

# CATEGORY 1

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ACCESSION NBR: 9711190306      DOC.DATE: 97/11/14      NOTARIZED: NO      DOCKET #  
 FACIL: 50-315 Donald C. Cook Nuclear Power Plant, Unit 1, Indiana M 05000315  
 AUTH.NAME      AUTHOR AFFILIATION  
 SCHOEPP, P.      Indiana Michigan Power Co.  
 BLIND, A.      Indiana Michigan Power Co.  
 RECIP.NAME      RECIPIENT AFFILIATION

SUBJECT: LER 97-021-01: on 970910, potential loss of all medium & high head injection occurred to single failure which could have prevented fulfillment of safety function of sys. Caused by personal error. Revised OHP 4023.ES-1.3.W/971114 ltr.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTTR 1 ENCL 1 SIZE: 5  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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Indiana Michigan  
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November 14, 1997

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

Operating Licenses 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:

97-021-01

Sincerely,

A handwritten signature in cursive script, appearing to read 'A. A. Blind'.

A. A. Blind  
Site Vice President

/mbd

Attachment

c: A. B. Beach, Region III  
E. E. Fitzpatrick  
P. A. Barrett  
S. J. Brewer  
J. R. Padgett  
D. Hahn  
Records Center, INPO  
NRC Resident Inspector

IE-21



## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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)  
Donald C. Cook Nuclear Plant - Unit 1DOCKET NUMBER (2)  
50-315

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## TITLE (4)

Potential Loss of All Medium and High Head Injection Due to Single Failure Could Result in a Condition That Would Prevent the Fulfillment of the Safety Function of a System

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
09	10	97	97	-- 021 --	01	11	14	97	Cook Unit 2	50-316
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR II: (Check one or more) (11)							
5			20.2201(b)			20.2203(a)(3)(i)			50.73(a)(2)(iii)	73.71(b)
POWER LEVEL (10)			20.2203(a)(1)			20.2203(a)(3)(ii)			50.73(a)(2)(iv)	73.71(i)
0			20.2203(a)(2)(i)			20.2203(a)(4)			X 50.73(a)(2)(v)	OTHER
			20.2203(a)(2)(ii)			50.36(c)(1)			50.73(a)(2)(vii)	(Specify in Abstract below and in Text, NRC Form 366A)
			20.2203(a)(2)(iii)			50.36(c)(2)			50.73(a)(2)(viii)(A)	
			20.2203(a)(2)(iv)			50.73(a)(2)(i)			50.73(a)(2)(viii)(B)	
			20.2203(a)(2)(v)			X 50.73(a)(2)(ii)			50.73(a)(2)(x)	

## LICENSEE CONTACT FOR THIS LER (12)

NAME  
Mr. Paul Schoepf, Safety Related Mechanical Engineering SuperintendentTELEPHONE NUMBER (Include Area Code)  
616/465-5901, x2408

## 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)

YES

X

NO

EXPECTED  
SUBMISSION  
DATE (15)

MONTH

DAY

YEAR

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

On September 10, 1997, with Units 1 and 2 in Mode 5, it was determined that a single active failure during an accident while performing switchover of the Emergency Core Cooling System (ECCS) pumps from the Refueling Water Storage Tank (RWST) to the recirculation sump could result in loss of all high and medium head injection. This was determined to be reportable as an unanalyzed condition under 10CFR50.72(b)(2)(i), and as a condition that could have prevented the fulfillment of a safety function under 10CFR50.72(b)(2)(iii). An ENS notification was made at 1919 hours the same day. This report is submitted in accordance with 10CFR50.73(a)(2)(ii) and (a)(2)(v).

The root cause of this event was personnel error. Significant improvements have been made to the review process for Emergency Operating Procedures (EOPs) since 1992 when the error occurred. Contributing to this event was the failure to recognize that the definition of a single active failure included failure of a pump to run once it had already started. The EOP which sequences the steps for switchover has been revised to preclude the situation where a single active failure would cause redundant equipment from being impacted. A formal policy and a directive on design bases and single failure criteria have been developed. The directive provides specific direction on the definition and use of the single failure criteria.

