

## LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 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

FACILITY NAME (1) Cook Nuclear Plant Unit 1										DOCKET NUMBER (2) 50-315		PAGE (3) 1 of 4		
TITLE (4) Hydrogen Recombiner Temperature Circuit Technical Specification Surveillance Requirement Not Met														
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 Cook - Unit 2		DOCKET NUMBER 50-316		
03	20	98	98	--	019	--	02	07	31	98	FACILITY NAME		DOCKET NUMBER	
OPERATING MODE (9)		5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)											
POWER LEVEL (10)		0	20.2201 (b)				20.2203(a)(2)(v)				<input checked="" type="checkbox"/> 50.73(a)(2)(i)		50.73(a)(2)(viii)	
			20.2203(a)(1)				20.2203(a)(3)(i)				<input checked="" type="checkbox"/> 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 or in NRC Form 366A	
			20.2203(a)(2)(iv)				50.36(c)(2)				50.73(a)(2)(vii)			
LICENSEE CONTACT FOR THIS LER (12)														
NAME Mr. Robert Carruth, Electrical Design Manager										TELEPHONE NUMBER (Include Area Code) 616 / 465-5901, x5146				
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).							<input checked="" type="checkbox"/> NO							
Abstract (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16) On April 7, 1998, with Units 1 & 2 in cold shutdown, it was determined that the Electric Hydrogen Recombiner (EHR) Technical Specification (T/S) surveillance requirement 4.6.4.2.b.1 was not met. T/S 4.6.4.2.b.1 requires a channel calibration of all recombinder instrumentation and control circuits, however the channel calibration procedure for EHR temperature measurement circuitry directs the technician to calibrate only the control room readout device. Failure to meet T/S surveillance requirements is a condition which requires a 30 day report in accordance with 10 CFR 50.73(a)(2)(i)(B), as any operation or condition prohibited by the plant's T/S's.  In addition, EHR temperature is used in T/S surveillances 4.6.4.2.a and 4.6.4.2.b.3. to prove operability of the recombiners. Therefore, since the EHR temperature circuitry was in question, all recombiners were considered to be inoperable. A contributing factor was a design deficiency in the temperature circuit. This condition was reported via ENS on April 7, 1998 under the provisions of 10 CFR 50.72(b)(2)(i), as an unanalyzed condition, and requires a 30 day report per 10CFR50.73(a)(2)(ii) for an unanalyzed condition.  The cause of the inadequate T/S surveillance is work practices when revising surveillance procedures. A contributing cause was a design deficiency due to inadequate design change management. A design change will be performed prior to plant restart, and surveillance procedures will be revised accordingly.  The event was of no safety significance. Actual plant data showed the errors associated with the EHR temperature measurement circuits to be minimal, therefore the recombiners would have performed their function in the event of a postulated accident.														

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

## CONDITIONS PRIOR TO EVENT

Unit 1 was in Mode 5, Cold Shutdown

Unit 2 was in Mode 5, Cold Shutdown

## DESCRIPTION OF EVENT

The Electric Hydrogen Recombiner (EHR) provides the means to prevent unsafe levels of hydrogen concentration from being reached in the Cook Nuclear Plant Containment following a design basis Loss-of-Coolant Accident (LOCA). The EHR uses electric heating elements to elevate the temperature of the containment atmosphere passing through it to a level where hydrogen-oxygen recombination can take place. Proper operation is confirmed by operating the recombinder during periodic tests and observing EHR temperature indications from thermocouples welded to the EHR heater sheath. Temperature indication is provided on a panel meter located in the main Control Room.

On April 7, 1998, during an Engineering study on instrument uncertainty calculations, it was determined that hydrogen recombinder Technical Specification (T/S) surveillance requirement 4.6.4.2.b.1, which requires a channel calibration of all recombinder instrumentation and control circuits, was not met. The channel calibration procedure for recombinder temperature measurement circuitry directs the technician to calibrate only the control room readout device. To meet the T/S requirement the entire instrument loop, from the sensing device through the signal processor and associated wiring to the control room readout device, should be calibrated.

EHR temperature indication is used during T/S surveillances to determine operability of the recombiners in accordance with T/S 4.6.4.2.a and 4.6.4.2.b.3. The temperature indication has also been used in post-accident procedures to assist in ensuring the EHR is ready for operation, but containment hydrogen concentration changes will identify whether the recombiners are operating satisfactorily.

The temperature circuit has not been properly tested in accordance with T/Ss, therefore the operability of all hydrogen recombiners cannot be verified. T/Ss do not allow operation with all recombiners inoperable, therefore, had the units been operating, the event would have resulted in the plant being in an unanalyzed condition.

