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Cook Nuclear Plant
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AEP
AMERICAN ELECTRIC POWER

August 3, 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:

98-035-00

Sincerely,

John R. Sampson

J. R. Sampson
Site Vice President

/mbd

Attachment

c: J. L. Caldwell (Acting), Region III
J. R. Sampson
P. A. Barrett
S. J. Brewer
R. Whale
D. Hahn
Records Center, INPO
NRC Resident Inspector

1165

NRC Form 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 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

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Cook Nuclear Plant Unit 1	50-315	1 of 6

TITLE (4)

Ice Condenser Lower Inlet Door Shock Absorber Equipment Found Damaged Due to Poor Work Practices

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
											Cook - Unit 2	50-316
07	02	98	98	--	035	--	00	08	03	98	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)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)	0	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	TELEPHONE NUMBER (Include Area Code)
Mr. Paul Schoepf, Mechanical Systems Manager	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)			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 July 2, 1998, during an inspection of the condition of Ice Condenser Lower Inlet Door Shock Absorber equipment, damage was identified that potentially impacted the ability of the shock absorbing bumpers to perform their intended functions. Deficient shock absorbing bumpers could lead to damage of the lower inlet doors and excess debris in the Containment Recirculation Sump following a postulated accident. An ENS notification was made on July 2, 1998, in accordance with 10CFR50.72(b)(2)(i) for an unanalyzed condition, and this LER is submitted in accordance with 10CFR50.73(a)(2)(ii)(A) for an unanalyzed condition.

The root cause of damaged shock absorbing bumpers was determined to be poor work practices, with contributing causes of written communications, environmental conditions, training/qualification, and supervisory methods. The bumpers will be replaced by a newer design shock absorber, the procedure has been revised to address inspection activities, the shock absorbers will be protected during maintenance evolutions, training will be provided to Ice Condenser maintenance workers, and oversight responsibility of Ice Condenser work will be transferred from Engineering to the Maintenance Department to access a larger staff skilled in production supervision.

The safety significance of the event is negligible. The condition of damaged bumpers did not represent a credible threat to the proportioning function of the lower inlet doors or to Containment Recirculation Sump operability. However, taken in aggregate, the additional foam debris from the Ice Condenser shock absorbers could have exacerbated the fibrous material condition described in LER 50-315/97-024, further degrading the ability of the Containment Recirculation Sump to perform its function.

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TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(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 an inspection of the condition of Ice Condenser Lower Inlet Door Shock Absorber equipment, damage was identified that potentially impacted the ability of the shock absorbers to perform their intended functions.

The safety-related Ice Condenser system absorbs thermal energy released during a postulated Loss of Coolant Accident (LOCA) or Main Steam Line break (MSLB) inside Containment, to limit initial peak Containment pressure. The system includes a completely enclosed annular compartment located around approximately 300 degrees of the Containment perimeter. A mass of sodium tetraborate ice is stored inside the compartment within an array of 1944 ice baskets, with each basket measuring 48 feet tall and having a diameter of 12 inches. The vertical portion of the basket is substantially open to accommodate heat transfer. The borated water from the melted ice passes through the Ice Condenser floor drains and into the Containment Recirculation Sump. The Ice Condenser plays no role in normal plant operation.

Hinged doors at the lower (inlet) and upper (vent) portions of the Ice Condenser connect the Ice Condenser to the Containment. During a postulated LOCA or MSLB inside Containment, pressure buildup in lower Containment causes the Ice Condenser inlet doors to open. The arrangement of the inlet doors distributes the steam and warm Containment air proportionately across the ice beds. Steam flowing through the ice compartments would be condensed, limiting peak Containment pressure. The upper vent doors open to provide a return path for the cooled Containment air.

The Ice Condenser lower inlet doors are designed to open when needed. Shock absorbers, called bumper bags, are installed to dissipate kinetic energy from the opening inlet doors without damaging the doors. The bumper bags are a foam wedge contained inside of polyethylene/fiberglass (plastic) bags, which are enclosed and protected by stainless steel mesh bags. Stainless steel panels cover the top, bottom, and one side of the bumpers.

The door energy is absorbed when the inlet doors open and crush the foam wedges. The plastic bags are designed with sufficient volume to completely enclose and contain the expanded volume of the crushed foam wedges. The stainless steel mesh bags are designed to provide redundant containment of the crushed foam and provide some protection for the plastic bags. The metal covers are designed to protect the bags and to help preserve the foam geometry during crushing. The crushed foam is contained to prevent its discharge into Containment, which could block floor drains or the Containment Recirculation Sump screens.

After damaged shock absorbers were found in December, 1997, Cook management made a decision to replace them with a later generation design "air box." Removal of the bag-style shock absorbers allowed a more thorough inspection, and the bags were observed to have significant wear areas, tears and punctures, damaged foam wedges, and foam wedges dislodged from their mountings.

