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June 9, 1995

Re: Indian Point Unit No. 2
Docket No. 50-247
LER 95-13-00

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

The attached Licensee Event Report LER 95-13-00 is hereby submitted in accordance with the requirements of 10 CFR 50.73.

Very truly yours,

Attachment

cc: Mr. Thomas T. Martin
Regional Administrator - Region I
US Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

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NRC FORM 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH 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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Indian Point Unit No. 2	0 5 0 0 0 2 4 7	1 OF 0 6

TITLE (4)

Test inadequacy potentially causing non-conservative OPDT tempature trip setpoint constant

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	1 0	9 5	9 5	— 0 1 3	— 0 0					0 5 0 0 0
										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 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	X 50.36(c)(1) (ii) (A)	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
Arthur P. Ginsberg	AREA CODE 2 1 2 — 4 6 0 - 4 3 3 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	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)

During a review of the test procedure to set the constants for Technical Specification 2.3.1.B(5), Overpower Delta T, the practice of using a 200 mv step function for increased accuracy to set the K5 term was investigated. Upon further analysis, it was determined that use of this large a step function could result in a non-conservative value for K5 and leave a setpoint lower than that allowed by Technical Specifications if the step was started at too high a value in the Tavg range. A review of the previous tests since the last procedure revision concluded that this non-conservatism only existed in the most recent test which was done while the plant was in refueling mode and was corrected before the plant was restarted. The earlier tests reviewed showed conservative values were obtained since the step was started at a lower Taverage.

A review of the basis for Technical Specification Safety Limits resulted in the determination that these Safety Limits would not have been exceeded nor could they potentially be exceeded by this setting. The safety limits are determined by steady state analysis, and the K5 settings affects only a dynamic term in the Overpower Delta T setpoint equation. Safety analyses were also reviewed, and it was determined that all design bases would continue to be satisfied even with any improper setting for K5.

Corrective action included revising the procedure to utilize a smaller step function when setting K5, to specify start-point of the step and resetting the four channel setpoints to values that satisfied the Technical Specification requirements.

The overtemperature Delta T setpoint is not affected.

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse 4-Loop Pressurized Water Reactor

IDENTIFICATION OF OCCURRENCE:

Test inadequacy potentially causing non-conservative Overpower Delta Temperature Trip Setpoint Constants

EVENT DATE:

May 10, 1995

REPORT DUE DATE:

June 9, 1995

REFERENCES:

Significant Occurrence Report (SOR) 95-347

PAST SIMILAR OCCURRENCE:

None

DESCRIPTION OF OCCURRENCE:

During a review of the overpower delta T surveillance test procedure in which the dynamic term constants are measured it was determined that too large a step introduced from too high a starting Tave, could cause the introduction of contribution from the K6 term. This test, resulted in non-conservative values of the constants. The test was revised and repeated and the values left were conservative with respect to the Technical Specifications. Based on our review, the plant did not operate with these non-conservative settings.

ANALYSIS OF OCCURRENCE:

Theory

The dynamic overpower delta T setpoint equation is as follows:

Delta Tsp = Delta To [K4 - K5'T(T3S)/(1+T3S) - K6 (T-T")]
and Delta T must be less than Delta Tsp

Where Delta T = measured delta T by Thot and Tcold RTDs, degrees F

Where Delta To = indicated Delta T at rated power, degrees F
K4 = constant
K5' = constant
T = RCS Taverage
T" = measured Tave at full power

Focusing on the dynamic term.

F(S) = T3S/(1+T3S) = impulse transfer function

Where T3 = impulse time constant
and S = Laplace variable

That is, for any function f(t),

$$F(S) = \int F(t)\exp(-St)\,dt$$
and
$$F(t) = \int F(S)I(S)\exp(-St)\,ds$$

Where I(S) = Laplace transform of the input function

Given Eo(S) = [KTS/ (1+TS)] Ein (S)
the response to a step function is

Eo(t) = KEinexp(-t/T3)

For the OPDT setpoint dynanic term

Eo(t) = ΔTo K5' Ein exp(-t/T3)

ANALYSIS OF OCCURRENCE: (continued)

Therefore, the K5' term can be obtained from the height of the output function and the T3 from the decay of the exponential term.

