CATEGORY 1

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FACIL:50-315 Donald C. Cook Nuclear Power Plant, Unit 1, Indiana M 05000315
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SUBJECT: LER 98-022-02:on 980415,postulated failure of SAT N regulator was noted.Caused by failure to perform adequate SE for procedure rev.10CFR50.59 program has been upgraded to meet current industry standards.With 980908 ltr.

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INDIANA MICHIGAN POWER

September 8, 1998

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Operating License DPR-58
Docket No. 50-315

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

98-022-02

Sincerely,

John R. Sampson

J. R. Sampson
Site Vice President

/mbd

Attachment

c: J. L. Caldwell (Acting), Region III
R. P. Powers
P. A. Barrett
J. B. Kingseed
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Records Center, INPO
NRC Resident Inspector

1/1
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NRC Form 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104

EXPIRES 04/30/98

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

LICENSEE EVENT REPORT (LER)

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

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TITLE (4)

Postulated Failure of Spray Additive Tank Nitrogen Regulator Potentially Results in Unanalyzed Condition

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
											Cook - Unit 2	50-316
04	15	98	98	--	022	--	02	09	08	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)			
		20.2201 (b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)	00	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 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	TELEPHONE NUMBER (Include Area Code)
Mr. Gary Weber, Manager - Design Reconstitution	616/465-5901, x3900

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).	X	NO				

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

On April 15, 1998, with Units 1 and 2 in Cold Shutdown, a scenario was discovered through which a single failure might establish a path for gaseous nitrogen or air to enter the suction piping of both Containment Spray (CTS) pumps. Under certain circumstances, this scenario may preclude both pumps from performing their safety functions. The pumps' failure mode would be "gas binding," with a resultant loss of discharge pressure. It was determined that this represented an unanalyzed condition due to a potential for both trains of the Containment Spray (CTS) system to be rendered inoperable by a single active failure, and an ENS notification was made in accordance with 10CFR50.72(b)(2)(i) for an unanalyzed condition. This LER is therefore submitted in accordance with 10CFR50.73(a)(2)(ii) for an unanalyzed condition.

The root cause of this condition is the failure to perform an adequate safety evaluation for the procedure revision performed in 1981 that permanently repositioned the nitrogen shutoff valve to normally open. The 10CFR50.59 program has been upgraded to meet current industry standards and expectations.

The postulated "gas binding" scenario was evaluated for safety significance. Other potential scenarios, involving diversion of sodium hydroxide, were also analyzed. The probability of gas binding was low, therefore this postulated scenario had low safety significance. Unavailability of sodium hydroxide had been previously analyzed and the postulated scenarios had been bounded by existing analyses. Therefore the health and safety of the public was not jeopardized.

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

CONDITIONS PRIOR TO THE EVENT
Unit 1 was in Mode Five, Cold Shutdown
Unit 2 was in Mode Five, Cold Shutdown

DESCRIPTION OF EVENT
During performance of a Safety System Functional Inspection of the Containment Spray (CTS) system a question was raised with regard to the single failure vulnerability of the system relative to the Spray Additive Tank (SAT). As a result of the subsequent review it was determined that the system did have single failure vulnerability. Scenarios were discovered through which a single failure might establish a path for nitrogen to enter the suction piping of both CTS pumps. Under certain circumstances, these scenarios may preclude both pumps from performing their safety functions. The pumps' failure mode would be "gas binding," with a resultant loss of discharge pressure.

Nitrogen is continuously supplied to the Unit 1 and Unit 2 SATs via a pressure-reducing regulator and nitrogen supply shutoff valves. The nitrogen is used as a cover gas to prevent dilution of the tank contents, sodium hydroxide, through absorption of moisture from the air. The regulator is to supply nitrogen at 3 to 5 psig with a maximum pressure of 12 psig.

In 1981 a procedure change was made to the nitrogen valve line up to the SAT. The normal operating position of the nitrogen shutoff valve was changed from closed to open. This change created the possibility that if the nitrogen regulator were to fail in conjunction with the failure of a SAT low level switch or SAT valve, it would be possible for nitrogen to become entrained in the fluid flow and enter the suction of the pumps. The pumps could then potentially become gas bound, and unable to perform their design functions.

