

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION  
(04-1998)**LICENSEE EVENT REPORT (LER)**(See reverse for required number of  
digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/1998

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Information and Records Management Branch (T-6 F33), 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. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NUMBER (2)

05000261

PAGE (3)

1 OF 5

TITLE (4)

CONDITION OUTSIDE DESIGN BASIS DUE TO INOPERABLE OVER POWER DELTA TEMPERATURE CHANNELS

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
06	10	1997	1997	07	01	04	16	98		05000
										05000

  

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
1	100	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	X 50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	or in NRC Form 366A

**LICENSEE CONTACT FOR THIS LER (12)**

NAME

H. K. Chernoff, Supervisor, Licensing/Regulatory Programs

TELEPHONE NUMBER (Include Area Code)

(843) 857-1544

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

**SUPPLEMENTAL REPORT EXPECTED (14)**

YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO	EXPECTED	MONTH	DAY	YEAR

**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 10, 1997, with the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2 operating at 100% power, plant operators noted that the Reactor Protection System (RPS) Over Power Delta-Temperature (OPDT) channels were not responding properly, and at 1101 hours, declared the OPDT channels inoperable. The NRC Operations Center was notified of this condition at 1155 hours pursuant to 10 CFR 50.72(b)(1)(ii)(B). An investigation determined that the circuit for the OPDT summator in each of the three RPS loops was not properly calibrated. This event is attributed to inadequate programmatic controls which led to a personnel error. In 1979, personnel failed to specify the low limit setpoint for the summator on the data sheet used for the calibration. As a result, the OPDT channels were not calibrated using the proper setpoint. The safety significance of this event is minimal. Although the OPDT trip function is required by Technical Specifications, it is an additional trip which is available, and is not credited in the safety analyses. Procedure and calibration data sheet changes were implemented specifying the correct low limit setpoint, and the OPDT channels were re-calibrated and placed back in service on June 10, 1997. This event was reviewed by Maintenance Instrumentation and Control (I/C) craft personnel, Maintenance Unit I/C procedure writers, and Operations shift personnel. A review was performed to determine which summators in the RPS required high and low limits to be set, and calibration data sheets were reviewed and verified to ensure the limits are specified. This report is submitted in accordance with 10 CFR 50.73 (a)(2)(ii) as a condition that was outside the design basis of the plant.

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I. DESCRIPTION OF EVENT

On June 8, 1997, with the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2 increasing back to 100 percent power following a scheduled power reduction conducted the previous day, plant operators noted that the Over Power Delta-Temperature (OPDT) setpoint had increased during the earlier power reduction. OPDT is a Reactor Protection System (RPS) (EIS System Code: JE) reactor trip function that is designed to protect against power level. This circuit trips the reactor on coincidence of two out of three signals, with one set of temperature measurements per loop. The OPDT reactor trip setpoint is continuously calculated for each channel, based on an equation contained in Technical Specifications (TS) Section 2.3.1.2.e, with electronic modules in the RPS circuitry that monitor various parameters to determine the setpoint value. One factor in this equation is  $K_6$ , which is defined as 0.00277 for  $T_{avg}$  greater than 575.4 degrees F, and zero for  $T_{avg}$  less than or equal to 575.4 degrees F. This means that the OPDT setpoint should not get any credit (i.e., increase) for  $T_{avg}$  being less than or equal to 575.4 degrees F and should be reduced if  $T_{avg}$  is greater than 575.4 degrees F.

The module that controls the  $K_6$  factor is signal summator TM-412M for "A" loop. This function is performed by preventing the output signal from the summator from decreasing below the zero output voltage when the  $T_{ave}$  input decreases below the 575.4 degrees value. This is done by setting the "low limit" control on the summator at 1.000 volts, which electronically prevents the signal from decreasing even though the input can still continue to decrease. The low limit is adjustable and is set during the routine calibration of the loop performed during refueling outages. If no limits are specified on the calibration data sheet, these limits are turned down to their lowest setting so they will not interfere with calibration of the module. Without the low limit properly set on the TM-412M module, the OPDT setpoint increased approximately 0.16 degrees F for every 1 degree F  $T_{avg}$  was less than 575.4 degrees F. The size of this error was largest at hot zero power where  $T_{avg}$  equals 547 degrees F and the resulting OPDT setpoint would be 65.47 degrees F.

Engineering personnel were requested to investigate this concern, and on June 10, 1997, determined that the three OPDT channels were not responding properly. Technical Specifications (TS) Table 3.5-2, Item 6, requires that a minimum of two channels of OTDT be operable when the reactor is critical. Accordingly, at 1101 hours Eastern Daylight Time, plant operators declared the three OPDT channels inoperable, and entered TS Section 3.0, which requires that the reactor be placed in hot shutdown within eight hours and in cold shutdown within the next 30 hours unless corrective measures are taken that permit operation under the permissible Limiting Condition for Operation (LCO).

