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AEP
INDIANA MICHIGAN POWER

November 19, 1999

United States Nuclear Regulatory Commission
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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 interim report is being submitted:

LER 315/99-026-00, "High Energy Line Break Programmatic Inadequacies Result in Unanalyzed Conditions."

The following commitment was identified in this submittal:

- Results of the evaluations and analysis of the safety significance of the conditions described herein will be provided in a supplement to this LER.

Sincerely,

M. W. Rencheck
Vice President – Nuclear Engineering

/srd
Attachment

c: J. E. Dyer, Region III
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Records Center, INPO
NRC Resident Inspector

IE22

PDR ADOCK 05000315

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

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TITLE (4)

High Energy Line Break Programmatic Inadequacies Result in Unanalyzed Conditions

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	22	1999	1999	–	026	–	00	11	19	1999	Cook Nuclear Plant 2	05000-316
											FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	0	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	0	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)	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)
Ms. Mary Beth Depuydt, Regulatory Compliance	(616) 465-5901 X 1589

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
X	YES (If Yes, complete EXPECTED SUBMISSION DATE).		01	21	2000
	NO				

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

On October 22, 1999, it was determined that a number of locations in the plant should now be considered unprotected from the effects of a postulated nearby high-energy line break (HELB) event. These areas were previously analyzed to be protected from, or not susceptible to, the effects of a HELB event. However, as a result of a recent evaluation of the HELB program, areas were identified that contained equipment that was either not qualified for the harsh environment that would result from a HELB, or would have been damaged by the jet impingement from a crack in high-energy piping near the equipment. The equipment potentially affected includes the Auxiliary Feedwater pumps, safety and non-safety related 600 VAC and lower voltage switchgear, Emergency Diesel Generators, Component Cooling Water pumps, Unit 2 Turbine Driven Auxiliary Feedwater pump battery train, and cabling and conduit inside containment. An Emergency Notification System (ENS) phone call was made on October 22, 1999, at 1500 hours in accordance with 10CFR50.72(b)(2)(i), for a condition which was found while both reactors were shutdown, which, had it been found while the reactors were in operation, could have resulted in the nuclear plants being in an unanalyzed condition that significantly compromises plant safety. This LER is submitted in accordance with the related 10CFR50.73(a)(2)(ii)(A) requirement.

The preliminary causes of the HELB programmatic inadequacies were lack of a clearly defined, centralized program and owner, and inadequate design basis supporting documentation, modification processes, and calculations.

Evaluations of these potential design deficiencies are ongoing. A supplement to this LER will be submitted upon completion of the evaluations.

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Conditions Prior to Event
Unit 1 was de-fueled
Unit 2 was de-fueled

Description of Event
On October 22, 1999, it was determined that a number of locations in the plant should now be considered unprotected from the effects of a postulated nearby high-energy line break (HELB) event. These areas were previously analyzed to be protected from, or not susceptible to, the effects of a HELB event. However, as a result of a recent evaluation of the HELB program, areas were identified that contained equipment that was either not qualified for the harsh environment that would result from a HELB, or would have been damaged by the jet impingement from a crack in high-energy piping near the equipment. The equipment potentially affected includes the Auxiliary Feedwater pumps, safety and non-safety related 600 VAC and lower voltage switchgear, Emergency Diesel Generators, Component Cooling Water pumps, Unit 2 Turbine Driven Auxiliary Feedwater pump battery train, and cabling and conduit inside containment.

Two of these conditions have been previously reported in LERs 315/98-058-00 and 316/98-005-00; however, a combined report is being submitted to better characterize the aggregate impact of the programmatic inadequacies that led to these individual conditions. A summary of each of the above six conditions follows. The conditions discussed below apply to both units except as noted. These events are not postulated to occur simultaneously as the result of a single HELB, but are postulated to occur individually due to a specific precursor.

Auxiliary Feedwater Pumps

This condition was previously reported in LER 315/98-058-00, and is summarized here for completeness.

