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ACCESSION NBR:9510030264 DOC.DATE: 95/09/28 NOTARIZED: NO DOCKET #
FACIL:50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana M 05000316
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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 95-005-00:on 950829,RT occurred on high negative rate resulted from trip of both CRD-MG sets due to mis-adjusted voltage regulators.Replaced CRD-MG common bus overvoltage relay body.W/950928 ltr.

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TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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Cook Nuclear Plant
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Bridgman, MI 49106
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INDIANA
MICHIGAN
POWER

September 28, 1995

United States Nuclear Regulatory Commission
Document Control Desk
Rockville, Maryland 20852

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:

95-005-00

Sincerely,

A. Alan Blind

A. A. Blind
Plant Manager

/clc

Attachment

c: H. J. Miller, Region III
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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	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.

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Donald C. Cook Nuclear Plant - Unit 2	05000 316	1 OF 5

TITLE (4) Reactor Trip on High Negative Rate Resulting From Trip of Both CRD-MG Sets Due to Mis-Adjusted Voltage Regulators

EVENT DATE (5)			LER NUMBER (6)			REPORT NUMBER (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
08	29	95	95	-- 005 --	00	09	28	95	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100%

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.402(b)		20.405(c)	X	50.73(a)(2)(iv)		73.71(b)
	20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
	20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER
	20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		(Specify in Abstract below and in Text, NRC Form 366A)
	20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
W. Nichols, Operations Superintendent	616/465-5901 x2536

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 August 29, 1995 at 0924 with Unit 2 in Mode 1 at 100 percent Rated Thermal Power, the South Control Rod Drive Motor Generator (CRD-MG) output breaker tripped via its directional overcurrent relay. This was followed by the automatic tripping of the North CRD-MG output breaker due to its overvoltage relay logic. Without a CRD-MG running, power was lost to all Control Rod Drive Mechanisms (CRDM's) which allowed all control rods to insert into the core. The Reactor Protection System (RPS) detected the resulting rapid drop in Reactor power and initiated a Reactor trip signal based on the high negative rate logic.

After the Reactor trip, all Safety systems operated normally with the exception of two motor operated valves (MOVs) associated with the West Motor Driven Auxiliary Feedwater Pump (W MDAFP). These valves were in their normally open position at the time of the Reactor trip, and did not respond to a close signal following the trip. This resulted in higher than desired feed water flow to the #21 & #24 steam generators, causing an RCS cooldown to 535 degrees, 12 degrees below the normal RCS post-trip (no load) temperature of 547 degrees.

This event was determined to have no actual or potential adverse effect on the health and safety of the public.

NRC FORM 366A (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Conditions Prior to Occurrence

Unit 2 in Mode 1, Power Operations, at 100 percent Rated Thermal Power at the middle of the Fuel Cycle.

Description of Event

On August 29, 1995 at approximately 0200, in response to South CRD MG set directional overcurrent relay (EIIS/AA-67) contact cycling, the voltage regulators (EIIS/AA-90) were adjusted on the North and South CRD-MG's. Although these adjustments stopped the relay cycling, it resulted in a voltage and reactive load unbalance between the South and North CRD-MGs which were running synchronized to their common output bus. This reactive load unbalance could not be readily determined from the permanently installed instrumentation.

At 0924, the South CRD-MG tripped via its directional overcurrent relay. This was followed after a five second delay by the North CRD-MG tripping due to its overvoltage relay logic (EIIS/AA-53/59). All Control Rod Drive Mechanisms (CRDM's) deenergized which allowed all control rods (EIIS/JD-JC) to insert into the core. The Reactor Protection System (EIIS/JE) detected the resulting rapid drop in Reactor power and initiated a Reactor trip signal based on the high negative rate logic.

All Safety Systems operated normally except for Motor Operated Valves (EIIS/BA-20) 2-FMO-212 and 2-FMO-242 which control Auxiliary Feedwater (AFW) (EIIS/BA) to the #21 and #24 steam generators (EIIS/SB-SG) from the West Motor Driven Auxiliary Feedwater Pump (EIIS/BA-P). These valves were in their normally open position at the time of the trip. When the Balance of Plant Reactor Operator attempted to reduce the AFW flow to all steam generators to prevent excessive cooldown of the (RCS) Reactor Coolant System (EIIS/AB-TT), valves 2-FMO-212 and 2-FMO-242 would not respond to a close signal.

Due to the additional AFW flow, RCS temperature eventually reached 535 degrees, 12 degrees below the normal post trip no load temperature of 547 degrees. The WMDAFP was stopped at 0958 after #21 and #24 steam generator levels returned to their normal values, and stable plant conditions were reached at approximately 1030.

