NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Perry Nuclear Power Plant, Unit 1	05000 440	1 OF 5

TITLE (4)
Inverter Failure Results in Reactor Scram

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 NAME	DOCKET NUMBER
										05000
08	31	95	95	-- 005 --	00	10	02	95	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	100	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)	X	OTHER	
		20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)	
		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 (Include Area Code)
Keith R. Jury, Supervisor - Compliance	(216) 280-5594

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
B	BO	INVT	T248	NO						

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 15 single-spaced typewritten lines) (16)

On August 31, 1995, at 1142 hours, the Perry Nuclear Power Plant was at 100 percent rated thermal power, when the reactor automatically scrammed due to a trip of the main turbine and subsequent closure of the Turbine Control and Stop valves.

The root cause of the scram was equipment failure. A resistor in a 125 VDC to 120 VAC Topaz inverter failed resulting in the loss of a 24 VDC instrument power supply to Reactor Pressure Vessel level instrumentation. Upon loss of the 24 VDC power supply, reactor low water level initiation logic was satisfied and a Reactor Core Isolation Cooling (RCIC) system initiation signal was generated. The RCIC initiation in turn caused an immediate main turbine trip and subsequent reactor scram. Plant systems and components functioned as designed during this transient with the exception that one outboard containment isolation valve, which failed to close. This event has minimal safety significance as the scenario is bounded by accident analyses.

Corrective actions for this event include: replacement of the Topaz inverter unit and restoration of the instrument power supply; evaluation of inverter upgrades; and evaluation of plant modifications to preclude an immediate reactor scram upon loss of an inverter. This event is being reported in accordance with the requirements of 10CFR50.73(a)(2)(iv), 10CFR50.73(a)(2)(i)(B). This report is also being submitted to fulfill the requirements of Technical Specification 3.5.1, Action h.

I. Introduction

On August 31, 1995, at 1142 hours, the Perry Nuclear Power Plant automatically scrammed from 100 percent rated thermal power, due to a trip of the main turbine and subsequent closure of the Turbine Control and Stop valves. During the transient, the reactor pressure vessel (RPV) water level decreased to approximately 124 inches above the top of active fuel. RPV water level was restored utilizing the High Pressure Core Spray (HPCS) system, the Reactor Core Isolation Cooling (RCIC) system, and the motor driven feedwater pump (MFP).

Notification was made to the NRC via the Emergency Notification System at 1225 hours in accordance with 10CFR50.72(b)(1)(iv), for an Emergency Core Cooling system (ECCS) discharge to the Reactor Coolant system (RCS); in accordance with 10CFR50.72(b)(2)(ii), for actuations of Engineered Safety Features (ESFs) including actuation of the Reactor Protection system (RPS); and in accordance with 10CFR50.72(b)(2)(vi), for a planned news release. This condition is being reported in accordance with 10CFR50.73(a)(2)(iv) for an event that resulted in actuation of ESF systems and an actuation of the RPS. It is also being reported in accordance with 10CFR50.73(a)(2)(i)(B), for operating in a condition prohibited by the Technical Specifications (TS).

Submittal of this report also satisfies the requirements for TS 3.5.1, Action h, which requires a Special Report following any ECCS actuation and injection into the RCS. This was the eighth HPCS injection cycle to date. The injection nozzle usage factor is currently less than 0.70.

II. Description of Event

On August 31, 1995, at 1142 hours, the Perry Nuclear Power Plant automatically scrammed from 100 percent rated thermal power following the failure of a Division 2 Topaz inverter power supply (1E12K701) which caused a RCIC initiation which resulted in a trip of the main turbine and a reactor scram. Reactor water level decreased to the level 3 setpoint (178 inches above the top of active fuel), which caused a Residual Heat Removal (RHR) system isolation (applicable valves were already closed), then further to the level 2 setpoint (130 inches above the top of active fuel). Upon reaching the level 2 setpoint, the HPCS system actuated and the following additional ESF actuations (i.e., isolations/trips) occurred: Balance of Plant (BOP); Reactor Water Cleanup system; and reactor recirculation pumps. Reactor water level was restored utilizing HPCS, RCIC, and the MFP. The plant was stabilized in Operational Condition 3.

Plant systems and components functioned as designed during this transient with the exception of one outboard containment isolation valve (1D17-F0081A) [ISV] which failed to close. The associated inboard isolation valve did close on the BOP isolation, and Operations personnel administratively verified that the inboard valve remained closed.