The East Motor Driven Auxiliary Feedwater Pump (MDAFP) and Turbine Driven Auxiliary Feedwater Pump (TDAFP) are located adjacent to each other and share a common hallway. The West MDAFP does not share this common hallway. The steam used to drive the TDAFP turbine is provided by a 4-inch supply line, which taps off of the 30-inch Main Steam header. Due to the 4-inch steam supply line, it is possible for a HELB to occur in the TDAFP room. To help mitigate the consequences of the postulated break, the door to the TDAFP room is propped open while the door to the East MDAFP room is maintained closed. This arrangement allows the steam from the HELB to exhaust into the common hallway shared by the pumps. Investigation revealed that no analysis could be located which evaluated the effects of the HELB on the equipment in the common hallway. A postulated line break in the area could result in a temperature of 330 degrees F. Four AFW valves required for safe shutdown of the plant may be affected by the postulated HELB because their cables are located in the hallway, but are not qualified for the adverse environmental conditions that would exist following the break. Therefore, it was concluded this condition could lead to the failure of the TDAFP and one MDAFP upon a postulated HELB in the area.

Additionally, it was discovered that all of the AFW pumps could be adversely impacted by a postulated main steam line break in the turbine building due to the following reasons:

1. The door from the turbine building to the AFW pump corridor is maintained open. The fusible link installed on this door actuates at 375 degrees F, which is above the expected temperature in the area following a postulated HELB event in the turbine building. Therefore, the door between the turbine building and the AFW pump rooms will not close following a postulated turbine building HELB event.

2. The ventilation systems supplying cooling to the MDAFP rooms draw air from the turbine building. A postulated main steam line break in the turbine building could result in steam being drawn into the MDAFP rooms, making the rooms a harsh environment. The dampers installed in the ventilation ductwork for the MDAFPs are curtain-style fire dampers with thermal fusible links, but are not designed to close with flow in the ventilation ducts. Therefore, since the MDAFPs are not qualified for a harsh environment, and the fire dampers may not close with airflow in the ducting to the MDAFPs, the pumps may not be protected from a postulated HELB event in the turbine building.

Assuming a break in the steam bypass header in the turbine building, coupled with the postulated failure of the AFW doors and ventilation dampers to reposition in response to the steam environment, the break could result in all of the AFW pumps being subjected to a harsh environment. As none of the AFW pumps are qualified for a harsh environment, this postulated event could result in a loss of all AFW.

Safety and Non-Safety Related Switchgear

The switchgear rooms are served by a supply-only ventilation system designed to exhaust through the switchgear room roll-up doors; therefore, the doors are maintained open to provide a ventilation exhaust path. The doors close automatically on a carbon dioxide actuation, and may be closed as required to support testing or maintenance. A computer calculation previously verified that the rooms would remain a mild environment post-HELB with the doors open.

A walk-down of the switchgear rooms performed in September 1999 revealed that the analytical assumptions used in the original calculation failed to identify a high-energy source near the rooms. A high-pressure feedwater heater is located outside the room near the open door. If the heater or associated piping failed, the resultant steam/water mixture could produce a harsh environment inside the switchgear room. Electrical structures, systems, and components located inside the switchgear rooms were not designed for a harsh environment. Therefore, safety related, safe shutdown, and vital instrument equipment powered from the 600 VAC and lower voltage buses located in the switchgear rooms may not function as designed.

Emergency Diesel Generators and Associated Ventilation Systems

At the time of the Emergency Notification System report to the NRC, preliminary information regarding a HELB impact on the EDGs indicated that the EDG rooms are not protected from the effects of a postulated HELB originating in the turbine building. The EDG ventilation system exhaust air path to the turbine building is provided with fire dampers in the wall penetration, but these dampers will not close based on a HELB in the turbine building. Steam could flow into the EDG rooms through the EDG ventilation exhaust ducts when the fans are not operating, rendering the rooms a harsh environment. The EDG equipment is not rated for a harsh environment.

Review of the issue is continuing, and it now appears that the effects of a HELB in the turbine building on the EDGs may be negligible due to the automatic operation of the ventilation fans. Evaluation results of the impact of a postulated HELB in the turbine building on the EDGs will be included in a supplement to this LER.

Component Cooling Water Pumps

This condition was previously reported as interim LER 316/98-005-00, and is included here for completeness.

