

## ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9010020367 DOC.DATE: 90/08/21 NOTARIZED: NO DOCKET #  
 FACIL:50-331 Duane Arnold Energy Center, Iowa Electric Light & Pow 05000331  
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SUBJECT: LER 90-011-00:on 900821,two primary containment isolation  
 sys actuations occurred during outage-related work.

W/9 ltr.

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September 20, 1990  
DAEC-90-0796

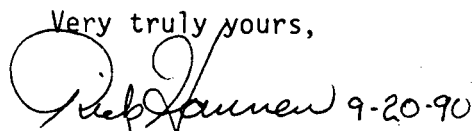
Mr. A. Bert Davis  
Regional Administrator  
Region III  
U. S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, IL 60137

Subject: Duane Arnold Energy Center  
Docket No: 50-331  
Op. License DPR-49  
Licensee Event Report #90-011

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a copy of the subject Licensee Event Report.

Very truly yours,

 9-20-90

Rick L. Hannen  
Plant Superintendent - Nuclear

RLH/JP/sjo

cc: Director of Nuclear Reactor Regulation  
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File A-118a

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SEP 24 1990

## LICENSEE EVENT REPORT (LER)

EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

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TITLE (4) Two Primary Containment Isolation System Actuations During Outage-Related Work Due To A Restricted Working Environment and Inadequate Human Factors Considerations.

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 NAMES		DOCKET NUMBER(S)							
0	8	2	1	9	0	9	0	0	1	1	0	0	0	0	0	0	0	0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more of the following) (11)									
POWER LEVEL (10)	0	0	0	20.402(b)	20.405(e)	X	50.73(a)(2)(iv)	73.71(b)			
				20.402(a)(1)(i)	50.38(a)(1)		50.73(a)(3)(v)	73.71(e)			
				20.405(e)(1)(ii)	50.38(e)(3)		50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 356A)			
				20.405(e)(1)(iii)	50.73(a)(2)(i)		50.73(a)(2)(viii)(A)				
				38.405(a)(1)(iv)	50.73(a)(2)(ii)		50.73(a)(2)(vii)(B)				
				20.405(a)(1)(v)	50.73(a)(2)(iii)		50.73(a)(2)(ix)				

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
James R. Probst, Technical Support Engineer	AREA CODE 3 1 9 8 5 1 - 7 3 0 8

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS

SUPPLEMENTAL REPORT EXPECTED (14)

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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

With the plant in a refueling outage, on August 21, 1990, an automatic initiation of one side of the Group III Primary Containment Isolation System (PCIS) isolation logic occurred due to a blown fuse. The root cause of the event was a restricted working environment with limited compensatory measures available. An individual re-terminating wires under cramped conditions inadvertently touched a wire to an incorrect terminal point in close proximity to the desired termination point. As corrective actions, the cause of the isolation was verified, and the logic and isolation were reset.

On August 25, 1990, the automatic closure of a Group IV PCIS valve resulted in a brief loss of Residual Heat Removal shutdown cooling. The valve's motor-operator (MO) was de-energized with the valve open during a Group IV logic test. The motor-operator control circuitry for the valve was not de-energized, however, and a Group IV isolation signal sealed-in. Upon re-energizing the valve's MO, the valve closed. The root cause of this event was found to be inadequate human factors considerations in the valve MO control circuitry design and documentation. As a corrective action, MO power breakers for affected valves will be labeled to alert personnel to the unique aspects of the control circuitry design which led to the event.

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TEXT CONTINUATION**

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

**I. DESCRIPTION OF EVENT:****A. Overview**

On August 21 and 25, 1990, Primary Containment Isolation System (PCIS, EIIS System Code JM) actuations occurred at the Duane Arnold Energy Center as a result of refueling outage-related activities. The Duane Arnold Energy Center was in cold shutdown with the vessel refueled for both events.

**B. Details**

On August 21, 1990, at 1327 hours, an automatic actuation of one side of the PCIS Group III isolation logic occurred. The "A" Standby Gas Treatment System (EIIS Code BH), which receives an initiation signal concurrent with this side of the Group III logic, was already in service. The isolation occurred due to a blown fuse in the Group III logic. This logic is de-energized to actuate. Shortly thereafter, following the determination that the blown fuse was due to work in a control room panel, the isolation was reset.

On August 25, 1990, at 2225 hours, the automatic closure of a PCIS Group IV Primary Containment Isolation System valve occurred following completion of acceptance testing on a control room modification package. Group IV provides an isolation for the shutdown cooling mode of the Residual Heat Removal System (RHR, EIIS System Code BO), which was then in service. To maintain shutdown cooling during the modification acceptance testing, which would be generating Group IV isolation signals, the shutdown cooling isolation valves were de-energized in the open position. Upon re-energization of its motor operator following the acceptance testing, the outboard shutdown cooling isolation valve, M01909 (EIIS Component Code ISV), closed, despite the fact that the Group IV Isolation logic had been reset. Shortly thereafter, following confirmation that the isolation was an unanticipated result of the modification testing, the valve was re-opened to restore shutdown cooling to operability.

