CATEGORY 1

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FACIL:50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana M 05000316
AUTH:NAME AUTHOR AFFILIATION
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BLIND,A.A. American Electric Power Co., Inc.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 97-006-00:on 971010,equipment in containment rendered inoperable,due to faulted floodup tubes occurred.Caused by welding in vicinty of floodup tubes.Damaged tubes will be replaced.W/971110 ltr.

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November 10, 1997

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

Operating Licenses DPR-74
Docket No. 50-316

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:

97-006-00

Sincerely,

A. A. Blind
Site Vice President

/mbd

Attachment

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

IE22

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

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.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	Page 1 of 5
Donald C. Cook Nuclear Plant - Unit 2	50-316	

TITLE (4)
Equipment in Containment Rendered Inoperable Due to Faulted Floodup Tubes

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
10	10	97	97	-- 006 --	00	10	10	97	None	
									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)(3)(i)		50.73(a)(2)(iii)	73.71(b)
POWER LEVEL (10)	00	20.2203(a)(1)		20.2203(a)(3)(ii)		50.73(a)(2)(iv)	73.71§
		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 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	TELEPHONE NUMBER (Include Area Code)
Mr. Mike Finissi, System Engineering - Electrical Supervisor	616/465-5901, x2830

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	NO				

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

Following a discovery of damaged floodup tubes in March of 1997 (LER 97-006-01), Donald C. Cook Plant personnel committed to perform inspections of floodup tubes during subsequent refueling outages. An inspection of unit 2 floodup tubes conducted during its current refueling outage identified three tubes containing cables connected to safety related components with through wall holes caused by welding activities. On October 10, 1997, the condition was reported under 10CFR50.72(b)(2)(i).

The damage has been attributed to arcing due to welding activity. The time at which the damage occurred cannot be positively determined, but it is believed to have occurred during recent welding activities near the damaged floodup tubes. The damaged tubes will be replaced, and enhancements made to the welding work process will preclude future arcing damage due to welding. Additionally, inspection of the floodup tubes for damage at the beginning and end of refueling outages will be performed. Additionally, for an operating unit, floodup tubes in the vicinity of any hot work performed in the annulus will be inspected daily.

Postulated failures that could result from the cracked floodup tubes were evaluated and found not to present a significant risk with regard to the protection of the public health and safety.

Conditions Prior to Event

Unit 2 was in Mode 5, Cold Shutdown

Description of Event

Electrical penetrations at the D. C. Cook Nuclear plant are located below the predicted flooding level inside the containment following a loss of coolant accident. As a result, safety related cables are routed through stainless steel tubes, known as floodup tubes, which prevent the water in the containment from contacting the cables. This precaution is necessary because the electrical cables have not been environmentally qualified for submergence in water, and Kapton insulated wires, the type used in electrical penetrations, are known to be susceptible to degradation when exposed to alkaline solutions. All Kapton wires below floodup levels needed for environmentally qualified equipment are contained in floodup tubes. There is no other environmentally qualified equipment below the floodup level which needs floodup tubes to maintain its qualification.

During the unit 2, 1996 refueling outage, moisture had been found in a floodup tube while inspecting a circuit that showed an intermittent ground. Previously, selected floodup tubes had been inspected for moisture intrusion. Although the results were satisfactory in that a very limited number of deficiencies were found, isolated instances of moisture intrusion continued. A program was therefore instituted to inspect the complete population of floodup tubes.

The inspection program began during the unit 1 1997 refueling outage. During that inspection, thirty eight floodup tubes were inspected, and water was found in one tube. The quantity of water in the floodup tube was determined to be insufficient to have degraded the insulation. However, during that inspection, through wall cracks were discovered in some floodup tubes (LER 97-006-01). Through wall defects had previously been found in a few floodup tubes, but were not considered to be a wide spread problem. Once this issue was identified, an increased inspection was then made to inspect all unit 1 floodup tubes for through wall cracks. A total of nine (9) floodup tubes were found to have through wall defects. Six (6) of these defects were found to be mechanical defects at the location where the floodup tubes are screwed together. Three of these defects were caused by welding. Nearly all of the damage was near the lower portion of the floodup tubes, approximately six feet or less above the penetration, and this was considered the critical area for possible damage. A visual inspection for floodup tube through wall damage in the critical area was then made on unit 2 while at power. Two additional floodup tubes were found to have through wall damage due to mechanical damage.

In order to prevent these occurrences commitments were made to LER 97-006-01 to enhance work standards while working on floodup tubes. Also 100% inspections of the floodup tubes were to be made at the beginning and end of each outage to check for cracks.

An inspection of unit 2 floodup tubes conducted during its current refueling outage was made from the penetration to the floodup box (the full length of the tube). Three tubes containing cables connected to safety related components with through wall holes caused by welding activities were identified during this inspection. The time at which the damage occurred cannot be positively determined, but it is believed to have occurred during recent welding activities near the damaged floodup tubes. At the time of discovery, both units were shut down while design bases issues were being evaluated. An additional inspection was conducted in unit 1, and no damaged floodup tubes were found.

Description of Event (cont'd)

During the inspection of the unit 2 floodup tubes, five tubes were found to have through wall holes caused by arcing. Of the five tubes, three contained cables supporting equipment required for accident mitigation or post accident monitoring. The impacted components are:

2-VRA-2310	High range radiation monitor (EIIS/IL-RA)
2-NTQ-130A 2-NTQ-130B 2-NTQ-130C	Reactor vessel level indicator system (RVLIS) -(EIIS/AB-LI) resistance temperature detectors
2-BLP-110 2-BLP-120	Steam generator (EIIS/IP-LT) 1 and 2 narrow range level transmitter

Cause of the Event

The tube damage has been attributed to welding in the vicinity of the floodup tubes.

