NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

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TITLE (4)

Power Range High Negative Flux Rate Reactor Trip

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 7	1 8	8 5	8 5	–	0 3 4	–	0 0	0 8	1 6	8 5		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	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
William R. Campbell - Superintendent, Engineering	AREA CODE 3 1 4 6 7 6 – 8 4 6 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	

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)

At 0712 CDT on 7/18/85 with the plant in Mode 1, Power Operation, and at 100% reactor power, a Reactor Trip occurred as a result of a Power Range High Negative Flux Rate Signal. A Feedwater Isolation, Auxiliary Feedwater Actuation, and Steam Generator Blowdown Isolation occurred as a result of the trip. The required safety-related equipment performed as designed except for one source range and one intermediate range channel of nuclear instrumentation.

The high negative flux rate occurred when control rods dropped due to a loss of both motor/generator (M/G) sets which supply the rod drive mechanisms. The M/G sets were lost when an overvoltage arrestor failed due to inadequate cooling of a rod drive power cabinet.

The problems with the nuclear instrumentation channels were identified as equipment failures and the necessary replacements were made. The inadequate cooling of the power cabinet resulted from the shutdown of the M/G set room cooler and the presence of a temporary cooling duct above the power cabinets (which inhibited natural circulation through the cabinet). Actions to prevent recurrence include upgrading the cooling capacity for the M/G set room and informing engineering personnel of the need to better review temporary modifications for the impact of potential equipment malfunctions.

This event did not threaten the public health or safety since the Reactor Protection System and Engineered Safety Features performed as designed.

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

On 7/18/85 with the plant in Mode 1, Power Operation, and at 100% reactor power, a Reactor Trip occurred as a result of a Power Range High Negative Flux Rate Signal. A Feedwater Isolation, Auxiliary Feedwater Actuation, and Steam Generator Blowdown Isolation occurred as a result of the trip. The required safety-related equipment performed as designed except for one source range and one intermediate range channel of nuclear instrumentation.

Description of Event

1. At 0711 CDT on 7/18/85 a "Rod Drive Motor/Generator (M/G) Set Trouble" annunciator was received on the main control board and then immediately cleared itself. In response an equipment operator was dispatched to the rod drive M/G set room to investigate. The annunciator was again received and at 0712 the reactor tripped on a high negative flux rate sensed by the power range channels of nuclear instrumentation. The operators recovered from the trip per plant procedures.

   At 0716 a report was made of smoke in the rod drive M/G set room and at 0726 it was reported that a rod drive cabinet had been damaged. I&C personnel were contacted to investigate.

2. While recovering from the trip, the operators observed the P-6 (permissive which energizes the source range channels of nuclear instrumentation when the intermediate range decreases below 5E-11 amps) annunciator flashing in and out. At 0725 the P-6 permissive was manually reset but channel 31 of the source range failed to energize. Channel 32 of the source range energized and operated properly.

Root Cause

1. The damage which occurred in the rod drive power cabinet (IEEE Standard 805-1983 System - AA) was apparently initiated by inadequate cooling of the cabinet. The inadequate cooling resulted from a combination of the rod drive M/G set room cooler, SGL02A (System - VF), being shutdown for preventive maintenance and the installation of a cooling duct above the rod drive power and logic cabinets. The cooling duct had been installed on 6/16/85 by a temporary plant modification to force cooling air from SGL02A to the top of the rod drive power and logic cabinets. High temperatures in the rod drive cabinets had been suspected of causing spurious electrical failures previously experienced in the cabinets. Therefore the cooling duct was installed to decrease the temperature in the cabinets. With SGL02A shutdown and the cooling duct inhibiting adequate natural circulation of air through the cabinets, overheating occurred which caused a breakdown of the overvoltage arrestor (System - AA, IEEE Standard 803A-1983 Component - FAR supplied by the Westinghouse Electric Corp.) for the lift coil circuit in rod drive power cabinet 1BD.

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It is believed that the overexcitation relay picked up on M/G set #2 and tripped its output breaker due to the increased load resulting from the arrestor breakdown. The initial generator voltage overshoot was followed, it is suspected, by an exciter current undershoot which reset the relay and cleared the alarm. The other inputs to the "Rod Drive M/G Set Trouble" annunciator are target and/or seal-in type and thus would not reset without operator action at the breaker cabinet.

The rods dropped when the M/G set #1 output breaker opened and all power to the rod drive mechanisms was lost. The M/G set #1 output breaker tripped open due to operation of its overcurrent trip device.