**II. CAUSE OF EVENT**

The cause of the partial Group III isolation signal on August 21, 1990, was a blown fuse, which de-energized one side of the de-energized-to-actuate logic. An extensive computerized valve position monitoring system was being installed in parallel with the Group III isolation logic. The blown fuse occurred when a contract individual was re-terminating a wire in a control room panel. While approaching the re-termination point on a small terminal strip, the tip of the wire touched an adjacent termination point. This resulted in a short to

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ground. The root cause of the event was the restricted working environment in the control room panel. The margin for error when manipulating wires was very small due to the compact nature of the terminal strip. In addition, the working area within the panel itself made maneuverability difficult. Limited compensatory measures are available to preclude the negative effects of all possible physical errors during extensive panel modifications. (See LER 90-008 for further discussion on this topic.)

For the Group IV isolation on August 25, 1990, the cause of the event was inadequate precautions taken to ensure that the outboard shutdown cooling isolation valve, M01909, would not be affected by the modification testing. Unlike most valves at the plant, the motor-operator control circuitry for M01909 is not directly tied to the valve's motor-operator breaker, but must be separately de-energized. The MO control circuitry for M01909 contains a seal-in feature to ensure the valve goes fully closed even on a signal of short duration. In order to prevent the closure of M01909 during the modification acceptance testing, the test procedure called for de-energization of M01909. The motor-operator of the valve was subsequently de-energized but the MO control circuitry was not. (It should be noted a logic feature in the MO control circuitry results in loss of control room valve position indication when power to the MO is removed.) Prior to completion of the modification test, all Group IV isolations were reset. The seal-in for the closure signal remained in M01909's MO control circuitry, as the valve had not yet moved to the closed position. Following test completion, M01909's motor-operator breaker was re-energized, and the valve closed due to the sealed-in control circuitry signal.

Only a small percentage of the motor-operated valves at Duane Arnold Energy Center have separately powered MO control circuitry. This unorthodox power scheme is a subtle distinction of 250 volt DC-powered valves which is not readily apparent on design drawings. In the past, personnel have relied upon knowledge and experience to ensure proper de-energization of such valves. Taken all together, the uncommon design of the M01909 motor-operator control circuitry power supply, combined with the design's inconspicuous nature in both plant documentation and in the field, resulted in the closure of this valve. There were inadequate human factors considerations built in to ensure proper removal from service of M01909. This human factors deficiency is considered the root cause, as only through its correction can recurrence of the event be prevented.

## III. ANALYSIS OF EVENT

The partial Group III isolation received on August 21, 1990 had no effect on the safe operation of the plant. The Group III isolation function is designed to ensure no effluent releases to the public occur by isolating the Reactor Building and portions of Primary Containment from the outside

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environment, and its actuation does not negatively affect safe plant operation under any conditions.

The shutdown cooling function of the Residual Heat Removal System is used when the plant is shutdown and vessel pressures are below 135 psig. The isolation of MO1909 on August 25, 1990 resulted in a very brief loss of shutdown cooling to the reactor, which was in cold shutdown at the time of the event. Shutdown cooling was promptly restored without a significant change in coolant temperature. The safety significance of the event was minimal. Loss of shutdown cooling for an extensive period of time can result in unanticipated vessel inventory heatup and vessel pressurization.

**IV. CORRECTIVE ACTIONS**

For the Group III isolation on August 21, corrective actions involved confirming the cause of the isolation and verifying that the isolation occurred as designed. As noted in LER 90-008, administrative controls for modification preparation are being strengthened to ensure inclusion of details and guidance when the potential exists for safety system actuations. This action will be completed by December 31, 1990.

For the Group IV isolation on August 25, the cause of the isolation was quickly ascertained, and shutdown cooling subsequently restored. As a corrective action to prevent recurrence, similar 250 volt DC valves will have their motor-operator power breakers specially labeled to ensure personnel are alerted to the design feature of a separate motor-operator control circuitry power supply. This labeling will be complete by November 1, 1990.

**V. ADDITIONAL INFORMATION****A. Previous Similar Events**

Previous similar events involving Group III isolations due to the current outage modifications were reported in LER 90-008. LER 87-011 also discusses a similar Group III event. A Group IV isolation following re-energization of MO1909 occurred in 1988.

**B. Other**

These events are being reported in accordance with 10CFR 50.73(a)(2)(iv).