CAUSE OF EVENT
The cause of this event was the failure to perform an adequate safety evaluation for the procedure revision which permanently incorporated the valve position change from normally closed to normally open . The actual change to the procedure was accomplished via Temporary Change Sheet 3 to Revision 3, and converted into a permanent change with Revision 4 to the procedure. No safety evaluation could be located for the Temporary Change Sheet, therefore, its contents can only be assumed. The safety evaluation for Revision 4 was on file, however, and did not contain justification for the "no" answers other than a statement that the procedure did not affect or interface with any safety related system. This safety evaluation was inadequate in that it did not thoroughly consider the potential effects of the valve position change.

ANALYSIS OF EVENT
On April 15, 1998, it was determined that an unanalyzed condition existed due to a potential for both trains of the Containment Spray (CTS) system to be rendered inoperable by a single active failure, and an ENS notification was made in accordance with 10CFR50.72(b)(2)(i) for an unanalyzed condition. This LER is therefore submitted in accordance with 10CFR50.73(a)(2)(ii) for an unanalyzed condition

Nitrogen is continuously supplied to the Unit 1 and Unit 2 SATs by way of a pressure-reducing regulator and nitrogen supply shutoff valves. Since implementation of the 1981 procedure change, the shutoff valves have been normally "sealed open". By procedure, the regulator is verified to maintain nitrogen pressure between 3 and 5 psig. The nitrogen supplied to the tank prevents dilution of the tank contents, 30%-34% sodium hydroxide, through absorption of moisture from the air. Suction piping from the SAT to the CTS eductors includes two valves in parallel. One safety function of the two valves is to open, permitting sodium hydroxide flow from the SAT to the CTS pumps. The parallel arrangement prevents a single failure of either valve from precluding accomplishment of this safety function. However, these two valves have another

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ANALYSIS OF EVENT (cont'd)
safety function. When the SAT reaches its low-level setpoint, these valves must close to ensure that nitrogen, or air, is not admitted into the suction piping of the CTS pumps.

The following analysis examines potential Spray Additive and Containment Spray System failure modes and their effects. The potential failure modes of interest to this analysis are those that could lead to one or both of the following effects:

(1) Nitrogen or air being admitted into CTS pump suctions.

(2) Sodium hydroxide inventory of SAT being diverted from the CTS active flow path.

All scenarios considered the current configuration of continuous nitrogen makeup to the SAT.

Since the nitrogen regulator, 12-GRV-330, is not safety related, credit is not taken for its function. The effects of a failed open nitrogen regulator are limited by the SAT safety valve, SV-107, set at 10 +/- 2 psig. The nitrogen pressure in the SAT is assumed to be the maximum setpoint value of the SAT relief valve, 12 psig.

The nitrogen regulator function is monitored daily from the Control Room in accordance with Procedure OHP 4030.STP.030, "Daily and Shift Surveillance Checks," by observation of IPI-200, the SAT pressure indicator.

It should be noted that while OHP 4030.STP.030 does require daily monitoring of SAT pressure, the notification limit is 1 psig, decreasing. That is, the notification limit is intended to prompt corrective action upon loss of nitrogen pressure, not an overpressure condition.

The principal difference between operating with nitrogen normally in service and with nitrogen normally isolated from the SAT is the response of tank pressure to decreasing sodium hydroxide level. With the nitrogen system normally isolated from the tank, the 3 to 5 psig nitrogen overpressure rapidly decreases to zero psig as tank fluid level decreases. According to the tank curve, the total internal volume of the SAT is 5,273 gallons. With level at the Technical Specification minimum of 4,000 gallons, the maximum initial volume available for nitrogen is 1,273 gallons. Using the ideal gas law and an initial nitrogen pressure of 5 psig, tank pressure will reach zero psig when the gas volume has been expanded to 1,706 gallons, that is, after about 433 gallons of sodium hydroxide have been drained from the tank.

At zero pressure, redundant tank vacuum breakers minimize further reduction of tank pressure.