The NRC Operations Center was notified of this condition at 1155 hours via the Federal Telephone System (FTS) in accordance with 10 CFR 50.72(b)(1)(ii)(B) as a condition outside the design basis of the plant.

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I. DESCRIPTION OF EVENT (Continued)

Further investigation and review of data determined that the circuit for the RPS summator in each of the three loops was not properly calibrated because the low limit setpoint (i.e., 1.000 volts) for the summator had not been specified on the data sheet used for the calibration. Procedure and calibration data sheet changes were implemented specifying the correct low limit setpoint, and the OPDT channels were re-calibrated. Loops 1 and 2 OPDT channels were placed back in service on June 10, 1997, at 1516 hours, and the loop 3 OPDT channel was placed back in service at 1522 hours.

II. CAUSE OF EVENT

Although the investigation of this event could not conclusively identify the root cause, this event is attributed to inadequate programmatic controls which led to a personnel error. OPDT calibrations are performed during refueling outages to satisfy the requirements of TS Table 4.1-1, Minimum Frequencies for Checks, Calibrations and Tests of Instrument Channels, Item 4, "Reactor Coolant temperature." The low limit setpoint for the summator is adjustable and is set to the specified value during routine calibrations of the loop.

A review of calibration data sheets revealed that the low limit appeared to be properly set from initial plant operation through 1976. However, there was no notation of this setting on calibration data sheets after that time. Temperature recording strip charts identify that the OPDT setpoint was performing its intended function up to the 1979 Refueling Outage (i.e., RO-6), but that the OPDT setting was increasing to an out of tolerance condition during power reduction transients after RO-6. This implies the low limit was not properly set during RO-6. One significant evolution which occurred during this refueling outage was the upgrade to allow reactor power to be increased from 2200 mwt to 2300 mwt. Calibration data sheets would have been revised to compensate for this change. At that time, calibration acceptance data was annotated by hand on a calibration data sheet and the sheet would be copied for use during the next calibration. Although not conclusively determined, it is likely that while the calibration sheets were being revised, the low limit setpoint was not carried over to the new sheets. Therefore, the investigation concluded that this event was most probably caused by failure to transcribe calibration data from the previous sheet to a new sheet, and the low limit setpoint was not adjusted.

IV. ANALYSIS OF EVENT

The protective instrumentation setpoints in the TS apply to trip settings for instruments monitoring reactor power and reactor coolant pressure, temperature, and flow, and pressurizer level. The trip settings ensure the combination of power, temperature, and pressure will not exceed core safety limits. The protective instrumentation setpoint for the OPDT reactor trip is calculated for each protection channel based on an equation provided in TS Section 2.3, "Limiting Safety System Settings, Protective Instrumentation."

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IV. ANALYSIS OF EVENT (Continued)

The basis of TS Section 2.3 states, "The OPDT reactor trip prevents power density anywhere in the core from exceeding 118 percent of design power density as discussed in Section 7.2.2 of the FSAR (i.e., the Updated Final Safety Analysis Report), and includes corrections for axial power distribution, change in density and heat capacity of water with temperature, and dynamic compensation for piping delays from the core to the loop temperature detectors."

The safety significance of this occurrence is considered low. Although the OPDT trip function is required by TS Section 2.3, it is an additional trip which is available and is not used for UFSAR Chapter 15 safety analyses. Chapter 15.0.7 of the UFSAR states, "If credit were taken in the analysis for such trips the results of the events would be further mitigated with less challenging results. It is, therefore, conservative not to credit the additional trips." Under worst case assumptions, had an RCS temperature transient occurred during the time the OPDT trip function was inoperable, automatic actuation of the mitigating features associated with the OPDT reactor trip would have been delayed and may not have occurred as designed. As described in UFSAR Section 7.2.1.2.1, "Reactor trips on nuclear overpower and low reactor coolant flow are provided for direct, immediate protection against rapid changes in these parameters. However, for all cases in which the calculated DNBR approaches the safety limit, a reactor trip on overpower and/or overtemperature delta temperature would also be actuated."

This report is submitted in accordance with 10 CFR 50.73 (a)(2)(ii) as a condition that was outside the design basis of the plant.

V. CORRECTIVE ACTIONS

The OPDT channels were re-calibrated and the low limits were set within the prescribed tolerance.

Changes were made to Loop Calibration Procedures (LP)-001, LP-002, and LP-003, to incorporate the low limit settings for the OPDT channel instruments.

This event was reviewed by Maintenance Instrumentation and Control (I/C) craft personnel, Maintenance I/C Unit procedure writers, and Operations shift personnel.

A review was performed to determine which summators in the RPS require high and low limits to be set.

Calibration data sheets were reviewed and verified that RPS high and/or low limits are specified.

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VI. ADDITIONAL INFORMATION

## A. Failed Component Information

None

## B. Previous Similar Events

None