The aggregate effect of the deficient conditions of the Ice Condenser shock absorbers was such that the bumpers, following a postulated accident, may not have been capable of performing their intended functions to cushion the lower inlet door opening and contain the crushed foam. Crushed foam that may have escaped from the damaged bags had the potential to reach the Containment Recirculation Sump and block the sump screens.

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

CAUSE OF EVENT

The root cause of this condition is work practices. Plant personnel failed to prevent damaging the bumpers during Ice Condenser maintenance evolutions. Ice accumulated around the bumpers and would freeze into blocks that required removal. The use of tools to chop, scrape, and shovel the ice away from the bumpers very likely contributed to bag damage. In addition, falling ice or dropped tools from above the bumpers may have struck the bags, also causing damage.

Contributing causes included the following:

Work practices -- due to a lack of awareness of the fragile nature of the bumper bags;

Written communication -- due to a failure to incorporate adequate bumper bag inspection requirements and acceptable damage criteria in the Ice Condenser maintenance procedures;

Environmental conditions -- because workers were not sensitive to the physical proximity of the bumpers to the ice bed maintenance work area, which allowed damage from falling ice or tools;

Training/qualification -- due to a lack of adequate training of ice maintenance personnel; and

Supervisory methods -- due to a lack of control of ice maintenance personnel.

ANALYSIS OF EVENT

On July 2, 1998, after review of Ice Condenser Lower Inlet Door Shock Absorber damage in the aggregate, an ENS notification (EN 34468) was made in accordance with 10CFR50.72(b)(2)(i), for an unanalyzed condition found while the reactor was shutdown. This LER is therefore submitted in accordance with 10CFR50.73(a)(2)(ii)(A), for an unanalyzed condition.

The condition of damaged Inlet Door Shock Absorbers raises two main concerns:

Damaged Lower Inlet Doors -- the damaged/dislodged foam could have caused the lower inlet doors to become damaged upon opening, disrupting proportional steam/air flow across the ice beds, which would reduce the effectiveness of the Ice Condenser in limiting peak Containment pressure; and,

Debris in Containment -- the torn bags could have allowed crushed foam particles to escape and be washed to the Containment Recirculation Sump, thereby blocking the sump screens during the recirculation mode of the Emergency Core Cooling Systems following a postulated accident.

Damaged Doors

For the lower inlet doors to become damaged upon opening, the foam wedges would have had to be significantly dislocated and/or significantly reduced in volume. However, this level of foam damage was not evident. The plastic bags and the stainless steel covers held the loose foam wedges very close to their originally installed locations. Therefore, the aggregate condition of damaged bumpers did not represent a credible threat to the proportioning function of the inlet doors.

Debris in Containment

To assess the significance of crushed foam in containment that may have caused blockage of the Containment Recirculation Sump screens, three key considerations were evaluated:

The likelihood that the foam would escape bumper bags during a LOCA;

The route that the foam must take to be delivered to the entrance of the recirculation sump; and

The buoyancy of the foam.

During normal conditions the foam is one solid piece. According to Westinghouse Scientific Paper 74-1B5-TAPSC-P3 (and others), mockup tests of the bumpers in 1973/1974 indicated that the foam was crushed, during simulated openings of a lower inlet door, to sizes ranging from 0.17 inch in diameter up to one cubic foot in volume. The foam was also noted to be very buoyant.

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ANALYSIS OF EVENT, cont.
For bumpers where the mesh bags and the underlying plastic bags were both cut/torn, it was possible that the foam could have escaped and become loose debris following a postulated accident. The plastic bags were sized and folded to have sufficient excess volume to accommodate all the crushed shock absorber material after the impact of a lower inlet door, and the bags were not pressurized under normal conditions. Many of the cuts on the bags were found directly adjacent to the foam, while the remaining cuts were found on folded portions (not adjacent to the foam).

One extreme case of bag damage was found on the U1 Bay 14 left bumper, with the sheet metal cover torn on top, large (two foot) tears at the top and bottom of the bags, and some missing foam. A significant amount of foam could have escaped this particular bag, due to the size of the tears, and also because the resulting ice melt would have likely entered the bag from the top and then washed foam out through the bottom.

The bumpers were not in the direct path of the blow-down steam, but foam may have escaped due to the possibility of a "back-draft" steam effect. Also, submersion of the bottom of the bags in the ice melt water would have likely washed out some foam. It would be very difficult to determine, with any degree of certainty, the amount of foam that could have escaped during an accident, due to the following factors:

The varied sizes and arrangements (locations) of the foam particles in the bag;
The amount of water that may wash out foam; and,
The sizes of the holes in the bags.

The volume of foam in a typical bumper is approximately 30 cubic feet, so the amount of foam that could be expected to be blown out of a cut bag during an accident may vary from a few cubic inches (for a 1/2 inch cut) up to perhaps 100-200 cubic inches (for a 4 inch cut). These estimates are reasonable judgments and take into account the location and sizes of the cuts, as well as their proximity to the foam. Therefore, the postulated amount of foam that could have escaped the U2 bags during an accident would be approximately one cubic foot.

