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)
REACTOR TRIP SET LESS THEN TECHNICAL SPECIFICATIONS LIST

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 9	8 4	8 4	—	0 2 3	— 0 3	0 9	1 9	8 5	N/A	0 5 0 0 0
										N/A	0 5 0 0 0

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 1 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	X 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	X 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
R A Fenech, Technical Engineer, Palisades	AREA CODE 6 1 6 — 7 6 4 - 8 9 1 3

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)	NO				

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

On November 9, 1984, with the Plant in cold shutdown, the Reactor Protection System (RPS) low-flow-trip for four (4) primary coolant pumps (PCP) operatoin was determined to be set incorrectly. On December 13, 1984, evaluation of the four-pump trip setting revealed that the RPS low flow trip for three (3) PCP operation was also not set correctly. In addition, the evaluation has shown that the three-pump setpoint is calculated by incorrect methods. As a result, a Technical Specifications safety system setpoint limit was exceeded during previous plant operation.

The incorrect trip settings occurred when a low-flow-trip calibration procedure was not perfomred and resulted in incorrect values in an RPS surveillance procedure. The incorrect calculation method originated with the controlling procedure and resulted from a misunderstanding of primary coolant flow characteristics.

The calibration procedure was performed and the correct four-pump trip values provided for the surveillance procedure. The calibration procedure requirements will be included in the RPS surveillance procedure. The three-pump low-flow trip has been reset and will result in a trip for any three-pump flow configuration. Three pump operation is thereby precluded until all concerns relating to the trip setpoint have been resolved. Special Test Procedures will be reviewed and appropriate scheduling provided.

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

On November 9, 1984, with the plant in cold shutdown, the Reactor Protection System [JC] low primary coolant flow trip was determined to be set incorrectly for four primary coolant pumps [AB;P] operation. Technical Specifications Table 2.3.1, Item 2, requires the four-pump low-flow-trip setpoint to be greater than or equal to 95 percent of the nominal four-pump primary coolant flow. During the operating period from July 1984 to September 1984, the trip setpoint did not meet this criteria.

On December 13, 1984, subsequent engineering evaluation revealed that the Reactor Protection System low primary coolant flow trip for three primary coolant pump operation was also set incorrectly. In addition, it was determined that the procedural method for calculating the trip setpoint results in a value that does not meet Technical Specifications limits for three-pump operation. Technical Specifications Table 2.3.1, Item 2, requires the three-pump low-flow trip setpoint to be greater than or equal to 71 percent of the nominal four-pump primary coolant flow. the exact date of occurrence of the calculation error cannot be determined, but is believed to have occurred in the early 1970's. In recent operation, a three-pump condition occurred on September 16, 1984 (reference Licensee Event Report 84-021, dated October 31, 1984), as a result of a primary coolant pump seal [AB;SEAL] failure.

The Reactor Protection System (RPS) low-flow-trip consists of four independent channels. Each channel utilizes a separate set of differential pressure (dp) detectors [JC;PDT]. Flow in each of the four coolant loops is determined by a measurement of pressure drop from inlet to outlet of the steam generators [AB;SG]. The total flow through the reactor core is measured by summing the loop pressure drops across the steam generators and correlating the pressure sum with the pump calibration flow curves. A reactor trip is initiated by two-out-of-four coincidence logic from any of the four independent measuring channels when the flow function falls below a preselected value. Pretrip alarms are initiated if the coolant flow function approaches the minimum required for reactor operation at the corresponding power level. The low-flow-trip setpoint is manually changed for the selected pump configuration by means of a setpoint selector switch.

Test Procedure T-69, "RPS Low Flow Trip Calibration", is used to determine the correlation between steam generator dp and total coolant flow. T-69 also determines the correct dp values for the low-flow-trip. These values are then used in Technical Specifications Surveillance Procedure MI-2, "Reactor Protection Trip Units", to set or verify the low-flow-trip such that it occurs at the setpoint calculated in T-69. Test Procedure T-69 is performed to incorporate changes in steam generator dp that do not correlate to flow changes.

