed Water Isolation, Control Room Ventilation Isolation, Containment Ventilation Isolation, Emergency Diesel Generator start, and a load sequencing of Safeguards Equipment. The Emergency Diesel Generators started, but did not load because off-site power was available.

The operators implemented the emergency operating procedures for a Safety Injection. The isolation of the Main Steam System (EIIS:SB) allowed the steam generators to repressurize to a value equivalent to RCS Tave. The subsequent addition of Safety Injection water cooled the RCS to 535°F. At approximately 0547, Safety Injection was secured. The plant was stabilized at normal no load conditions (557°F and 2235 psig). The operators noticed that one steam dump valve indicated in the mid position, but approximately 30 minutes after the event, the valve indicated shut without any operator action. Initially, it was reported to the NRC that this valve was failed open, but it was later determined that the arm which hits the limit switch was loose and that the valve was actually closed when it indicated mid position.

The event resulted in declaration of an "Unusual Event" at 0546 in accordance with procedure PEP-101, "Emergency Classification and Initial Emergency Actions," due to injection of ECCS water into the reactor. The Unusual Event was terminated at 0630.

During the event, the B Emergency Diesel Generator Fuel Oil Transfer Pump Room Exhaust Fan (E-85A-SB) (EIIS:VL) tripped upon starting due to a spurious low flow signal. The alternate fan (E-85B-SB) then started and continued to run as required. This failure did not contribute to the event. The failure of E-85A-SB was discovered when the operator was performing the Safeguards System Actuation verification.

DESCRIPTION (continued)

After the event, the shift verified that the safety actuation had been correctly implemented. Plant management was informed, and a debriefing with the shift was conducted. During the course of that debriefing it was determined that the steam dump controller was not set properly. The responsible control operator stated that he had not changed the setpoint during his shift, and that he had checked the setpoint prior to opening the MSIVs. He stated that with the controller set at 74% vice the required 84%, he made an error when the controller was checked.

CAUSE

The cause of the event was both procedural deficiency and personnel error. A human factors deficiency also contributed to the event. With the steam dump system in automatic and the pressure control setpoint incorrectly set too low, opening an MSIV would initiate a transient cycling of the steam dump valves. General Operating Procedure GP-002, "Normal Plant Heatup From Cold Solid to Hot Subcritical," requires the Steam Dump System to be in the manual mode with the steam dump valves closed prior to opening the MSIVs. Using this sequence would have prevented the event. However, this procedure also allows the MSIVs to remain closed during this heatup phase and be opened later in accordance with GP-005, "Power Operation Mode 2 to Mode 1." The operators were utilizing GP-005, which references OP-126 for specific steps. OP-126 allowed the steam dump controller to remain in automatic mode of operation while opening MSIVs. GP-005 contained a step to check the setting of the steam dump controller after the step for opening the MSIVs. Additionally, the step called for setting the controller at 1092 psig, however, the controller scale is in percent. The operator was required to look up in the curve book the setting corresponding to 1092 psig, and assure that the controller was adjusted to the value (84%). The operator looked at the controller and thought it was set correctly (at 84%) when it was actually at 74%. Additionally, there was no distinctive mark on the controller scale to show the normal setting.

The failure of the "B" Emergency Diesel Generator Fuel Oil Transfer Pump Room Exhaust Fan (E-85A-SB) was caused by a spurious signal from the flow switch for E-85A-SB (Manufactured by Fluid Components, Inc., part number FR72-4 with 6 inch probe). The setpoint for the flow switch was changed to eliminate the problem which had been caused by flow oscillations of sufficient magnitude to trip the low flow switch.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1	0 5 0 0 0 4 0 0	8 7	— 0 6 2	— 0 0	0 5 OF 0 6

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

ANALYSIS OF EVENT

This event was reportable due to the actuation of Emergency Safeguards Features, Safety Injection (SI) initiation and a reactor trip. Approximately 2925 gallons was injected into the RCS, and RCS temperature dropped approximately 19° during the transient. The consequences are a direct result of the duration of the safety injection flow into the RCS.