For the Unit 1 bay 14 left bumper, perhaps as much as 1/3 of the foam, or about 10 cubic feet, could have escaped due to the size of the tears in the bag. Therefore, the postulated amount of foam that could have escaped the U1 bags during an accident would be approximately 10.5 cubic feet.

Foam that escapes the bumper bags in the lower ice condenser could have reached the recirculation sump screens through either of two tortuous pathways.

1. The blow-down forces due to an accident would have to force the foam to travel up and around the ice baskets (48 feet), through the upper deck grating (another 17 feet), and over to and down the refueling cavity drains; or,
2. The foam would have to travel down through the inlet door openings against the flow of steam/air, or be washed down through the floor drain grating (1.75 inch openings), and through 12 inch flapper valve drains to the lower Containment.

There are no models to study debris transport for this type of material, but if the noted quantities of foam are present, some would likely transport to the Recirculation Sump. Consequently, the release of foam particles during an accident and resulting transport to the recirculation sump would be limited by the following:

The near-complete enclosure of exposed foam by the plastic bags, mesh bags, and the stainless steel sheet metal in 95 of the 96 inspected bumpers;
The foam would have been exposed to a back-draft steam flow, rather than direct steam flow;
The tortuous paths the foam would have to travel from the lower ice condenser to reach the sump;
The buoyancy of the foam, which would result in the foam floating on the surface of the water adjacent to an active sump, thereby limiting sump blockage; and,

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ANALYSIS OF EVENT, cont.

The need for the foam to cover approximately 50 percent (42 square feet) of the recirculation sump screens before sump operability would have been challenged.

Therefore, the condition of damaged bumpers did not represent a credible threat to Containment Recirculation Sump operability.

When assessed independent of other recent Ice Condenser and Containment deficiencies identified in previous Licensee Event Reports (LER), the safety significance of the conditions described in this LER are negligible. The condition of damaged bumpers did not represent a credible threat to the proportioning function of the lower inlet doors or Containment Recirculation Sump operability.

A previous Licensee Event Report (LER) (LER 50-315/97-024-04), addressed degradation of the Containment Recirculation Sump due to fibrous material found in Containment, which could have potentially caused excessive blockage of the sump screen. The issue of Containment Recirculation Sump screen blockage discussed in LER 97-024-04 is relevant to this LER because, taken in aggregate, the additional foam debris from the Ice Condenser Lower Inlet Door Shock Absorbers could have exacerbated the condition described in LER 97-024, further degrading the ability of the Recirculation Sump to perform its function.

CORRECTIVE ACTIONS

The Ice Condensers have been declared inoperable due to other issues, but are not required to be operable in the current plant mode.

The bumper style shock absorbers are being replaced with a stainless steel air box design, which is considered more durable than the plastic/mesh bags and foam wedges, and does not have the potential to create a debris problem in Containment. These air boxes will be installed in all bays except on the entrance wall in bay 24 for each unit, which requires a smaller bumper device. The new design air boxes are too large for the entrance wall in Bay 24, therefore the existing bumpers in Bay 24 will be restored with new bumper components. Bumper installation and refurbishment will be completed prior to each unit's startup.

PREVENTIVE ACTIONS

Replacement of the bumpers with a new design addresses several of the causes of the event, including work practices (simpler design, easy to inspect and maintain, more durable), and environmental conditions (more durable).

Written communication is addressed by a procedure change which requires periodic inspections of the bumpers and documentation of any degraded conditions on a Condition Report.

Environmental conditions for the bumper bag style shock absorbers (Bay 24) are addressed by a new requirement to cover and protect the bumpers with plywood covers during Ice Condenser maintenance. Protection of the new style air box is under consideration pending evaluation of the strength of the air boxes.

Training of personnel performing work in the ice condenser will provide focused information to raise the sensitivity of workers on limiting damage to plant components, particularly any future plastic bag/wire mesh bumpers (Bay 24 entrance wall bumpers).

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PREVENTIVE ACTIONS, cont.
To address poor supervisory methods, responsibility for oversight of Ice Condenser production workers is being realigned from the Engineering department to the Maintenance department. The Maintenance department has more production supervisors with the skills necessary to provide thorough supervisory oversight to workers compared to the Engineering department. Therefore, this realignment of responsibilities is expected to result in improved worker performance during Ice Condenser maintenance activities.

FAILED COMPONENT IDENTIFICATION
Not applicable.

PREVIOUS SIMILAR EVENTS
LER 50-315/97-024-04
LER 50-315/98-017-01

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 98-035-00:on 980702,identified that potentially impacted ability of shock absorbing bumpers to perform intended functions.Caused by poor work practices.Bumpers will be replaced by newer design shock absorber.W/980803 ltr.

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