CENTERIOR ENERGY

PERRY NUCLEAR POWER PLANT
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Michael D. Lyster
Vice President - Nuclear

September 13, 1990
PY-CEI/NRR-1225 L

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

Perry Nuclear Power Plant
Docket No. 50-440
LER 90-017

Dear Sir:

Enclosed is Licensee Event Report 90-017 for the Perry Nuclear Power Plant.

Sincerely,

Michael D. Lyster

MDL:NJL:njc

Enclosure: LER 90-017

cc: NRR Project Manager
Sr. Resident Inspector

U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4 0	1 OF 0 3

TITLE (4): Thermal Power Exceeds Operating License Limits Due to Feedwater Heater Level Control Failure

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)
												0 5 0 0 0
0 8	1 4	9 0	9 0	-	0 1 7	-	0 0	0 9	1 3	9 0		0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
1	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10): 1 0 0	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)	X OTHER (Specify in Abstract below and in Text, NRC Form 366A): Operating License Violation
	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
Henry L. Hegrat, Compliance Engineer, Extension 6855	2 1 6 2 5 9 - 3 7 3 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	
C	S N	L C V	C 6 3 5	N							

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 August 14, 1990 at 0655 hours, reactor thermal power level exceeded 102 percent of the maximum power level authorized in the facility Operating License. The transient event occurred when the 5A and 6A Feedwater heaters unexpectedly isolated due to a failure of the 5A Feedwater heater level control valve, resulting in a decrease in reactor feedwater temperature. Prior to the transient, the plant was in Operational Condition 1 (Power Operation) at 100 percent of rated thermal power. The Reactor Pressure Vessel [RPV] was at saturated conditions at approximately 1015 psig. Operators recovered from the transient by manually adjusting reactor recirculation flow in accordance with approved plant instructions. Thermal power exceeded 102 percent for 117 seconds, with a peak thermal power of 104.24 percent.

The root cause of this event was component failure with a contributing procedural deficiency. Failure of the 5A Feedwater heater level control valve caused the 5A Feedwater heater to isolate on high water level. This isolation in turn caused the 6A Feedwater heater to isolate on high water level. Corrective actions taken include modifications to manually throttle the normal drain valve until repairs can be made during the refueling outage currently in progress. Additionally, enhancements were made to the applicable Off Normal Instruction, and this event will be discussed with all Licensed Operators during continuing training.

On August 14, 1990 at 0655 hours, reactor thermal power level exceeded that specified in the Operating License due to an unexpected isolation of a Feedwater heater in the High Pressure Heater, Drains and Vents (SN) System. At the time of the event, the plant was in Operational Condition 1 (Power Operat· ·) with reactor thermal power approximately 100 percent of rated. Reactor vessel [RPV] pressure was approximately 1015 psig with reactor coolant at saturated conditions.

On August 14, 1990, at 0651 hours, Licensed Operators received a 5A Feedwater heater [HX] isolation alarm due to high wat :r level. Automatic 5A high level isolation actions included closure of the following valves: 6A heater drain to 5A heater valve, the extraction steam to 5A heater supply valve, and the extraction steam to 5A heater non-return check valve. Immediately, Licensed Operators entered Off Normal Instruction (ONI-N36) "Loss of Feedwater Heating". Immediate actions specified in ONI-N36 require the operator to "reduce reactor power using Reactor Recirculation Flow Control to less than or equal to the power level prior to the loss of feedwater heating". Subsequent action included three attempts to restore the 5A heater on line by gradually opening the extraction steam supply valve once the high lev·l alarms had cleared.

Before the 6A heater alternate drain valve could respond to divert 6A heater drains to the condenser, the 6A heater level increased to its high level setpoint causing the 6A Feedwater heater to isolate on high water level. The isolations of the 5A and 6A heaters resulted in the addition of positive reactivity to the reactor from cooler feedwater returning to the reactor vessel. Operators continued to monitor reactor power and continued attempts to restore the 5A and 6A Feedwater heaters to service. The highest neutron flux level observed on the Average Power Range Monitoring (APRM) system during the event was 102 percent. Licensed Operators manually adjusted reactor recirculation flow four times to decrease reactor power during the transient. Following the last recirculation flow adjustment at approximately 0658 hours, reactor power was stabilized at 94 percent as both the 5A and 6A heaters were returned to service.