The error in pressure setpoint of the Steam Dump Control System (SDCS) is unique to the startup and shutdown of the reactor and at low turbine loads. Operation of the SDCS in this mode provides temperature control for the RCS. If the error had been larger (e.g. a lower controller steam pressure setting), the transient would have been initiated as the Main Steam Bypass valves were throttled open. The operator would have observed steam dump valves cycling from position indication on the Main Control Board with indications of abnormally low Steam Header Pressure and RCS Tave. Without operator action, the transient would be stopped by actuation of a Main Steam Isolation Signal, Safety Injection, and a reactor trip. Again, the consequences would have been limited to the safety injection flow into the RCS.

If the error had been smaller (e.g. a higher controller steam pressure setting but less than 1092 psig), the transient on opening the first MSIV would have been slower. Without operator action, the transient may have resulted in only cycling on the P-12 interlock without a MSIS or SI.

The event fell between these two extremes. The Main Steam Bypass valves provided enough flow resistance such that the setpoint error did not produce any other gross indications of the problem. Only as the first MSIV was opened was there enough steam flow to the steam header to initiated the transient.

Shearon Harris Nuclear Power Plant has experienced previous safety injection events as reported in LER 86-002, 86-004, and 86-009. However, these events occurred when the plant was shutdown and depressurized. They occurred due to errors in surveillance testing and inadvertent deenergization of two PIC cabinets. The events reported in LER 86-002 and 86-004 did not result in water injection into the RCS because the charging/safety injection and the residual heat removal pumps were under clearance at the time. The event reported in LER 86-009 did result in water injection into the RCS for approximately one minute. The plant has not experienced any previous events related to the Steam Dump System.

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

CORRECTIVE ACTIONS

1. The event has been discussed with the reactor operator involved, the results of his actions have been clearly identified, and he understands the results of his actions. Training on the event has been performed with all licensed operators. The training emphasized that after a step is performed, the operator must confirm a correct response prior to proceeding; and if necessary, reverse the action just performed. In particular, it was stressed that the MSIV should have been closed on the first indication of a problem. The training covered procedure changes, operator actions, and personnel errors.