It was noted that the Phase A and Phase B fuses were blown in the Lift Disconnect Box for the M/G set #1 output breaker. Inspection of coordination curves indicate that the fuses should have prevented the operation of the generator breaker overcurrent trip devices. The breaker was tested and the overcurrent device was verified to be working properly. The cause of this coordination problem remains unknown.

2. The flashing in and out of the P-6 annunciator is believed to be the result of stray AC current entering the LOG AMP of the channel 36 power range nuclear instrumentation (System - IG). The problem had been previously identified and reported in Callaway LER 85-025-00 dated 6/3/85 and Callaway LER 85-026-00 dated 7/5/85. Further information on the investigation of this problem will be submitted in a supplemental report to LER 85-025-00 on 9/30/85.

   The failure of the channel 31 source range nuclear instrumentation to energize was due to a failed high voltage power supply (System - IG, Component - JX supplied by the Westinghouse Electric Corp.).

Corrective Actions

1. SGL02A was returned to service at approximately 1020 on 7/18/85 with a caution tag added to the handswitch controlling the room cooler. The caution tag requires alternate cooling to be established for the rod drive cabinets prior to securing the room cooler.

   Rod drive power cabinet 1BD was cleaned and reworked as necessary to correct the damage which resulted from the overheating. Operability of the cabinet was verified at approximately 2240 on 7/18/85 by the satisfactory completion of Operations surveillance Procedure OSP-SF-00002, Control Rod Partial Movement Test.

   A temperature alarm was added to two rod drive power cabinets to provide indication to the Control Room of a loss of forced cooling. Also, the

preventive maintenance work authorization document was revised to eliminate the requirement to secure the room cooler fan for filter replacement.

2. The replacement of the failed high voltage power supply in channel 31 of the source range nuclear instrumentation was completed at 1720 on 7/18/85. The intermediate range drawer for channel 36 was replaced with a spare at 1515 on 7/18/85.

Actions to Prevent Recurrence

1. To prevent recurrence of this incident, design changes are being evaluated which will upgrade the existing cooling capacity of SGL02A and add a completely redundant air handling unit for the M/G set room. A design change package has also been initiated t provide a permanent temperature alarm for the rod drive power cabinets.

   Since a contributing factor to this event was the temporary modification under which the cooling duct was installed, site engineering personnel were informed of the circumstances surrounding this event and the need to review temporary modification for impact on operating procedures or the impact of potential equipment malfunctions.

   Also, new setpoints were set into the generator overexcitation relays so that the fuses in the Lift Disconnect Box would blow and prevent tripping of the M/G set output breakers under circumstances such as those which occurred during this event. The new setpoints were discussed in Callaway LER 85-022-00 dated 5/10/85.

2. The high voltage power supply failure in the source range nuclear instrumentation is considered an isolated case for which no further corrective action is necessary. The intermediate range nuclear instrumentation problem is undergoing further evaluation, the results of which will be reported in the supplemental report to LER 85-025-00.

Safety Analysis

1. The failure in the rod drive power cabinet did not constitute a significant safety concern because the required Reactor Protection system and Engineered Safety Features equipment performed as designed to mitigate any adverse consequences. The loss of power to the rod control system results in an effective reactor trip, even without Reactor Protection system operation.

2. The problem experienced with the intermediate range channel of nuclear instrumentation did not constitute a significant safety concern because the reactor operators were aware of the problem and manually energized the source range channels at the appropriate time. It should be noted the

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problem is only experienced when channel 36 is in the vicinity of the P-6 setpoint.

The failure of the source range channel of nuclear instrumentation to energize did not constitute a significant safety concern because its safety function (Reactor Trip) had already been performed.

Based on the above, this event did not pose a threat to the public health or safety.

Previous occurrences: none

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CALLAWAY PLANT

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August 16, 1985

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

ULNRC-1156

Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 85-034-00
POWER RANGE HIGH NEGATIVE FLUX RATE REACTOR TRIP

The enclosed Licensee Event Report is submitted pursuant to 10 CFR 50.73(a)(2)(iv) concerning a Reactor Trip initiated by a Power Range High Negative Flux Rate Signal. The high negative flux rate occurred when control rods dropped due to an electrical failure caused by inadequate cooling to a rod control power cabinet.

Andrew P. Neuhalfen
S. E. Miltenberger
for Manager, Callaway Plant

WRC/WRR/JWK/drs
Enclosure

cc: Distribution attached

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cc distribution for ULNRC-1156

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