A Probabilistic Risk Assessment was performed to determine the failure probability of an RHR pump to continue to run. The failure probability did not result in a noticeable increase in core damage frequency. This condition was therefore concluded to have a low safety significance, and not to represent a threat to the health or safety of the public.

9711190306 971114  
PDR ADOCK 05000315  
S PDR

## LICENSEE EVENT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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.

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

**Conditions Prior to Event**

Unit 1 was in Mode 5, Cold Shutdown

Unit 2 was in Mode 5, Cold Shutdown

**Description of Event**

During the AE Design Inspection, conducted August 4 through September 12, 1997 at Cook Nuclear Plant, as a result of questions posed by the inspection team, it was determined that the possibility of a single failure during an accident while performing switchover of the ECCS pumps from the Refueling Water Storage Tank (RWST) suction to the recirculation sump suction could result in the loss of all high and medium head injection.

A historical review of the revisions to OHP 4023.ES-1.3, Transfer to Cold Leg Recirculation, was conducted to determine when the sequence of steps which could result in the loss was placed in the procedure. It was determined that the sequence of steps in question appeared with Revision 2 to the procedure, which became effective September 30, 1992. This sequence remained intact through Revisions 3 and 4.

Revision 2 provided an interim alignment for switchover from ECCS injection to the recirculation phase which established Safety Injection (SI) and Centrifugal Charging Pump (CCP) suction simultaneously from the West Residual Heat Removal (RHR) train, with the suction source for both of the CCPs and SI pumps isolated from the RWST. At this point, the suction source from the East RHR train was not available. This sequence established dependence on all high head and medium head injection pumps on the West RHR pump as a suction source. The failure of the West RHR pump, under these conditions, would have resulted in a loss of all high head and medium head injection pumps.

The 'Scope of Revision' for, Revision 2, states: '...revised order of valve manipulation to more closely follow UFSAR sequence and delayed completion of switchover until RWST low-low level alarm actuates'. However, the sequence of steps incorporated into the procedure did not match those contained in the UFSAR at this time for the switchover from ECCS injection to the recirculation phase. The sequence in the UFSAR did not establish dependence of the CCPs and SI pumps on either RHR pump and was not vulnerable to a single failure as the procedure was.

Revision 2 to OHP 4023.ES-1.3 was reviewed and approved at both the departmental and Plant Nuclear Safety Review Committee (PNSRC) level. None of the reviews performed discovered the flaw in sequencing of the switchover.

**Cause of Event**

The primary cause of this event was personnel error. The preparer of Revision 2 incorrectly incorporated the UFSAR sequence of switchover steps into the procedure. The file for the OHP 4023.ES-1.3 revision does not contain a copy of the specific document which the preparer utilized as the source of the switchover procedure, and the preparer was unable to provide any additional information which would provide a better understanding of the inconsistency between UFSAR sequence of steps and those contained in OHP 4023.ES-1.3, Revision 2.

A secondary cause for this event was the failure of all parties involved to understand the definition of a single active failure to include failure of a pump to run once it had already started. Failure to recognize this precluded identification and correction of the unacceptable ECCS lineup.

## LICENSEE EVENT CONTINUATION

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TEXT (if more space is required, use additional NRC Form 366A's) (37)

### Analysis of Event

This event was reported via the ENS on September 10, 1997 at 1700 hours EDT under 10CFR50.72(b)(2)(i), as an event found while the reactor was shutdown that resulted in an unanalyzed condition, and under 10CFR50.72(b)(2)(iii)(A), (B) and (D) as a condition that potentially could have prevented the fulfillment of the safety function of a structure or system. This LER is submitted in accordance with 10CFR50.73(a)(2)(ii), as an event found while the reactor was shutdown that resulted in an unanalyzed condition, and was outside the design bases, and under 10CFR50.73(a)(2)(v), as a condition that potentially could have prevented the fulfillment of the safety function of a structure or system.