At the time of the writing of LER 316/98-005-00, a preliminary determination had been made that a postulated critical crack in a Unit 2 main steam line could degrade the ability of adjacent CCW pumps to perform their design function. The CCW pumps for both units are located in close proximity to one another in a semi-enclosed area in the Auxiliary Building. Adjacent to the pumps on the Unit 2 side is a pipe chase enclosing two main steam lines and a main feedwater line, which

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can be accessed through any of 3 doors. The corresponding area on the Unit 1 side does not have any doors or safety related equipment adjacent to the high-energy pipe chase. No calculation could be found which showed that the doors would withstand the energy released from a postulated critical crack directly opposite the doors. The existing calculation considered a HELB location roughly 37 feet from the doors. The pipes pass within about 4 feet of the doors. As the adjacent CCW pump motors and other equipment are not qualified for the high temperature and/or high humidity environment that might occur following a postulated crack in the steam or feedwater piping near the doors, this concern was determined to constitute an unanalyzed condition.

Unit 2 Turbine Driven Auxiliary Feedwater Pump Battery Train

The 250 VDC N-train battery and associated support equipment supplies power for the operation of the turbine driven auxiliary feedwater system. The Unit 1 N-train battery system supporting components are located in an area protected from the effects of a HELB event. However, the Unit 2 N-train battery system supporting components, such as the battery charger and power distribution cabinet, are located in the steam generator blow-down flash tank room, which is outside of the battery room. The battery support components would be exposed to a harsh environment in the event of a failure of the steam generator blow-down line as it enters the blow-down flash tank. These components are not qualified for a harsh environment, and therefore could cause a failure of the Unit 2 N-train battery, and subsequently, the Unit 2 TDAFP.

Cables and Conduits Inside Containment

Forty-two potential jet impingement targets exist that could be adversely affected due to a postulated crack in high-energy lines inside containment. These targets consist of cables and conduits in containment that are not adequately protected from the effects of jet impingement, and may fail.

Cause of Event

The preliminary causes of the HELB programmatic inadequacies were lack of a clearly defined, centralized program and owner, and inadequate design basis supporting documentation, modification processes, and calculations. Specifically, documentation and calculations supporting the plant configuration related to HELB protection could not be located, definitions of systems, locations, and protection requirements were disorganized, methodologies used may not have been consistent with industry practice, and system walk-down data was missing.

Preliminary causes specific to the identified issues include:

- Inadequate consideration of the transport of steam through ventilation systems,
- Failure to identify HELB sources near equipment,
- Assumptions that Unit 2 configuration was identical to Unit 1 without verification by field inspections,
- Unanticipated interaction between equipment and adjacent areas with HELB potential, and,
- Inadequate evaluation of jet impingement inside containment.

These issues are symptoms of a larger generic issue, inadequate design and licensing basis control, due to a failure to recognize that maintaining the design basis and providing strong configuration management are vital functions in nuclear power operations.

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Analysis of Event
An Emergency Notification System (ENS) phone call was made on October 22, 1999, at 1500 hours in accordance with 10CFR50.72(b)(2)(i), of a condition which was found while both reactors were shutdown, which, had it been found while the reactor was in operation, could have resulted in the nuclear plant being in an unanalyzed condition that significantly compromises plant safety. This LER is submitted in accordance with the corresponding 10CFR50.73(a)(2)(ii)(A) reporting requirement.

Evaluations of the potential design deficiencies for each of the conditions identified above are ongoing. Results of the evaluations and analysis of the safety significance of the conditions described herein will be provided in a supplement to this LER.

Corrective Actions
No immediate corrective actions were necessary as a result of the identified problems because both units are shutdown and de-fueled, and there are no high-energy conditions in either unit.

The corrective actions to prevent recurrence for the root cause of the generic inadequacies of the design control process are currently being addressed through the CNP Corrective Action Program. The root cause evaluation identified numerous corrective actions to address management, organizational, and programmatic issues in the Engineering organization, and the applicable actions to be completed prior to restart are included in the CNP Restart Plan.

Actions to prevent recurrence specific to the HELB program and the conditions identified are still under development. Preliminary actions identified include:

- A comprehensive re-evaluation of the HELB program,
- Integration of the HELB program from scattered fragments into one program, to include a centralized owner, monitoring requirements, and performance measures,
- Improved procedures for HELB program processes,
- Documentation of assumptions and analyses supporting the revised HELB program,
- Identification and inclusion of appropriate HELB-affected equipment into the Environmental Qualification Program, and
- Modifications to protect equipment from a HELB.

Previous Similar Events
LER 315/99-007-00
LER 315/98-058-00
LER 316/98-007-00
LER 316/98-005-00