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

AEP
INDIANA
MICHIGAN
POWER

August 7, 2000

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

Operating License 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 submitted:

LER 316/2000-009-00, "Common-Cause Ventilation Failure Results in Inoperable Auxiliary Feedwater Pumps".

The following commitments were identified in this submittal:

- The Auxiliary Feedwater Pump room cooler flow blockage issue will be resolved by December 15, 2000, such that the compensatory actions are no longer necessary.
- The Auxiliary Feedwater Pump room cooler flow blockage issue will be resolved prior to the completion of the installation of the cooler modification for Unit 1.
- A non-conformance evaluation (NCE) will be performed to determine if the installation of the valves in a backward configuration will be acceptable for long term operation. The NCE will be completed by August 31, 2000.
- A "lessons learned" memorandum will be developed and issued to all Design Engineering personnel to inform them of the consequences of this type of oversight in the design process.

Should you have any questions regarding this correspondence, please contact Mr. Brian A. McIntyre, Acting Director, Regulatory Affairs, at 616/465-5901, extension 1575.

Sincerely,

M. W. Rencheck
Vice President – Nuclear Engineering

/mbd
Attachment

IE22

c: J. E. Dyer, Region III
B. A. McIntyre
D. Hahn
W. J. Kropp
R. P. Powers
R. Whale
Records Center, INPO
NRC Resident Inspector

NRC Form 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Donald C. Cook Nuclear Plant Unit 2	05000-316	1 of 4

TITLE (4)

Common-Cause Ventilation Failure Results in Inoperable Auxiliary Feedwater Pumps

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
07	05	2000	2000	--	009	--	00	08	07	2000	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	100	20.2201 (b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	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)	X 50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
M. B. Depuydt, Regulatory Affairs	616 / 465-5901, x1589

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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 5, 2000, during routine operator rounds, it was observed that the Unit 2 Turbine Driven Auxiliary Feedwater Pump (TDAFP) room cooler was not operating properly as indicated by a room temperature of approximately 100 degrees Fahrenheit (F). It was determined that normal lake water debris capable of passing through the Essential Service Water (ESW) strainer mesh was limiting flow through the room cooling system. The TDAFP was declared inoperable in accordance with Technical Specification (TS) 3.7.1.2, "Auxiliary Feedwater System." On July 7, 2000, reduced cooling flow to the East Motor Driven Auxiliary Feedwater Pump (MDAFP) room cooler was observed, and it was also declared inoperable. The design and installation discrepancies identified were considered a common-cause failure mechanism. This LER is submitted in accordance with 10CFR50.73(a)(2)(vii) for a condition that caused two independent trains to become inoperable in a single system.

The apparent cause was determined to be human error, specifically, a lack of attention to the detail of the design requirements for the modification that installed the Auxiliary Feedwater Pump (AFP) room cooler units. The ESW valves for the AFP room coolers have been repositioned. Operations will periodically monitor ESW flow to all AFP room coolers and flush as required. The Unit 2 AFP room cooler flow blockage issue will be resolved by December 15, 2000, such that the compensatory actions are no longer necessary. The potential for flow blockage in Unit 1 will be resolved prior to the completion of the installation of the cooler modification. A "lessons learned" memorandum will be developed and issued to Design Engineering personnel detailing the causes and consequences of this type of oversight in the design process.

Based on the evaluations performed, the potential common cause failure of the AFP room coolers due to design inadequacies has minimal safety significance.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR	SEQUENTIAL NUMBER			REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 2	05000-316	2000	--	009	--	00	2 of 4

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

Conditions Prior to Event
Unit 2 was in Mode 1, Power Operation, at 100% Rated Thermal Power.

Description of Event
On July 5, 2000, during routine operator rounds, it was observed that the Unit 2 Turbine Driven Auxiliary Feedwater Pump (TDAFP) room cooler was not operating properly as indicated by a room temperature of approximately 100 degrees Fahrenheit (F). The cooler fan was found running with the cooling unit compressor tripped. Investigation determined that the cooler unit compressor had tripped on high differential pressure due to inadequate Essential Service Water (ESW) system flow through the cooler unit. Normal lake water debris, such as sand, silt, and shell fragments, was building up within the cooling system, causing a gradual reduction in flow. The degraded flow condition was determined to be a result of the cooler unit discharge valve position. The valves were throttled to approximately 1/16 inch open, and would not pass the maximum expected ESW system debris size of 1/8 inch, based on the 1/8 inch mesh in the upstream ESW strainer. This condition was exacerbated by the incorrect orientation of the cooler ESW return valves, as they were determined to have been installed backwards with respect to the direction of ESW flow. The incorrect orientation of the valves used to throttle ESW flow through the Auxiliary Feedwater Pump (AFP) room coolers in and of itself does not represent an operability concern. However, when taken in conjunction with the as-found throttle positions, the ability of the valves to pass sand, silt, and other debris carried by ESW flow is further reduced.

