

# CATEGORY 1

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 FACIL: 50-315 Donald C. Cook Nuclear Power Plant, Unit 1, Indiana M 05000315  
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 RECIP. NAME      RECIPIENT AFFILIATION

SUBJECT: LER 98-023-02: on 980416, potential failure due to cross train routing of non-safety related cables was noted. LER 98-023-00 & 98-023-01, retracted. W/980831 ltr.

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104

Indiana Michigan  
Power Company  
Cook Nuclear Plant  
One Cook Plant  
Bridgman, MI 49106  
616 465 5901



August 31, 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:

98-023-02

Sincerely,

A handwritten signature in cursive script that reads "John R. Sampson".

J. R. Sampson  
Site Vice-President

/mbd

Attachment

c: J. L. Caldwell (Acting), Region III  
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## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
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INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED  
ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO THE  
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INFORMATION AND RECORDS MANAGEMENT BRANCH (T-8 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

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TITLE (4) Retraction - Potential Single Failure Due to Cross Train Routing of Non-Safety Related Cables
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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	
04	16	98	98	-- 023 --	02	08	31	98	Cook - Unit 2	50-316	
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)											
OPERATING MODE (9)		5	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 Mr. Robert Carruth, Electrical and I&C Design Engineering Manager	TELEPHONE NUMBER (Include Area Code) 616/697-5146
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## 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 16, 1998, with Units 1 and 2 in Cold Shutdown, it was determined that a cable separation concern existed with non-safety related cables run in safety related cableways. It was identified that a Train A associated cable and a Train B associated cable were electrically and physically connected, introducing the potential of a short circuit single failure involving both trains. Cable separation standards require that non-safety related cables, if routed with safety related cables, cannot later be routed with a second trains' safety related cables. This practice reduces the risk due to a potential single failure of a non-safety related cable, which could render both safety trains' cables inoperable. The event was reported in accordance with 10 CFR 50.72(b)(2)(i), as a condition, which was found while the reactor was shutdown, which if it had been found while the reactor was operating, would have resulted in the nuclear power plant being in an unanalyzed condition. The ENS notification was made at 1413 hours EDT on April 16, 1998.

The investigation into the cable routing was conducted in coordination with the investigation into the load shed cable concern reported in the 315/98-016 LER series. The investigations resulted in the conclusions that the associated circuits cable routing concerns are bounded by the current licensing basis. Therefore it has been determined that the plant was within its analyzed conditions of operation. The interim LERs submitted on May 18, 1998 and July 30, 1998 as LER 315/98-023-00 and LER 315/98-023-01, respectively, are being retracted.

For proper understanding of LER 315/98-023-02, on cable separation, please refer to LER 315/98-016-02 on diesel generator load shed.



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

## CONDITIONS PRIOR TO EVENT

Unit 1 in Mode 5, Cold Shutdown

Unit 2 in Mode 5, Cold Shutdown

## DESCRIPTION OF EVENT

On April 16, 1998, with Units 1 and 2 in Cold Shutdown, it was determined that a cable separation concern existed with non-safety related cables run in safety related cableways. It was identified that a Train A associated cable and a Train B associated cable were electrically and physically connected, introducing the potential of a short circuit single failure involving both trains. The affected cables are not safety related, but at some point during their routing they have been run with safety related cables; therefore, they are considered safety associated. Connecting the two cables together effectively creates a non-safety cable traveling between both trains. This introduces the potential for cable failures and circuit breaker failures involving both trains.

Cable separation standards require that non-safety related cables, if routed with safety related cables, cannot later be routed with a second train's safety related cables. This practice reduces the risk due to a potential single failure of a non-safety related cable, which could render both safety train's cables inoperable. The event was reported in accordance with 10 CFR 50.72(b)(2)(i), as a condition, which was found while the reactor was shutdown, which if it had been found while the reactor was operating, would have resulted in the nuclear power plant being in an unanalyzed condition. The ENS notification was made at 1413 hours EDT on April 16, 1998.

The investigation into the cable routing was conducted in coordination with the investigation into the load shed cable concern reported in LER 315/98-016-00, -01 and -02. The investigations resulted in the conclusions that the associated circuits cable routing concerns are bounded by the current licensing basis. Therefore it has been determined that the plant was within its analyzed conditions of operation. The interim LERs submitted on May 18, 1998 and July 30, 1998 as LER 315/98-023-00 and LER 315/98-023-01, respectively, are being retracted.

For proper understanding of LER 315/98-023-02, on cable separation, please refer to LER 315/98-016-02 series on diesel generator load shed.

## CAUSE OF EVENT

Even though it has been determined that the plant is within the licensing bases, it was not the intent of the design criteria to allow for the above condition except in instances where it was a practical necessity from an engineering viewpoint (e.g., annunciator bus). Although not necessary, a practical cause for the event is provided.

There are several Cook Nuclear Plant (CNP) specifications which have differing requirements that cover 1E and 1E-associated design criteria. Also, there is no specific guidance related to the subject of the reported condition. Both of these items contributed to the non-intended design being implemented.