Control room operators initially declared the Division 2 diesel generator inoperable at 1204 hours due to the loss of power to portions of its instrumentation, and completed the one hour actions required by TS 3.8.1.1.b at approximately 1300 hours. It was later determined that the Division 2 diesel generator had become inoperable at 1142 hours. Therefore, specified actions were not taken within one hour as required by this TS.

At approximately 1700 hours, control room personnel determined that the isolation actuation instrumentation associated with containment isolation valves 1P43-F215, 1E51-F063, and 1E51-F078 was inoperable. The operators immediately began to implement the Actions of TS 3.3.2 which require closure of these valves within 2 hours. Due to the complexity of evaluating what equipment that was affected by this transient, Operations personnel did not immediately recognize the impact of the power supply failure on the subject containment isolation valves. However, since the isolation actuation instrumentation had become inoperable at 1142 hours (due to failure of the power supply), the applicable actions were not taken within the time frame required by this TS.

III. Cause of Event

The root cause of this event was equipment failure. Failure of a resistor in a 125 VDC to 120 VAC Topaz inverter [INVT] resulted in the loss of a 24 VDC instrument power supply [JX] to RPV level instrumentation. Upon loss of the 24 VDC power supply, reactor low water level initiation logic was satisfied and a RCIC initiation signal was generated. The RCIC initiation in turn caused a main turbine trip and resultant reactor scram.

Failure of the resistor was attributed to an in-series AC relay in a DC circuit. This caused excessive current to be drawn through the resistor which over time, caused the resistor to ultimately overheat and fail. This inverter had been installed since 1993.

This failure mechanism had previously been identified in 1984; the Topaz inverters were thought to have been upgraded with DC relays. However, this particular unit had not been upgraded. Station personnel are currently evaluating why this unit was not upgraded. Any corrective actions resulting from this evaluation will be dispositioned via the Corrective Action Program.

The cause of valve 1D17-F0081A failing to close could not be definitively determined. Station personnel performed a logic check that indicated that a closure signal was initiated and the valve should have closed. During troubleshooting activities, personnel slightly agitated this valve which resulted in the valve closing. Further testing of the valve could not re-create a second failure. The actuator and/or linkage appears to have stuck in the open position. Station personnel adjusted the open limit switch to assure that the valve did not stick due to over-travel in the open direction.

The cause of the TS Actions not being performed in accordance with the time limitations of the respective specifications, was attributed to personnel not realizing the extent of equipment rendered inoperable due to the failed Division 2 power supply. Following the initial transient, station personnel immediately performed the associated TS actions as it was determined that equipment was inoperable.

IV. Safety Analysis

This event is bounded by the Updated Safety Analysis Report (USAR) Chapter 15.2.3, "TURBINE TRIP," which provides analysis for a variety of turbine or nuclear system malfunctions that initiate a turbine trip. In addition, USAR Chapter 15.2.7, "LOSS OF FEEDWATER FLOW," assumes a total loss of feedwater flow with make-up to the RPV being provided by ECCS. This analysis also bounds this transient. The impact of the HPCS initiation and injection, inclusive of fatigue, is enveloped by design analyses for the reactor, reactor internals, and HPCS piping. Therefore, this transient was bounded by the existing safety analysis and is considered to have minimal safety significance.

V. Similar Events

Two previous events involving similar loss of instrument power supplies resulting in initiation of RPV low water level logic were reported in LERs 86-041 and 93-012. These events were caused by voltage fluctuations in the output of the reserve battery charger upstream of a 125 VDC to 120 VAC Topaz inverter.

LER 93-012 contained a corrective action stating engineering personnel would evaluate replacement of the 125 VDC to 120 VAC Topaz inverters. A design change was initiated to replace these inverters, and is currently being re-evaluated for implementation.

The corrective actions from these events would not have precluded occurrence of this event.

VI. Corrective Actions

1. The inverter unit was replaced and the instrument power supply was restored.

2. Engineering is evaluating plant modifications to preclude an immediate reactor scram upon loss of an inverter.

3. Station personnel are currently investigating why the AC relay was not replaced with a DC relay during the 1984 upgrade effort. There are 13 Topaz inverters installed at the station; station personnel will verify that the applicable inverters contain DC relays.

4. Performance of valve 1D17-F0081A will be monitored via the Inservice Testing program.

5. Control room personnel will be trained to this event with respect to vigorously identifying inoperable equipment following a transient, and subsequently performing required TS Actions.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].