In practice, the input step does not rise to its maximum in zero time, but the rate of rise is faster for a larger step. Therefore, the larger the input the more accurate the response is.

The response to ramp function of magnitude A is

$$Eo(t) = AKT\ (1=\exp(-t/T))$$

For $t \rightarrow \infty$, $Eo = AKT$

For the overpower delta T, $Eo(t) = AK5'T$. This is the middle term in the Technical Specification equation. Note that:

$$K5(T3) = K5'(test) \times T3$$

For the overtemperature delta T setpoint, the Technical Specification term is the result of a lead-lag transfer function response to a step function. It can be shown that K2(T.S.)=K2'(test). Therefore, the problem doesn't affect the OT delta T setpoint.

K5 is a purely dynamic term that is zero unless Tavg is increasing. It is calibrated by introducing a step change into Impulse/Lag unit TM-4*2D (which contains the adjustments for both K5 and K6). The response is an "impulse" followed by an exponential decay. K5 is determined from the height of the impulse. T3 is determined by the time it takes the response to decay 36.7 percent of the initial "impulse" value.

K6 is a static term that is linear and present whenever Tavg is above T" (about 559 degrees F - This is a value that varies depending on plant measurements taken at 90 percent power). When Tavg is below T", the K6 term is zero. If the step change does not exceed the value of T", the response will reflect no contribution from K6 term. If the step change exceeds the value of T", the response to the step will be reflected in both K5 and a contribution from the K6 term as both K5 and K6 terms change in value for a change in Tavg. The degree of the potential error is determined by the height of the pulse and how far it has encroached on the "K6 region".

The range of the instrument is 100-500 mV when measured across a 10 ohm resistor. 559 degrees F is 201.3 mV. Therefore, the simulated Tavg step change would have to be between 100 and 201.3 mV in order to ensure no K6 contribution Because of conservatism, a 200 mV step started at 100 mv would not provide a K6 contribution to the pulse height larger enough to result in a K5 that exceed technical specification limits.

ANALYSIS OF OCCURRENCE: (continued)

Test History

From Revision 0 in 1976 through revision 12 (1990) PT-V11A specified a step change as follows:

"Place a step input to the I/L unit from convenient Tavg test injection point."

The only way to determine that the starting point and height of the step was to look at the recorder traces. The technician was given leeway to determine the step he wanted to use.

In 1990, it was determined that the test had several deficiencies including lack of detail, especially in the K5 section. Revision 13 included specification of the height of the step (200 mV) and the method for calculating K5 and K5Xt3. This was done based on the method used in the 1990 test and reflected the method used on the 1990 recorder traces. Revision 13 was first performed on 7/23/91.

Evaluation

An internal Con Edison evaluation was performed. A review of the Technical Specifications and the FSAR has shown that the above did not result in exceeding any Safety System Setting and did not result in exceeding any Safety Analysis Limit. Figure 2.1-1 of the Technical Specifications, the safety limits, is derived assuming no contribution from the K5 term in reducing the setpoint. The most limiting criteria for this figure are the DNB limits and core exit enthalpy limits. In addition, no credit is taken for the OPDT in the accident analyses. (Only the non-LOCA events are potentially affected by OP delta T.) Therefore, the conclusions of the Safety Analysis Report and the bases of the Technical Specifications are not affected.

An independent evaluation has been performed by our vendor Westinghouse which demonstrates that there are no safety questions involved.

Reportability

This condition is being reported under 10 CFR 50.73 because it was determined that one of the terms of the overpower delta temperature trip settings in the Limiting Safety System setting was exceeded. However, the plant never operated with this non-conservative setting and the Safety Limits would not have been exceeded.

CAUSE OF OCCURRENCE:

Improper procedural guidance provided to persons performing the test, and an in-adequate review of the test procedure.

CORRECTIVE ACTION:

1) The test procedure was revised to utilize a 95mV step starting at 100mV. This ensures that for the current Taverage, there will be no contribution from the K6 term. The circuitry was recalibrated using the new procedure.

2) Test procedures involving dynamic testing of lead/lag/impulse circuits will be re-reviewed.

3) This LER will be considered for inclusion in the Engineering Support Personnel (ESP) training program as an example of the subtleties of dynamic testing and will be discussed with groups involved in such testing..