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**INDIANA
MICHIGAN
POWER**

AEP:NRC:2573-05

January 12, 2004

Docket No. 50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 2
LICENSEE EVENT REPORT 316/2002-005-01
UNIT 2 TRIP DUE TO INSTRUMENT RACK 24-VOLT DC
POWER SUPPLY FAILURE

In accordance with the criteria established by 10 CFR 50.73, Licensee Event Report System, the following supplemental report is being submitted:

LER 316/2002-005-01: "Unit 2 Trip due to Instrument Rack 24-Volt DC Power Supply Failure."

This LER is being supplemented to correct a statement regarding actions completed in the timeframe of the event. The original LER stated all remaining 24-VDC control group power supplies in Unit 2 were verified to be no older than two years old. This statement was incorrect. In addition, the reference to supplementing the LER upon completion of the root cause evaluation has been deleted since the cause of the event is essentially the same as that initially identified.

Please note that subsequent to this event, Unit 2 tripped on February 5, 2003, as a result of similar equipment failure. This was addressed in LER 316/2003-002. The cause of the February 5, 2003, Unit 2 trip, along with implemented corrective actions, will be addressed in LER Supplement 316/2003-002-01.

There are no new commitments identified in this submittal. Should you have any questions regarding this correspondence, please contact Mr. Brian D. Mann, Acting Regulatory Affairs Manager, at (269) 697-5806.

Sincerely,

Michael J. Finissi
Plant Manager

JP/jen

Attachment

JE22

c: J. L. Caldwell – NRC Region III
K. D. Curry – AEP Ft. Wayne
J. T. King - MPSC
MDEQ – WHMD/HWRPS
NRC Resident Inspector
Records Center - INPO
J. F. Stang, Jr. – NRC Washington DC

NRC Form 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION <h2 style="text-align: center;">LICENSEE EVENT REPORT (LER)</h2> <p style="text-align: center;">(See reverse for required number of digits/characters for each block)</p>	APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004 <small>Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.</small>
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4. TITLE
Unit 2 Trip due to Instrument Rack 24-Volt DC Power Supply Failure

5. EVENT DATE			6. LER NUMBER				7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
05	12	2002	2002	-- 005 --	01	1	12	2004	FACILITY NAME	DOCKET NUMBER	

9. OPERATING MODE	1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)									
10. POWER LEVEL	100%	20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)	
		20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)		50.73(a)(2)(x)	
		20.2203(a)(1)			50.36(c)(1)(i)(A)			X 50.73(a)(2)(iv)(A)		73.71(a)(4)	
		20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)		73.71(a)(5)	
		20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A	
		20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)			
		20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)			
		20.2203(a)(2)(v)			50.73(a)(2)(i)(B)			50.73(a)(2)(vii)			
20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)					
20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(viii)(B)					

12. LICENSEE CONTACT FOR THIS LER

NAME Toby Woods, Regulatory - Compliance Supervisor	TELEPHONE NUMBER (Include Area Code) (269) 466-2798
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	JG	N/A	Lamda	Yes					

14. SUPPLEMENTAL REPORT EXPECTED					15. EXPECTED SUBMISSION DATE				
YES (If Yes, complete EXPECTED SUBMISSION DATE).				X	NO		MONTH	DAY	YEAR

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

At 2301 hrs on May 12, 2002, Unit 2 tripped due to an instrument rack power supply failure. Specifically, the second of two redundant 24-volt direct current (VDC) power supplies to reactor control instrumentation control group cabinet 2-PS-CGC-16 failed. The failure of both power supplies caused steam generator (SG) feedwater regulating valve 2-FRV-210 to close. Unit 2 subsequently tripped on low water level in SG-21 coincident with low feedwater flow. In accordance with 10 CFR 50.72 (b)(2)(iv)(B), a four-hour ENS notification (Event #38915) was made to the NRC on May 13, 2002, at 0255 hours for an event or condition that resulted in an actuation of the reactor protection system (RPS) when the reactor is critical. As such, this LER is being submitted in accordance with the requirements of 10 CFR 50.73 (a)(2)(iv)(A) for a condition or event that resulted in an automatic actuation of the RPS system.

The preliminary cause of this event was age-related failure of components within the power supplies. A contributing factor was that no provisions existed for periodic monitoring of the power supplies.

This event had minimal safety significance since plant procedures and operator training provided sufficient direction for control room personnel to shutdown the plant and maintain it in a safe shutdown condition. The failed 24-VDC power supplies were replaced. The remaining 24-VDC control group power supplies in Unit 2 were inspected and one power supply was replaced. Routine tasks have been established to verify the availability of the 24-VDC power supplies for both Unit 1 and Unit 2.

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

Conditions Prior to Event

Unit 2 – Mode 1, 100 percent power
Unit 1 – Mode 6, 0 percent power

Description of Event

At 2301 hrs on May 12, 2002, Unit 2 tripped due to an instrument rack power supply failure. Specifically, the second of two redundant 24-volt direct current (VDC) power supplies to reactor control instrumentation control group cabinet 2-PS-CGC-16 failed. The failure of both power supplies caused steam generator (SG) feedwater regulating valve 2-FRV-210 to close. Unit 2 subsequently tripped on low water level in SG-21 coincident with low feedwater flow.