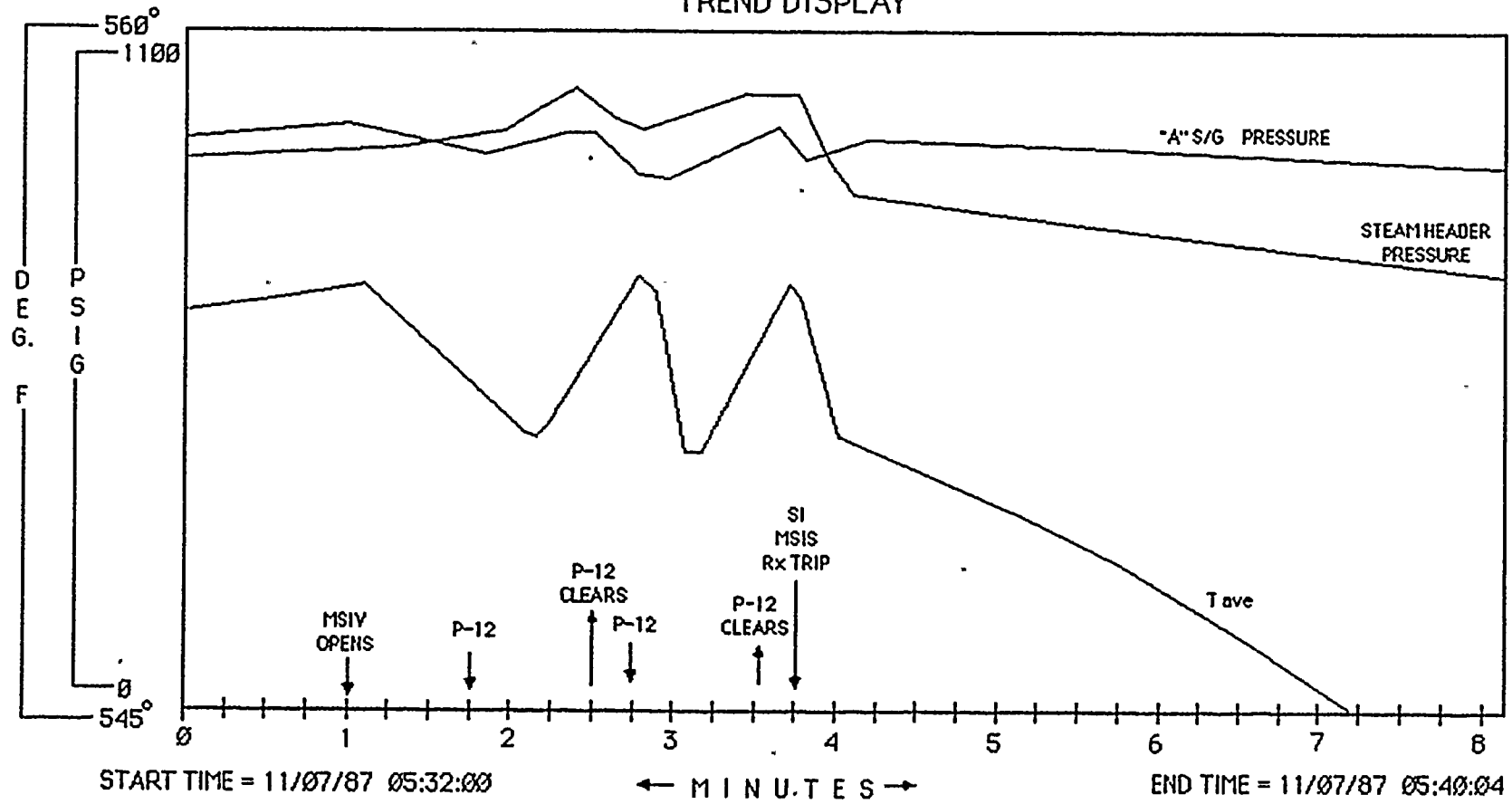
2. General Operating Procedure GP-005 and OP-126 have been changed to ensure that the Steam Dump System is placed in manual mode and the steam dump valves closed prior to admitting steam to the secondary system and prior to opening the MSIVs. In addition, GP-005 now requires independent verification when setting the steam dump controller setpoint and has been changed to show the percent of scale as well as the steam pressure setting. OP-126 has also been changed to show both percent of scale and steam pressure setting. GP-002 has been changed to delete steps for opening the MSIVs.

3. The steam dump controller scale has been marked with a red line at the normal value (1092 psig and 84%).

4. To eliminate the cause for the spurious alarm, which tripped the "B" Emergency Diesel Generator Fuel Oil Transfer Pump Room Exhaust Fan (E-85A-SB), the setpoint for the flow switch was changed, and the exhaust fan was tested and returned to service at 0745 on November 8, 1987.

SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1

TREND DISPLAY



CP&L

Carolina Power & Light Company

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New Hill, NC 27562

File Number: SHF/10-13510C
Letter Number: HO-870564 (O)

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

SHEARON HARRIS NUCLEAR POWER PLANT UNIT 1
DOCKET NO. 50-400
LICENSE NO. NPF-63
LICENSEE EVENT REPORT 87-062-00

Gentlemen:

In accordance with Title 10 to the Code of Federal Regulations, the enclosed Licensee Event Report is submitted. This report fulfills 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,

RAWatson

R. A. Watson
Vice President
Harris Nuclear Project

RAW:lkd

Enclosure

cc: Dr. J. Nelson Grace (NRC - RII)
Mr. B. Buckley (NRR)
Mr. G. Maxwell (NRC - SHNPP)

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