The TDAFP was declared inoperable in accordance with Technical Specification (TS) 3.7.1.2, "Auxiliary Feedwater System," and the ESW supply valves were subsequently cycled open then re-throttled, restoring full cooling flow to the cooler units. On July 7, 2000, debris caused reduced cooling flow to the East Motor Driven Auxiliary Feedwater Pump (MDAFP) room cooler, and the East MDAFP was also declared inoperable.

The design and installation discrepancies associated with the blockage of the AFP room cooling systems that resulted in the inoperability of the TDAFP and East MDAFP, taken in the aggregate, were considered a common-cause failure mechanism for all the AFP room coolers. This LER is submitted in accordance with 10CFR50.73(a)(2)(vii) for a condition that caused two independent trains to become inoperable in a single system designed to remove residual heat.

Cause of Event
The apparent cause was determined to be human error, a lack of attention to the detail of the design requirements for the modification that installed the AFP room cooler units. The ESW system interconnection points were implemented under a separate design change package (DCP) than the DCP that actually installed the cooler units in Unit 2. Specifically, the cooler DCP considered the potential for ESW system debris to block the cooler coils, but did not consider the potential throttle position of the discharge valves for debris blockage. Due to the need to maintain a limit on service water flow through the cooler units to ensure adequate ESW design basis accident flow rates to other ESW components, the cooler discharge valves were only open approximately ¾ of a turn out of a 7 ½-turn full open position. This ¾-turn opening of the valves resulted in a cross-sectional area less than the 1/8-inch debris particle size that could be present because of the ESW system upstream strainer mesh size. The identified condition is believed to be an isolated condition based on the phased approach of the design change packages.

Analysis of Event
The Auxiliary Feedwater System (AFWS) provides feedwater to the steam generators when the main feedwater pumps are unavailable or during accident/abnormal conditions. The AFWS is also relied upon to provide steam generator makeup during a station blackout (SBO) condition, and has 10CFR50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," requirements. During the recent Unit 2 outage, the AFP room heating, ventilation, and air conditioning (HVAC) system was modified to protect the components in the rooms that are susceptible to harsh environments resulting from a high-energy line break (HELB). The AFP rooms were sealed from adjacent compartments, two 100 percent capacity safety related room coolers were installed in the TDAFP room, and one 100

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR	SEQUENTIAL NUMBER			REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 2	05000-316	2000	--	009	--	00	3 of 4

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

percent capacity safety related room cooler was installed in each of the two MDAFP rooms. The coolers were designed to maintain the rooms less than 85 degrees F without pump operation, and less than 104 degrees F with the respective AFP in operation.

Procedure 12 PMP-4030.001.001, "Impact of Safety Related Ventilation on the Operability of Technical Specification Equipment," was written to provide direction to Operations regarding the operability of safety related ventilation and the equipment it supports. On July 5, 2000, the procedure required that both TDAFP room coolers were required to be operable for continued operability of the TDAFP. It has since been determined that only one of the two cooling units needs to be operable for the TDAFP to be considered operable.

Calculations have been performed that demonstrate the ability of the TDAFP to continue operating following a complete loss of room cooling for a minimum of four hours during a SBO event. For the condition described in this LER, temperature in the TDAFP room was excessively high for normal plant conditions, but did not reach the 110 degree F setpoint for the control room alarm. Assuming a worst-case initial starting temperature of 110 degrees F in the TDAFP room, the evaluation indicated that the temperature in the room would still be below the 150 degree F criteria required by NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors."

An evaluation of the effect on equipment for a 150 degree F TDAFP room environment demonstrates that electrical equipment located in the room would remain functional at the elevated temperature for a minimum of four hours. Furthermore, a review of the Donald C. Cook Nuclear Plant (CNP) safety analyses has determined that there is no design basis accident that requires the TDAFP to operate for more than four hours in support of accident mitigation. Based on the above information, the TDAFP remained capable of performing its intended safety function as designed.