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

Test Procedure T-69 was required to be performed in December 1981 during the plant startup following the 1981 refueling outage. A scheduling error by the plant support staff omitted this test. In addition, Surveillance Procedure MI-2 did not reference T-69 to ensure the correct trip values were available. As a result, the low primary coolant flow trip settings were not updated to account for steam generator dp changes that resulted from tube plugging.

An analysis was performed to determine the operating periods affected by the error in the low-flow-trip setpoint. The analysis has shown that the four-pump low-flow trip setpoint was within Technical Specifications limits, except for the period of operation from July 1984 to September 1984. During the period, all four low-flow-trip setpoints were found to be less than the required minimum value of 95 percent. Using conservative calculations, the greatest error was determined to have been a setpoint of 94.37 percent. It is estimated, based on the extrapolation of the current safety analysis, that the consequences of a four-pump loss of flow would still be acceptable (ie, above minimum departure from nucleate boiling ratio limit), even assuming a trip at 92.37 percent (94.37 - 2 percent uncertainty).

Continued evaluation of the low-flow-trip revealed a similar setpoint error occurred in the three-pump low-flow-trip, as a result of failing to perform Test Procedure T-69. Although the Technical Specifications limit for the three-pump low-flow-trip setpoint was not met, three pump operation has occurred only once in recent operation. Specifically, on September 16, 1984, a primary coolant pump (PCP) was tripped concurrent with plant shutdown, in response to a PCP seal failure.

The analysis performed to evaluate the three-pump low-flow-trip setpoint resulted in additional review of Test Procedure T-69. These reviews identified that the calculation method specified by T-69 to determine the three-pump low-flow-trip setting would result in a trip value that would not meet the Technical Specifications limit for three-pump operation.

T-69 specifies that the three-pump trip be set at 90 percent of the three-pump measured flow. Technical Specifications Table 2.3.1 requires the three-pump low-flow-trip to occur at greater than or equal to 71 percent of the four-pump measured flow. In correlating the three-pump measured flow to the four-pump measured flow, the presence of reversed loop flow in the idle loop was not considered. Also, the steam generator dp detectors provide a positive output for both normal forward flow or reversed loop flow. Neither of these effects were considered when Test Procedure T-69 was originated in 1974. However, calculations using actual three-pump loop flow measurements, based on PCP dp and pump flow curves taken in 1975, indicate that the low-flow-trip would have been set 1.8 percent below the Technical Specifications limit using Test Procedure T-69. A thermal margin analysis has determined that the minimum departure from nucleate boiling ratio limit would be satisfied during a three-pump loss of flow with the RPS trip set with this error. In addition, Technical Specification 3.1.1(c) requires the Plant to be in hot standby within 24 hours with one or more pumps out of service. Three-pump operation is prevented from being a prolonged operating condition by this requirement. Any reliance place on the three-pump low-flow-trip would have been limited in duration.

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

Test Procedure T-69 was performed on November 15, 1984, during plant startup. The correct four-pump low-flow-trip setpoints have been established. The three-pump low-flow-trip setpoints have been adjusted to cause a trip if the setpoint operation is thereby precluded until all concerns relating to T-69 calculations have been resolved.

Surveillance Procedure MI-2 will be revised to include requirements to ensure Test Procedure T-69 is performed as required, and that the correct trip values are available and referenced. All special test procedures will be reviewed to determine the tests that will require future performance. Additional action will be provided to ensure performance of the tests identified by the review.

As noted, the four-pump low-flow-trip setpoint error was identified on November 9, 1984. The details of this occurrence were reported in Revision 0 to this LER on December 10, 1984. During evaluation of the four-pump low-flow-trip setpoint, additional items were initially discovered on December 13, 1984, it was not until January 10, 1985 that the details were made available and the reportability determined. On January 10, 1985, notification was made to the NRC by telephone to identify these new concerns.