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)
Perry Nuclear Power Plant, Unit 1	0 5 0 0 0 4 4 0	1 OF 0 3

TITLE (4)
RWCU System Design Problems Cause High Differential Flow Isolation

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

OPERATING MODE (9): 4

POWER LEVEL (10): 0 0 0

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)
Paul Russ, Compliance Engineer, ext. 6472	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

SUPPLEMENTAL REPORT EXPECTED (14)

[ ] YES (If yes, complete EXPECTED SUBMISSION DATE) [X] NO

EXPECTED SUBMISSION DATE (15): MONTH | DAY | YEAR

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

On January 7, 1987 at 2015, a Reactor Water Cleanup (RWCU) containment isolation occurred due to indicated high differential flow. The cause of the isolation has been identified to be flow control valve problems and possible calibration inaccuracies of the flow elements used by the Leak Detection system resulting from reactor coolant temperature changes. In response to the isolation, operators restored the system to its original configuration.

As a result of this and previous events an engineering design change has been implemented to provide mass and temperature compensation for the RWCU Leak Detection delta flow instrumentation. This design change has helped to reduce the magnitude of the indicated delta flow error while operating the RWCU system at low reactor power levels. Evaluation of the results of the design change will continue during plant startup testing. In addition, an engineering design change has been initiated to replace five RWCU flow control valves. The replacement valves will provide the flow throttling characteristics to reduce flow oscillations during startup of the RWCU system. Due to operational constraints and parts availability, this design change is not expected to be implemented until the first refueling outage.

On January 7, 1987 at 2015, a Reactor Water Cleanup (RWCU)[CE] containment isolation occurred due to indicated high differential flow. At the time of this event, the plant was in Operational Condition 4 (Cold Shutdown) lowering reactor vessel [RPV] water level in preparation for restarting the reactor. Reactor coolant temperature was approximately 160 degrees and reactor vessel pressure atmospheric.

On January 7 at 1950, plant operators began lowering reactor vessel water level in accordance with Integrated Operating Instruction (IOI)-4, "Cold Startup" by rejecting reactor vessel water via RWCU to the main condenser. At 2015 while adjusting the flow to the main condenser, an inboard RWCU containment isolation occurred due to indicated high differential flow. In response to the isolation, plant operators verified no actual RWCU leak existed, and reset the isolation. The RWCU system responded to the high differential flow isolation signal as designed. RWCU pump A was restarted at 2045 with the Leak Detection system [IJ] for RWCU in bypass to prevent an unnecessary isolation. The Leak Detection system is not required in Operational Condition 4. After satisfactory system startup, the RWCU Leak Detection system was returned to normal at 2246.

Troubleshooting, system testing and investigation of this and previous events (see LERs 86-039, 86-056, 86-068 and 86-085) identified the cause of the isolations as the location of the blowdown flow element, oversensitive flow control valves and lack of density compensation for RWCU delta flow. Previously, the blowdown flow element was relocated upstream of the blowdown pressure control valve [PCV] to prevent the flow element from intermittently becoming uncovered due to the lack of back pressure. This has reduced the indicated flow oscillations while operating the RWCU system with blowdown flow. Flow oscillations while manipulating the RWCU flow control valves during system sta-tup and subsequent flow adjustments continue to be a problem. The plant operators are not always able to recover from the flow oscillations before the system isolates on high differential flow. A design change to replace the flow control valves was initiated prior to the January 7 event but has not been implemented. Additionally, a contributing cause is the effect of the changes in reactor coolant temperature on the indicated flow rates. The flow elements are calibrated based upon operating temperature and do not compensate for temperature changes in the reactor coolant experienced during startup. This can result in a reduced margin to the isolation setpoint at certain operating conditions. A design change to provide mass and temperature compensation for the delta flow instrumentation was initiated prior to the January 7 event but had not been implemented.

The Leak Detection system compares RWCU suction flow to the flow returning to the reactor vessel and blowndown flow. All three flows are summed to generate an indication of differential flow. A RWCU high differential flow signal indicates the suction flow entering the system is not being discharged via normal flowpaths (reactor vessel, and blowdown to radwaste or main condenser). This could be the result of a line break in the RWCU system. Indicated high differential flow for a duration of 45 seconds generates an isolation signal

from the Leak Detection system. The 45 second time delay normally allows for system flow transients when changing operational configurations. If an RWCU containment isolation were to occur at high reactor power, the loss of the RWCU system may cause reactor coolant conductivity to slowly increase until the system is returned to service. In addition, during shutdown with little or no internal recirculation flow, reactor vessel thermal stratification may also occur. However, the time out-of-service for RWCU would be short and these effects minimal. Since no actual RWCU high differential flow existed and the fact that the system did respond as designed to the indicated high differential flow isolation, the event is not considered safety significant.

As a result of this and previous events, an engineering design change has been implemented to provide mass and temperature compensation for the RWCU Leak Detection delta flow instrumentation. This design change has helped to reduce the magnitude of the indicated delta flow error while operating the RWCU at low reactor power levels. Evaluation of the results of the design change will continue during plant startup testing. In addition, an engineering design change has been initiated to replace five RWCU flow control valves. The replacement valves will provide the flow throttling characteristics to reduce flow oscillations during startup of the RWCU system. Due to operational constraints and parts availability, this design change is not expected to be implemented until the first refueling outage.

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