Cause of Event

The root causes of the reactor trip and MOV problem were as follows:

Reactor Trip

No procedural guidance was available to Operations for adjusting the CRD-MG voltage regulators. This resulted in the misadjustment of the voltage regulators approximately seven hours before the Reactor trip. The CRD-MG common bus voltage is normally at 260 volts. However, in an attempt to eliminate relay contact cycling, the CRD-MG sets' no load voltages were adjusted by Operations personnel to 245 volts (South) and 285 volts (North). This resulted in the South CRD-MG output breaker tripping via its directional overcurrent relay followed by the North CRD-MG output breaker tripping via its overvoltage relay logic.

The common bus overvoltage relay was found set too low. It was found to be actuating at 240 volts instead of the desired 300 volts. The field overexcitation relay was found to be set properly at 280 volts. When the South CRD-MG output breaker tripped, bus voltage increased to approximately the 285 volts (no load) of the North CRD-MG set. This voltage allowed the overexcitation relay to actuate. This actuation combined with the existing bus overvoltage actuation completed the overvoltage logic and resulted in a North CRD-MG set output breaker trip.

Auxiliary Feedwater Motor Operated Valve Failures

Following this event, MOV diagnostic testing was performed which found the torque switch for the 2-FMO-242 to trip inconsistently in successive trials.

The investigation also found that torque switch trip (TST) settings for both the 2-FMO-212 and the 2-FMO-242 valves had been reset in early 1995. The reason for the new setpoints was to improve margin between torque switch trip and thermal overload trip of the motor operator supply breaker when operating the valve under postulated degraded voltage conditions. The trip settings were also based on dynamic load conditions corresponding to a postulated high flow/high differential pressure (dP) condition which typically results in the highest thrust demand for globe-style valves.

The FMOs are globe-style valves, but are somewhat unique in that they are designed for flow control and incorporate balanced trim in a cage-guided configuration. With this particular style of globe valve, the load conditions associated with low flow and high backpressure, i.e. those conditions which exist following a normal reactor trip, create the highest thrust demand that the motor-operator must support. The TST settings which existed prior to being reset permitted the valves to operate properly under the low flow/high backpressure conditions, which the new settings did not.

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Analysis of Event

This event is being reported per 10CFR50.73(a)(2)(iv) as an event that resulted in automatic actuation of Engineered Safety Features (ESF) including the Reactor Protection System (RPS). This event began with the sequential automatic tripping of the North and South CRD-MGs. The RPS detected the rapid drop in Reactor power caused by deenergizing all CRDMs and initiated a high negative rate Reactor trip signal. All Control rods fully inserted, the turbine tripped, both Motor Driven Auxiliary Feedwater Pumps started, and a feedwater isolation signal occurred, all as designed.

Normal off-site power was available. The Emergency Diesel Generators were in standby, and no safety equipment was out of service prior to the trip. All systems functions as required with the exception of the of 2-FMO-212 and 2-FMO-242. The East Motor Driven Auxiliary Feed Pump (E MDAFP) and the Turbine Driven Auxiliary Feedwater Pump (TDAFP) and their associated valves were available and functioned properly.

Because of the FMOs' failure to reposition and the resultant cooldown, a Shutdown Margin calculation was performed to assure that the margin had been maintained throughout the event. The calculation indicated that an adequate margin would have been provided at 535 degrees F for at least 46 hours after the event, assuming one stuck rod and no dilution.

It was determined that this event did not have any actual or potential adverse impact the health and safety of the public.

Corrective Actions

The CRD-MG common bus overvoltage relay body was replaced and the calibration of the CRD-MG individual overvoltage relays checked. All related overvoltage relays were functionally tested, and all direction overcurrent relays were calibrated.

Written standing orders were issued directing Operations personnel to contact Plant Engineering when CRD-MG voltage regulator adjustments are desired, and aids were posted on the CRD-MG sets control panels to indicate normal operating zones.

The need for both CRD-MG common bus and individual overvoltage relays is being evaluated, as well as the possibility of replacing the overvoltage relays with a different protective device.

The torque switch for the 2-FMO-242 valve was replaced and tested satisfactorily.

NRC FORM 366A (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

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Corrective Actions (cont'd)

Torque switch settings for 2-FMO-212 and 2-FMO-242 were increased to ensure that the valves are capable of operating under the low flow and high backpressure load conditions. Post-maintenance testing confirmed this prior to returning the unit to service. The TST settings associated with the Unit 2 East MDAFP, 2-FMO-222 and 2-FMO-232, had not yet been lowered as had the settings for 2-FMO-212 and 2-FMO-242. These valves were tested and verified to be at an acceptable setting.

The TST settings associated with the Unit 1 MDAFP valves, 1-FMO-212, -222, -232 and -242, had been reset. Since that time, the valves had operated in response to a July 1995 unit trip and performed properly. Despite this, the Unit 1 valve TST settings were also increased to better support the low flow/high backpressure load condition.

Failed Equipment

Component I.D.: Torque Switch
Component Manufacturer: Limitorque
Model #: SMB-000

Similar Events

None