## ANALYSIS OF EVENT

Cable separation standards require that non-safety related cables, if routed with safety related cables, cannot later be routed with a second train's safety related cables. This practice reduces the risk due to a potential failure of a non-safety related cable. The failure mode is a fault of the Balance of Plant (BOP) cable, which is not cleared by its primary protective device. This results in an overheating condition of the cable and subsequent functional degradation of adjacent safety related cables that share the raceway with the faulted BOP cable. In order for single failure criteria to be violated, the BOP

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## ANALYSIS OF EVENT (cont'd)

cable failure would have to propagate to cables in both safety trains and produce resultant failures such that there would be a dual loss of a required safety function.

The failure scenario described above contains the following: 1) the non-1E fault, 2) the failure to isolate of one or more non-1E circuit isolation devices, and 3) the failure of two 1E devices. The CNP safety systems and supporting systems were designed around the concept of a single active failure, defined in FSAR Chapter 6 as: "The inability of any single dynamic component or instrument to perform its design function when called upon to do so by the proper actuation signal. Such functions include change of position of a valve or electrical breaker, operation of a pump, fan, or diesel generator, action of a relay contact, etc."

CNP is not designed or licensed to accommodate the failure of all non-safety cables and components as was subsequently required in IEEE 379-1977. The IEEE 379-1977 requirement is referred to as preconditioning. Preconditioning, as presented in IEEE 379-1977, goes beyond the CNP design bases to require a much more defense in depth approach. The IEEE 379-1977 standard requires a design that accounts for active failures of the safety and supporting systems, and also a design which accommodates all possible failures in the non-1E portion of the electrical design. IEEE 384-1974 with its more stringent treatment of associated circuits and BOP interfaces is compatible with this IEEE 379-1977 expanded interpretation. Cook's associated circuits design is not compatible with either the IEEE 379-1977 or the IEEE 384-1974 standards. The CNP design employs a diverse approach to that taken by IEEE 379 and 384. However, the CNP approach achieves the same objective of providing assurance that redundant safety systems can be adequately electrically supported. Because of this, assuming the failure to isolate of all BOP and one 1E devices is outside the licensing bases of the plant. The conditions described in the interim LER 315/98-023-00 and LER 315/98-023-01 do not result in the plant being in an unanalyzed condition and do not increase the risk due to a potential single failure of a non-safety related cable which could render both safety train's cables inoperable.

Although CNP is within the licensing bases, it was not the intent of the design criteria to allow for the above condition, except in instances where it was a practical necessity from an engineering viewpoint (e.g., annunciator bus). Thus, an effort was made to assess the present design's vulnerability to the reported condition.

CNP wiring diagrams were reviewed for opposite train and train associated cables terminating on common terminal points. Approximately 125 instances were identified. After the circuits were identified, each one was evaluated for its power source and potential for fault currents large enough to cause proximate cable failure degradation. Circuits where the power source fault capacity was very low were removed from further consideration as not being a credible hazard to adjacent safety related cables. Circuits which had significant through-fault capacity were analyzed for worst case fault conditions, assuming the failure to isolate of one or more protectives and using appropriate circuit impedance. Instances where the fault levels were high enough to warrant further consideration received a detailed fault analysis to determine the specific maximum credible sustained fault condition. The maximum fault levels established were compared to the results from the control cable testing identified in LER 315/98-016-02. This testing was performed at AEP's John E. Dolan Electrical Laboratory under the direction of 227440-CDM-5400-02 (Effects of Fault Current in Control Circuit Applications - Test Plan & Guidelines). Conclusions were then made as to the possible hazards to adjacent safety related cables.

The vulnerability study and testing led to the conservative determination that there exists, in a few instances, a potential for a circuit fault beyond our accepted design base. That fault when combined with the subsequent failure of the main protective device in the control circuit, might allow significant sustained current to pass through a control cable of both ESS train trays. This is an unlikely event, that represents a "beyond the design base event" in the CNP design. Enhancements to these circuits will be initiated.

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## CORRECTIVE ACTION

The condition as initially reported was subsequently found to be within the CNP design base, therefore no corrective actions are required.

However for the cases that were identified as being "beyond the CNP design base" a conservative second (redundant) protective device will be added in series with the circuit's existing circuit protective device to provide additional assurance that any down stream faults will be isolated. This will be accomplished by:

Adding redundant fuses to one circuit in each of the following 250Vdc distribution panels: 4kV Switchgear Room 1-DAB (circuit #4) and Unit 1 Control Room 1-CRCD (circuit #11). The additional fuses will be installed in a junction box located adjacent to their respective distribution panel.

Adding 2 circuit breakers (for circuits #11 and #12) in a terminal box adjacent to 120Vac critical control room power distribution panel 1-CCRP-2, which is in the Unit 1 Control Room.

Also an enhancement to the current CNP design documents will be developed that incorporates the current specifications regarding 1E and 1E-associated design and installation criteria. It will also include information that was captured from this reported condition. In addition, this document will provide the proper sequence and steps that will be required for issuing design.

## FAILED COMPONENT IDENTIFICATION

Not Applicable

## PREVIOUS SIMILAR EVENTS

None