During the switchover sequence, which takes approximately 15 minutes, operators monitor pump discharge pressure and motor amps to ensure the switchover is occurring properly. In the event of the catastrophic failure (worst case failure allowing the minimum amount of reaction time for the operators) of the West RHR pump, one of the following annunciators indicating the failure of the West RHR pump would alarm in the Control Room:

- RHR Pumps Motor Instant Trip
- RHR Pumps Motor Overload Trip
- RHR Loop Flow Low

In the event of an instantaneous RHR pump failure, the SI pumps and CCPs would have lost their Net Positive Suction Head (NPSH) immediately. As a result, these pumps would have begun to cavitate and quickly would have degenerated into a state of non-functionality. The motor amps for these pumps would have fluctuated once cavitation started which would have given an additional indication, in addition to the RHR pump failure, to the operators that the pumps needed to be promptly removed from service. It is highly unlikely, per feedback from Operations Department personnel, that operators would have responded to the distress of the SI pumps and CCPs prior to their failure due to cavitation problems.

However, a Probability Risk Assessment was performed for the failure probability of an RHR pump to continue to run. The failure probability for an RHR pump to run was calculated to be  $(7.18 \text{ E-}05 \text{ failures/hr}) \times (.25 \text{ hr}) = 1.80 \text{ E-}05 \text{ failures}$ . The current failure probability for high pressure recirculation during a small break LOCA is approximately  $2 \text{ E-}03$ . The addition of the West RHR pump failing to run increases the high pressure recirculation failure probability by less than 1%. This increase is negligible and would not result in a noticeable increase in core damage frequency. Therefore, the safety significance of this event is low and the health and safety of the public were not endangered.

### Corrective Action

OHP 4023.ES-1.3, Transfer To Cold Leg Recirculation, for both Units 1 and 2 was revised to transfer both the East and West RHR pumps from the RWST to the recirculation sump. Subsequent to the transfer of the RHR pumps to the recirculation sum, the supply will be established to the SI pumps and the CCPs. After the RHR supply is established to the SI pumps and CCPs, the RWST suction valves will be closed. The new switchover sequence will preclude the situation where a single active failure would cause a redundant train from being impacted.

## LICENSEE EVENT CONTINUATION

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

**Corrective Action (cont'd)**

The review process for EOPs has improved significantly since 1992. Currently there are multi-discipline reviews from many technically experienced personnel. This process has been effective in identifying and correcting procedural problems. The nature of the incorporation of the unacceptable ECCS lineup in Revision 2 of the procedure would suggest that this was an isolated case. As the event appears to be an isolated one, and there have been improvements implemented in the EOP review process, no additional preventive actions are warranted specific to this event.

As a focal point for understanding the definition and use of "design bases" as it applies to the design, operation, support and maintenance of the Cook Nuclear Plant, AEPNGG Directive 800000-DIR-2300-04, Definition and Use of Design Bases and Single Failure Criteria, has been developed. Attachment 2 to 800000-DIR-2300-04 provides specific direction on the definition and use of the "single failure criteria" which is defined in the body of the directive. Within the text of Attachment 2 a specific example of an "active failure" is cited as "the failure to continue to run".

Training on AEPNGG Directive 800000-DIR-2300-04, Definition and Use of Design Bases and Single Failure Criteria was initiated on November 4, 1997. The initial training for personnel impacted by the issuance of this directive will be completed by November 21, 1997.

As discussed in the NRC's Confirmatory Action Letter (CAL) to the Cook Nuclear Plant, dated September 19, 1997, we are assessing the problems identified during the recent AE Design Inspection to determine whether these types of engineering problems exist in other safety related systems and whether they affect system operation in the longer term. We will evaluate our programs for improvements to assure these kinds of problems are promptly identified, thoroughly evaluated and resolved. The results of our reviews and assessments, as well as necessary preventive actions will be communicated separately to the NRC.

**Failed Component Identification**

Not Applicable

**Similar Events**

315/97-016-01