Following the transient, Reactor Engineering personnel evaluated all relative data to determine if thermal power levels authorized by the plant Operating License had been exceeded. By applying appropriate gain adjustment factors and thermal time constants to readings taken from all eight APRM channels, it was determined that thermal power levels exceeded 102 percent of rated thermal power on two occasions. After the isolation of the 5A heater, thermal power exceeded 102 percent of rated for approximately 12 seconds, with a peak thermal power of 102.6 percent. After the isolation of the 6A heater, thermal power reached 104.24 percent, and exceeded 102 percent for 105 seconds. At no time during the transient were high neutron flux alarms or control rod blocks received, verifying that neutron flux peaks did not exceed 108 percent. The NRC Operations Center was informed of the event via the Emergency Notification System at 1551 hours on August 14, 1990.

The root cause of this event was component failure. The 5A heater level had been experiencing small level oscillations during the second operating cycle. The 5A

heater level oscillations had been stable until just prior to this event as monitored by the system engineer. Troubleshooting following this event indicated that the 5A heater normal drain valve [LCV] was very slow to open. The slow stroke time in the open direction was indicative of (1) a loss of dampening fluid within the actuator, (2) mechanical binding in the valve actuator, (3) a defective diaphragm, or (4) an air leak in the pneumatic supply to the control valve. Slow opening of the valve is believed to have caused excessive 5A heater level oscillations. The net effect was a loss of level control causing the 5A Feedwater heater to isolate on high water level. Procedure deficiency was considered to be a contributing factor. ONI-N36 "Loss of Feedwater Heating" provided an immediate action statement directing operators to return reactor power to pre-transient values. This approach fails to recognize that authorized power levels may be exceeded if operators wait until power begins to increase before reacting.

Loss of Feedwater Heating is analyzed in the Updated Safety Analysis Report (USAR) Section 15.1.1 and assumes a reduction of up to 100 degrees Fahrenheit in reactor core inlet temperature. During the event of August 14, 1990, loss of the 5A and 6A Feedwater heaters resulted in a temperature drop of approximately 25 degrees F. The actual maximum calculated thermal power in the event was 104.24 percent. For a 25 degree F. feedwater temperature decrease, the expected steady-state reactor power level increase from 100 percent is 5 percent. Therefore, this event was fully within the envelope of the analysis in the Safety Analysis Report. Except for the 5A Feedwater heater malfunction, all other plant systems functioned as designed and all operator actions were taken in accordance with approved operating instructions. In addition, thermal limits were not challenged at any time during this transient as calculated by Reactor Engineering personnel. During this event, no safety system actuations occurred. The Reactor Protection System [JE] was fully operable throughout this transient in case it would have become necessary to automatically insert control rods to reduce reactor power. Therefore, this event is not considered to be safety significant.

In order to prevent recurrence, a temporary change to ONI-N36 was made requiring an immediate power reduction to 95 percent to prevent exceeding rated thermal power in case a Feedwater heater isolation occurs at full power. To temporarily restore the 5A Feedwater heater to service, the failed 5A Feedwater heater normal control valve was manually throttled open to 75 percent and level was controlled using the 5A Feedwater heater alternate control valve. This was performed in accordance with approved procedures. The longterm corrective action will be to disassemble and repair the failed component(s) within the 5A heater normal drain valve assembly. This will be performed during the second refuel outage, currently in progress. Based on troubleshooting results and/or failure analysis, additional corrective action will be determined and implemented. As part of the Licensed Operator Requalification training program, this event will be discussed with all Licensed Operators.

Energy Industry Identification System Codes are identified in the text as [XX].