With respect to the scenarios discussed here, the primary effect of operating with nitrogen normally isolated is that, well prior to tank fluid level being drawn down to the low level setpoint, SAT overpressure would be reduced from 5 psig to zero psig. With nitrogen supplied continuously, tank pressure must be assumed constant at the limiting value of 12 psig.

The following table summarizes the various scenario evaluations. For each case, two concerns are addressed:

(1) The potential for nitrogen or air to enter the CTS pump suctions, causing a failure of both CTS trains

(2) The potential for sodium hydroxide to be diverted from the active CTS flow path.

A "No" indicates that no adverse impact would result from the scenario. A "Yes" indicates that the scenario has the potential for an adverse impact.

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ANALYSIS OF EVENT (cont'd)

Summary of the Potential for an Adverse Impact with the Nitrogen Supply Valves Open

Case #	Case Description	Nitrogen or Air Intrusion	Sodium Hyroxide Diversion	Notes
Scenario 1 – Failure of SAT shutoff valve to close on low-low SAT level				
1A 1B	RWST, No Flow RWST, Full Flow	No No	No No	CTS suction lined up to Refueling Water Storage Tank (RWST) for Cases 1A and 1B
1C 1D	Recirc Sump, No Flow Recirc Sump, Full Flow	Yes Yes	Yes No	CTS suction lined up to Conatinment Recirculation Sump for Cases 1C and 1D
Scenario 2 – Failure of SAT shutoff valve and eductor shutoff valve to close on low SAT level				
2		Yes	No	
Scenario 3 – Failure of CTS pump to run				
3		Yes	Yes	
Scenario 4 – Failure of CTS pump and valves on one train after repositioning on CTS actuation				
4A 4B	Aligned to RWST Aligned to Recirc. Sump	No Yes	No Yes	
Scenario 5 – Loss of sodium hydroxide following application of spray termination criteria				
5		Yes	Yes	

With the nitrogen SAT shutoff valves open, several scenarios have potential adverse impacts if the nitrogen regulator fails open, which although possible, is not probable. With the nitrogen regulator failed closed or functioning properly, no scenario will have an adverse impact.

The significance of this event is minimized by several factors:

(1) the regulator must fail open;
(2) no credit has been taken for containment pressure greater than zero psig;
(3) no credit has been taken for increasing containment sump level and
(4) no credit has been taken for operator action.

Engineering personnel reviewed the design and performance of the nitrogen regulators and concluded that the safety significance of the potential adverse impact scenarios is low. There was no evidence that the regulator had ever failed at the plant. A review of the design of the nitrogen regulator did not identify any probable failure mechanism that could cause the regulator to suddenly fail open. The vendor had no knowledge of any cases of the regulator failing open. One failure

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ANALYSIS OF EVENT (cont'd)
mechanism could have caused a gradual increase in pressure over several days or longer, but such an increase would probably have been identified by the daily operator verifications of proper nitrogen pressure.

All cases involving diversion of sodium hydroxide would still include the addition of most of the available sodium hydroxide to containment spray. In those cases, the amounts of sodium hydroxide added to the spray would be sufficient to maintain an akaline spray. This would accomplish the function of the spray additive, to enhance the removal of iodine from the containment atmosphere. This had been verified by past analyses of containment pH with various assumptions of reduced volumes of available sodium hydroxide. Therefore the health and safety of the public was not adversely impacted.

CORRECTIVE ACTIONS
The nitrogen valve lineup will be revised to show a normally closed position for the nitrogen shutoff valves, and the valves will be placed in the closed position.

Additionally, the UFSAR system flow diagrams will be reviewed against actual valve lineups to ensure that no similar conditions exist.

No further preventive actions are required. The 10CFR50.59 program has recently been upgraded to meet current industry standards and expectations. As previously stated in LER 315/97-019-01, complete and accurate safety screenings are being stressed by department managers. All personnel qualified to perform safety screenings were requalified in early 1998. Although the requirements for performance of safety screenings are proceduralized, the general steps to be taken to ensure the quality of those safety screenings were re-emphasized during the training.

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, therefore no further preventive actions are being taken.

FAILED COMPONENT IDENTIFICATION
Not Applicable

PREVIOUS SIMILAR EVENTS
315/97-019-01
316/81-005/01T-0