Maximum temperature in the MDAFP rooms is limited to 140 degrees F due to the electrical equipment in the rooms. Testing was performed during the refueling outage to determine the heat up rate in the MDAFP rooms following a complete loss of room cooling, and the results indicated a heat-up rate of 23 degrees F per hour. Based on an initial starting temperature of 85 degrees F and a 23 degrees F per hour heat-up rate, the temperatures within the rooms could exceed the design temperature limit of 140 degrees F after approximately 2.5 hours. This allows an adequate period of time for operators to access the AFP pump rooms and perform compensatory measures before damage to the equipment would occur.

To perform the common-cause failure evaluation, scenarios for worst case room temperatures were considered. The worst case high energy line break (HELB) for the turbine building is a doubled ended guillotine break of a main steam line. Following this HELB, calculations show that the peak temperature in the area of the MDAFP rooms would be 150 degrees F, with temperatures in most areas of the turbine building reaching no more than 112 degrees F. The MDAFP rooms were constructed with heavy concrete walls, and it would take between 5 and 14 hours for heat conduction through the walls to occur and the temperatures in the rooms to reach a peak steady state. Release of steam from a HELB is assumed to terminate within 30 minutes, which indicates that heating of the rooms would most likely result from operation of the MDAFPs, not from a HELB. Assuming that heat up of the MDAFP rooms would be the result of pump operation and not externally driven, common cause failure of the room coolers during a postulated HELB results in room temperatures that are bounded by a complete loss of room cooling without a concurrent HELB. Calculations also show that the turbine building is not pressurized by the HELB, as the structure is large and not air tight. Based on calculated maximum temperatures, termination of the steam release within 30 minutes, and no pressurization of the building, an adequate period of time is available for operators to access the AFP rooms and perform compensatory measures before damage to the equipment would occur.

Based on the evaluations performed, the potential common cause failure of the AFP room coolers due to design inadequacies has minimal safety significance.

Corrective Actions

Immediate corrective actions were to declare the TDAFP inoperable in accordance with TS 3.7.1.2, and the ESW supply valves for both of the TDAFP room coolers were subsequently cycled open to remove the debris, then re-throttled, restoring cooling flow to the coolers. On July 7, 2000, the East MDAFP was declared inoperable when degraded flow was observed in the ESW supply to the East MDAFP room cooler, and the valves were cycled open then re-throttled to remove the debris.

The ESW valves for the TDAFP room coolers and MDAFP coolers have been repositioned to optimize the throttle positions of the valves such that the potential for accumulation of debris on the inlet or outlet valve seats is reduced, while maintaining cooler flow rates at design values. The ESW valves are still throttled to a small opening due to the limitations on flow rates through the coolers, therefore, compensatory actions as described below are required to prevent accumulation of debris in the valves.

Operations will periodically monitor ESW flow to all MDAFP and TDAFP room coolers and flush as required to ensure that silt/sand/debris does not accumulate in the room cooler supply lines or coolers to an extent that would cause the loss of adequate cooling flow. These compensatory actions are necessary during normal operating conditions and within a four-hour period following any postulated design basis accident requiring operation of the MDAFPs. Operations has established administrative controls to ensure that monitoring and flushing activities are scheduled to occur at the appropriate intervals and are appropriately logged. Detailed instructions regarding the conduct of the flushing evolution and restoration of the cooling loop to its normal operating configuration is governed by normal operating procedures. These compensatory actions will remain in effect until the cooler flow blockage issue is resolved.

The Auxiliary Feedwater Pump room cooler flow blockage issue will be resolved by December 15, 2000, such that the compensatory actions are no longer necessary.

The Auxiliary Feedwater Pump room cooler flow blockage issue will be resolved prior to the completion of the installation of the cooler modification for Unit 1.

A non-conformance evaluation (NCE) will be performed to determine if the installation of the valves in a backward configuration will be acceptable for long term operation. The NCE will be completed by August 31, 2000. The cause of the incorrect installation will be addressed throught the CNP corrective action program.

A "lessons learned" memorandum will be developed and issued to Design Engineering personnel detailing the causes and consequences of this type of oversight in the design process.

An initial review was performed of other ESW design changes installed during the recent shutdown. No problems similar to those documented in this LER were found. A complete evaluation of the extent of condition will be performed during the root cause investigation, which is currently in progress. The extent of condition and any additional corrective actions from the root cause investigation will be documented and addressed through the CNP corrective action program.

Previous Similar Events

None