

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9804220203 DOC. DATE: 98/04/17 NOTARIZED: NO DOCKET #
 FACIL: 50-315 Donald C. Cook Nuclear Power Plant, Unit 1, Indiana M 05000315
 AUTH. NAME AUTHOR AFFILIATION
 BOESCH, J. Indiana Michigan Power Co.
 SAMPSON, J. R. Indiana Michigan Power Co.
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 98-013-01: on 980306, improper splice configurations for power operated relief valve limit switches resulted in unanalyzed condition. Caused by inadequate guidance in installation documents. Evaluation performed. W/980417 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 5
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Indiana Michigan
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Cook Nuclear Plant
One Cook Place
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April 17, 1998

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:

98-013-01

Sincerely,

A handwritten signature in cursive script, reading "John R. Sampson", is positioned above the typed name.

J. R. Sampson
Site Vice President

/mbd

Attachment

c: A. B. Beach, Region III
E. E. Fitzpatrick
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R. Whale
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NRC Resident Inspector

JE221

9804220203 980417
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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)

Improper Splice Configurations for Power Operated Relief Valve Limit Switches 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
03	06	98	98	-- 013 --	01	04	17	98	Cook Unit 2	50-316
									FACILITY NAME	DOCKET NUMBER
			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)(3)(i)			50.73(a)(2)(iii) 73.71(b)	
POWER LEVEL (10) 0			20.2203(a)(1)			20.2203(a)(3)(ii)			50.73(a)(2)(iv) 73.71e	
			20.2203(a)(2)(i)			20.2203(a)(4)			50.73(a)(2)(v) OTHER	
			20.2203(a)(2)(ii)			50.36(c)(1)			50.73(a)(2)(vii) (Specify in	
			20.2203(a)(2)(iii)			50.36(c)(2)			50.73(a)(2)(viii)(A) Abstract below	
			20.2203(a)(2)(iv)			50.73(a)(2)(i)			50.73(a)(2)(viii)(B) and in Text,	
			20.2203(a)(2)(v)			X 50.73(a)(2)(ii)			NRC Form 366A)	

LICENSEE CONTACT FOR THIS LER (12)

NAME

TELEPHONE NUMBER (Include Area Code)

Mr. John Boesch, Maintenance Superintendent

616/465-5901, x2634

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 March 6, 1998, with Unit 1 and 2 in cold shutdown, it was determined that the splices for the limit switches on the Unit 1 Power Operated Relief Valves (PORVs) were installed without the "breakout boot" required for Environmental Qualification (EQ). The valves were declared inoperable, and an ENS notification was made at 1829 hours EST under 10CFR50.72(a)(2)(i) for an unanalyzed condition. Inspection of the PORV limit switches for Unit 2 identified that although the breakout boot was installed, a problem with the length of the splice overlap existed at a different splice location. This discrepancy resulted in the valves being declared inoperable, and an update to the original notification was made on March 7, 1998, at 0615 hours EST. This LER is therefore submitted in accordance with 10CFR50.72(a)(2)(ii) for both units.

The root cause for the lack of breakout boots was determined to be inadequate guidance in the installation documents. These documents are currently being revised, and once the revisions are complete, the breakout boots will be installed. The root cause for the improper splice overlap length could not be determined. These splices are not normally accessed during routine work and no record could be found that indicates when these splices were last worked on or when they were originally installed.

An evaluation of the existing configurations was performed. It was determined that although the installed configuration did not meet the EQ requirements, the configuration used would have functioned adequately during accident and post-accident conditions. It is therefore concluded that the event had minimal safety significance and the health and safety of the public were not endangered.



LICENSEE EVENT CONTINUATION

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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

On March 6, 1998, while planning a job order on the Unit 1 Power Operated Relief Valves (PORVs), a potential discrepancy was noted between actual installation configuration and the required Environmental Qualification (EQ) configuration. It was decided that a walkdown of the Unit 1 PORVs should be performed to confirm the installed configuration.

The walkdown revealed that a single Raychem splice was used for 1-NRV-152 and 1-NRV-153 instead of the required EQ "breakout boot" as described in DCC Specification DCC-PS-630-QCN. A breakout boot is used to splice a pair of leads to a single field cable, and physically resembles the letter "Y" or a pair of pants. It could not be determined when the improper splices were installed, but it was conservatively assumed that the improper splices had been installed while the unit was operating. The valves were subsequently declared inoperable.

A walkdown of the Unit 2 PORVs was conducted early on March 7, 1998. This walkdown revealed that the breakout boots were properly installed, however, the Raychem splices for a different splice of a single conductor to another single conductor did not have the EQ required overlap length of 2 inches. These valves, 2-NRV-151, 2-NRV-152 and 2-NRV-153, were also declared inoperable.

Subsequent to the discovery of the problems with the PORVs, the lack of a breakout boot was also identified on the splices for 1-NSO-21 and 1-NSO-22, the Unit 1 reactor vessel head vent valves.

Cause of Event

The root cause of this event was inadequate written guidance for the installation of the required EQ breakout boot splices. The splices are to be installed in accordance with the Electrical Design Standard (EDS) for the particular installation. In the case of the PORVs, EDS 335 contains illustrated installation details for the limit switches themselves and includes a reference to DCC Specification DCC-PS-630-QCN for the actual splice configuration. DCC-PS-630-QCN describes the process for assembling a qualified splice, but does not contain any illustration to assist in that assembly.