The post trip investigation indicated that all control rods fully inserted. The three auxiliary feedwater (AFW) pumps automatically started as expected. The turbine-driven AFW pump was manually stopped to minimize reactor coolant system (RCS) cooldown. The SG stop valves were manually closed to stabilize RCS temperature in accordance with plant procedures. Automatic pressurizer pressure control was disabled due to the failure of the 24-VDC power supplies. As such, RCS pressure was manually controlled using the pressurizer heaters and spray. Due to the failure of the 2-PS-CGC-16, 24-VDC power supplies, the automatic function of the power operated relief valves (PORV) was disabled as well, but manual control remained available.

The volume control tank (VCT) level instrument 2-QLC-451 bi-stables deenergized due to the failure of the 24-VDC power supplies. This caused 2-QRV-303, "RCS letdown to VCT diversion valve," to open to full divert to the hold up tanks, allowing the running centrifugal charging pump (CCP) to significantly reduce VCT level. The loss of 24-VDC disabled automatic makeup to the VCT. Automatic transfer of the CCP suction from the VCT to the refueling water storage tank (RWST) had also been disabled by the loss of the 24-VDC power supply. VCT level dropped to approximately two to three percent, and suction to the charging pumps was manually switched from the VCT to the RWST. Additionally, operators aligned QRV-303 to the VCT position. These manual actions avoided a draindown of the VCT and potential damage to the inservice CCP.

The boration flow path from the RWST was declared inoperable due to the failure of the RWST sequence signal ability to actuate. Both boration flowpaths from the boric acid storage tanks were declared inoperable due to VCT pressure and then declared inoperable again, due to loss of the plant heating steam when the auxiliary building area temperatures fell below the minimum area temperature requirements.

In accordance with 10 CFR 50.72 (b)(2)(iv)(B), a four-hour ENS notification (Event #38915) was made to the NRC on May 13, 2002, at 0255 hours for a condition that resulted in an actuation of the reactor protection system (RPS) when the reactor is critical. As such, this LER is being submitted in accordance with the requirements of 10 CFR 50.73 (a)(2)(iv)(A) for a condition that resulted in an automatic actuation of the RPS system.

Cause of Event

The preliminary cause of this event was age-related failure of components within the control group 24-VDC power supplies. A failure evaluation was performed on the two failed power supplies. The evaluation identified that the failed power supplies were originally installed in 1994 and contained components (capacitors, resistors, etc.) manufactured as early as 1989. As such, the power supplies were four to five years old when first installed and energized in 1994.

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A contributing factor was that no provisions existed for periodic monitoring of the control group 24-VDC power supplies. Additionally, the wiring configuration in the control group 24-VDC power supply racks did not allow on-line replacement of individual failed power supplies.

Analysis of Event

Several control functions were lost due to the failure of the control group 24-VDC power supplies: 1) SG feedwater regulation with valve 2-FRV-210, 2) VCT automatic make-up, 3) automatic switchover of the CCP suction to the RWST on low-low VCT level, and 4) automatic pressurizer pressure control using the pressurizer spray valves and heaters and automatic operation of the PORVs on high pressure.

1. Closing of the feedwater regulating valve 2-FRV-210 is not a significant safety concern for the following reasons:
 - On a reactor trip or loss of normal feedwater, the AFW system starts and supplies the required feedwater flow to shutdown the unit. This function was not affected due to the control group 24-VDC power supply failures because it does not rely on valve 2-FRV-210.
 - 2-FRV-210 failed closed on a loss of the control group 24-VDC power supplies, but this is the desired valve position if a SG tube rupture were to occur or when isolating a faulted SG.
2. VCT level instrument 2-QLC-451 bi-stables deenergized due to the loss of the control group 24-VDC, resulting in the diversion of the RCS letdown from the VCT to the hold up tanks. Deenergizing the 2-QLC-451 bi-stables also disabled the automatic make-up to the VCT and automatic switchover of the CCP suction to the RWST. Moreover, loss of 24-VDC caused the "VCT level hi divert to holdup tanks" alarm and "volume control tank level low" alarm to annunciate and also disabled the "VCT level lo lo refueling water sequence" alarm. Nonetheless, VCT level instrument 2-QLC-451 continued to provide accurate indication of VCT level. In addition, VCT level instrument 2-QLC-452 remained unaffected. Thus, while automatic make-up and switch over to the RWST functions were disabled, control room personnel were able to monitor VCT level and manually switch the CCP suction from the VCT to the RWST.
3. Automatic pressurizer pressure control was disabled, however, manual control of the pressurizer heaters and spray was still available. The PORVs were not available for automatic action, but were available in manual.
4. The boration flowpaths Technical Specification action statements were met.

Based on the discussion above, the safety significance of this event was minimal since plant procedures and operator training provided sufficient direction for control room personnel to shutdown the plant and maintain it in a safe shutdown condition. There was no impact on the health and safety of the public as a result of this event.

Corrective Actions

The failed control group 24-VDC power supplies in control group CGC-16 were replaced. The remaining 24-VDC control group power supplies in Unit 2 were inspected and one power supply in control group 2-CG2-19 was replaced.

Prior to the startup of Unit 1 on June 8, 2002, all 24-VDC control group power supplies in Unit 1 were replaced.

Routine tasks have been established to verify the availability of the control group 24-VDC power supplies for both Unit 1 and Unit 2.

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A modification was performed on the Unit 1 control group 24-VDC power supply racks to allow on-line replacement of failed power supplies. To improve system reliability, a similar modification has been scheduled for Unit 2 during the next refueling outage.

Previous Similar Events

None