## CAUSE OF EVENT

The cause of the incomplete T/S surveillance channel calibration is poor work practices used ten years ago to revise the plant surveillance procedures.

Prior to 1987, the channel calibration procedure had been performed correctly by calibrating the entire channel. A known test signal was injected in the circuit as close to the sensor as possible, and the output on the Control Room panel verified. However, procedure revision \*\*12-THP 6030 IMP. 140, "Electric Hydrogen Recombiner Instrumentation Calibration" Revision 4, Change Sheet 3, moved the test input signal injection point outside containment to the panel display because of the need to avoid the possibility of adverse containment conditions. Apparently it was decided that the EHR T/C reference modules did not need to be included in the test signal path because it was not possible to adjust the modules. A cross-calibration of the three thermocouple (T/C) sensors is periodically performed and was considered sufficient testing of the T/C reference modules and T/C sensors. The procedure change process failed to consider that the T/C reference module is an active device, which would affect all three T/Cs in the same manner had it failed.



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## CAUSE OF EVENT (cont'd)

A contributing cause was a deviation in design from that of the system supplier due to inadequate design change management, resulting in inadequate documentation and verification of the design as installed in the plant.

The temperature circuit was originally designed by the vendor to consist of a T/C temperature sensor, Type K T/C wire extending from the EHR in Containment through a penetration to a Control Room panel, and a temperature indicator designed to be connected to Type K T/C wire. During the study on instrument uncertainty calculations, it was discovered that the installed temperature circuit differed from the design provided by the vendor. The installed design used a T/C reference module in Containment with copper instrumentation wire run through the Containment penetration to the Control Room indicator. However, the as-built design was not properly transferred to design drawings, which may have impacted the development and revision of surveillance procedures for the temperature circuit.

The as-built design of the EHR temperature circuit solved a problem with the original design in that a cold reference junction would have been created where the T/C wire ran through the Containment penetration, which would have added error to the circuit based on ambient temperature changes at the penetration. The T/C reference module placed inside Containment near the EHR is designed to compensate for the cold reference junction created by the connection of dissimilar T/C wire to copper instrumentation wire. Then, the use of copper instrumentation wire from the T/C reference module to the Control Room panel would not create any cold reference junctions, thereby eliminating penetration ambient temperature change errors in the circuit.

However, the as-built design did not change the Control Room indicator, which required T/C wire as the input connection. The indicator was designed to compensate for the cold reference junction created by the connection of T/C wire. With copper instrumentation wire connected, the indicator is attempting to compensate for a type of connection which doesn't exist, so additional error is introduced to the circuit. The magnitude of the introduced error is limited to the amount of Control Room ambient temperature change from that temperature at which the calibration occurred, which is less than 10 degrees Fahrenheit.

## ANALYSIS OF EVENT

The condition was determined to not meet the requirements of Technical Specification 4.6.4.2.b.1 because the Electric Hydrogen Recombiner temperature measurement instrumentation did not receive a proper channel calibration. Additionally, the condition was determined to represent an unanalyzed condition, and in accordance with 10CFR50.72(b)(2)(i) an ENS notification was made on April 7, 1998. This LER is therefore submitted in accordance with 10CFR50.73(a)(2)(i)(B) for any operation or condition prohibited by the plant's Technical Specifications, and 10CFR50.73(a)(2)(ii) for an unanalyzed condition.

The event was of no safety significance. Actual plant data showed the errors associated with the EHR temperature measurement circuit to be less than or equal to 10 degrees F for the range in which the Recombiner would have been surveillance tested or operated. Plant T/S surveillance testing required temperature to be raised to greater than or equal to 50 degrees F above the T/S required temperature of 700 degrees F to determine operability of the recombiners. Therefore, the procedural margin to the T/S surveillance requirement was not exceeded due to the 10 degree F error, and the recombiners would have performed their function in the event of a postulated accident.

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## CORRECTIVE ACTIONS

All hydrogen recombiners were declared inoperable due to the inadequate surveillance procedure.

A design change is being performed to correct the EHR temperature measurement circuit design deficiencies, and installation and testing of the new design is identified as a restart constraint.

The surveillance procedure has been placed on "Administrative Hold" and will not be used until revised based on the new design of the circuit.

## PREVENTIVE ACTIONS

No further preventive actions are required. Adequate barriers now exist by means of the technical review process and Safety Evaluation screening of procedure changes to ensure that a similar event will not occur in the future. Adequate barriers to prevent a repeat of the design deviation are provided by the present design change process. These barriers were not in place when the events described in this LER occurred.

## FAILED COMPONENT IDENTIFICATION

Not Applicable

## PREVIOUS SIMILAR EVENTS

315/85-043-01