The root cause for the improper splice overlap lengths for the Unit 2 PORVs could not be determined. These splices are not normally accessed during routine work and no record could be found that indicated when these splices were last worked or when they were originally installed. A review of documents that provide the splice installation details clearly indicate a requirement for a 6 inch sleeve length with a 2 inch overlap.

Analysis of Event

This event was reported via ENS on March 6, 1998 in accordance with 10CFR50.72(a)(2)(i), as an unanalyzed condition on Unit 1. The notification was updated on March 7, 1998 to include the Unit 2 PORVs. This LER is therefore submitted in accordance with 10CFR50.73(a)(2)(ii)(B), as an event which was found while shutdown, which if found while the reactor was operating, would have constituted an unanalyzed condition.

LICENSEE EVENT CONTINUATION

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Analysis of Event (cont'd)

An Engineering evaluation of the installed configurations was performed. The first issue addressed was the lack of a breakout boot for the single conductor to two conductor splice. The breakout boot is designed to provide a seal where the two conductors leave the single conductor. Raychem had qualified the breakout boots for installations exposed to direct steam impingement. Instead of using a breakout boot for the 1-NRV-152 and 1-NRV-153 applications, each of the three individual conductors were insulated with Raychem WCSF heat shrink tubing. Then the entire assembly was covered with a piece of the same tubing. Raychem manufactures the WCSF tubing with a pre-coated adhesive whose function is to provide an environmental seal for isolating the active electrical component from moisture. The entire WCSF sleeve is then heat shrunk to seal against the conductor. The adhesive flows to conform to the shape of the conductor. For this particular installation, it also flowed between the two conductors to provide the sealing function normally performed by the breakout boot.

The primary failure mechanism to be considered is moisture collection inside the Raychem splice on the conductor to form a low resistance path to ground. The possibility of a short circuit is a function of the length of this path, the circuit voltage and the resistance of the path. In order to develop a low resistance path to ground it would be necessary for moisture to penetrate the Raychem splice underneath the outer tubing. While a qualified assembly would have a breakout boot, an analysis of the existing configuration shows that it also would provide protection from moisture intrusion.

The breakout boot was qualified against direct spray impingement on the splice for a 1000 volt circuit. For the existing configuration in a 250 volt DC circuit, protection against direct steam impingement is not required as these splices are located inside terminal boxes. Without direct spray impingement, it is considered unlikely that moisture would penetrate the installed splice configuration, and the physical creep distance requirements for the 250 volt DC circuit are less than required for a 1000 volt circuit.

The second issue considered was that of the proper size of overlap for Raychem WCSF-N material used for conductor to conductor splices. The current Raychem installation practices requires that for a Loss of Coolant Accident (LOCA) application, the WCSF tubing is 6 inches long in order to provide 2 inches of overlap. This 2 inch length was chosen by Raychem to insure successful completion of the LOCA testing for 1000 volt applications directly exposed to steam. However, varieties of overlap lengths, some as short as one eighth inch have been acceptably qualified by industry testing. The Nuclear Utility Group on Equipment Qualification prepared a report on industry testing of short Raychem splices, which was issued on May 22, 1987, and is the basis for the industry acceptance of the shorter Raychem splice. At this time these tests are under review so that a direct comparison can be made of the test parameters versus the accident profile for Cook.

Additionally, as with the qualified breakout boot configuration, the application for which the shorter splice length exists is a 250 vDC circuit installed inside terminal boxes, as opposed to the tested 1000 volt configuration exposed to direct steam impingement.

In conclusion, it was determined that although the installed splices do not meet the EQ requirements for breakout boot and splice overlap length, it is considered likely that the installed configuration would have performed adequately in a LOCA or post-LOCA environment. Therefore, this event is considered to be of minimal safety significance as the health and safety of the public was not jeopardized.

LICENSEE EVENT CONTINUATION

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Corrective Actions

EDS 335 will be revised to reference EDS 620, instead of the DCC Specification. EDS 620 will illustrate the required configuration for a multiple cable splice using the breakout boot. Once these revisions are completed, the breakout boots will be installed in accordance with the EDS. Action requests have already been prepared for installation of the breakout boots on both the affected PORVs and reactor vessel head vent valves.

Corrective actions will be taken as appropriate for the splice overlap length problem once the root cause has been determined. This LER will be updated at that time to reflect those actions.

In response to a number of EQ discrepancies that have been identified during the restart readiness reviews currently underway, a Project Team has been assembled to assess the EQ process. This team is composed of members from EQ and Design Engineering, Maintenance Training, Maintenance Planning and Maintenance procedure writers, Quality Control, and Procurement. The team will review and assess the EQ process for adequate knowledge and training on installation practices for each discipline. The amount, content and frequency of training given to each discipline will be evaluated, as will the documents used for installation. The team is expected to complete their charter within 6 months, and appropriate actions will be taken to implement solutions to the problems they identify. This information will be provided to the NRC once the long term actions have been determined.

Failed Component Identification

Not Applicable

Previous Similar Events

315/97-006-01

316/97-006-00