Analysis of the Event

This event is reportable under the provisions of 10CFR50.73(A)(2)(i)(B), operation prohibited by the plant's technical specifications, 10CFR50.73(a)(2)(ii), any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded, and 10CFR50.73(a)(2)(ii)(B), a condition which is outside of the design basis of the plant.

The cables are required to be environmentally qualified per 10CFR50.49. However, the environmental qualification testing did not include submerging the cable in water. Partial test data for Kapton insulated cable shows that one test sample failed after two hours, and a second test sample failed after forty eight hours. On this basis, it was determined that Kapton insulated cable was not suitable for long term use submerged in a sump solution having a pH of 9-10.

Because the damage to the floodup tubes is located below the containment floodup level, water could enter the tube and the cable would be submerged in a sodium hydroxide solution having a pH of 9 to 10. Submergence in this solution would degrade the Kapton insulation, and it would eventually fail. As the time to failure cannot be accurately predicted, any equipment required for long term accident mitigation was considered to be inoperable.

The result of the evaluation is that, although the potential for equipment failure placed the plant outside of its licensing basis, there was no postulated failure that is considered to have a major impact with regard to protecting the public health and safety. Also, the equipment was backed up by unaffected redundant equipment and/or equipment which could perform a similar safety function.

Analysis of the Event (cont'd)

Narrow Range Steam Generator Level Transmitters

The narrow range steam generator level transmitters, 2-BLP-110 (steam generator 1) and 2-BLP-120 (steam generator 2), provide a signal to the reactor protection system and they are used for post accident monitoring of the steam generator level (Technical specification 3.3.3.8 requires one operable channel per steam generator). The protection system function (five second requirement) would be accomplished prior to the cable's becoming submerged. There are three narrow range steam generator level transmitters per steam generator, and the post accident monitoring function could be accomplished by either of the two remaining narrow range transmitters.

Reactor Vessel Level Indication System

The failure of the RTDs which provide input for temperature compensation could result in the operators being provided with misleading information regarding reactor vessel level following a loss of coolant accident. Although RVLIS is not used to mitigate an accident, it is used in the emergency operating procedures to monitor core cooling, and it is referred to in both the Response to Inadequate Core Cooling and the Response to Degraded Core Cooling procedures.

The failure of one train of RVLIS would not have prohibited the monitoring of core cooling. There are two RVLIS trains and the minimum technical specification requirement is one operable train. Except for those rare instances when the second train was inoperable, the redundant train would have been capable of performing its post accident monitoring function. Additionally, the core exit thermocouples, which were available, are also used in both procedures to monitor core cooling.

Radiation Monitor

Technical specification 3.3.3.1, Table 3.3-6 requires that a minimum of two containment high range area monitor channels be operable. When less than the minimum are operable, the action statements require that the inoperable channel be restored within seven days or a special report be submitted. No other actions are required by the technical specification, and operation with inoperable radiation monitors is allowed.

Corrective Action

The damaged tubes will be replaced prior to entering Mode 4, an inspection of all unit 1 floodup tubes was conducted (no further welding damage was discovered), and the practices necessary when working in the vicinity of floodup tubes was communicated plant wide.

The damage to the floodup tubes has been attributed to welding activities in their vicinity. The PMI-2270 (fire protection), which contains the requirements for obtaining a welding permit, will be revised by November 15, 1997 to ensure that walkdowns are completed prior to the start of the job. A Production Supervisor's signature on the Welding/Burning /Grinding (WBG) permit form stating that he has performed a walkdown of the affected area and has taken appropriate action prior to starting the job will be required.

Corrective Action (cont'd)

The pre-job briefing form for work on containment has been revised to include precautions when working around floodup tubes. The revisions identify that floodup tubes must not be damaged and that care should be taken when working around them. Included is a checklist item to discuss protection of floodup tubes when work is performed in their vicinity.

Work standards will be created in the Nuclear Plant Maintenance System to include directions regarding the care that must be taken when welding in the vicincity of floodup tubes. The directions will be incorporated into future work packages to provide emphasis to the worker that the job requires special precautions and work practices to ensure that floodup tube and electrical insulation are not damaged. This will be completed by November 15, 1997.

Increased training will be provided regarding floodup tubes and their importance. Floodup tube protection will be added to PM&IS inprocess training to be given to all incoming workers (welders and others) under PM&IS supervision. Maintenance will train workers and supervisors who have work activities in the vicinity of floodup tubes on new requirements to the pre-job briefing forms, PMI revisions, planning work standard to ensure that the preventive actions are understood and observed. The immediate action is to develop a briefing paper conveying the changes. This will be completed by November 22, 1997.

Inspections will be made on an operating unit if any burning/welding/grinding is done in the annulus. For an operating unit (as distinguished from a refueling outage) floodup tubes in the vicinity of any hot work performed in the annulus will be inspected daily. One hundred per cent of these inspections will be monitored every twenty four hours. This monitoring will be performed until it has been determined that the other preventive actions have become effective.

The inspections for through wall damage committed to in LER 97-006-01 will continue at the beginning and the end of each refueling outage.

Failed Component Identification

Not applicable

Previous Similar Events

316/89-011-00
315/97-006-01