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DUKE POWER

September 27, 1994

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Catawba Nuclear Station
Docket No. 50-414
LER 414/94-005

Gentlemen:

Attached is Licensee Event Report 414/94-005 concerning REACTOR TRIP DUE TO DRAWING ERROR.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

D. L. Rehn

xc: Mr. S. D. Ebneter
Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
101 Marietta Street, NW, Suite 2900
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Mr. R. E. Martin
U. S. Nuclear Regulatory Commission
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Washington, D.C. 20555

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NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

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.

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Catawba Nuclear Station, Unit 2	05000414	1 OF 6

TITLE (4)
Reactor Trip Due to a Drawing Error

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
									N/A	05000
08	30	94	94	-- 005 --	00	09	27	94	CNS, Unit 2	05000414

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	100%		20.402(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)
D. P. Kimball, Safety Review Group Manager	(803) 831-3743

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 30, 1994 at 2130 hours, Unit 2 Reactor (Rx) Trip occurred while maintenance personnel were investigating the cause of the Reactor Trip/Safety Injection events recorder point being in alarm. Unit 2 was in Mode 1, Power Operation at 100% power. As a part of investigating the cause of the alarm a maintenance technician determined that it would be necessary to open a sliding link. The link as shown on the drawing used by the technician should have been in the Rx Trip/ Safety Injection events recorder point circuitry; however, it was actually in the Manual Safety Injection/Reactor Trip circuitry. This is the circuit that supplies 48 volts direct current (vdc) from the Solid State Protection System (SSPS) to the undervoltage trip coil for the Reactor Trip Breaker (RTB). When the link was opened, the 48vdc was removed from the RTB undervoltage (UV) trip coil resulting in an UV trip immediately followed by a shunt trip induced by the UV coil tripping and a Rx Trip. The subsequent investigation revealed that the wrong link was opened due to being incorrectly identified on the drawing.This event is attributed to less than adequate work practices in that self-checking was not properly applied because the error was not recognized during an earlier revision to the drawing. Corrective actions include revising the drawing, changes to the Engineering guideline for checking drawings, and evaluation of the troubleshooting process.

REQUIRED NUMBER OF DIGITS/CHARACTERS
FOR EACH BLOCK

BLOCK NUMBER	NUMBER OF DIGITS/CHARACTERS	TITLE
1	UP TO 46	FACILITY NAME
2	8 TOTAL 3 IN ADDITION TO 05000	DOCKET NUMBER
3	VARIES	PAGE NUMBER
4	UP TO 76	TITLE
5	6 TOTAL 2 PER BLOCK	EVENT DATE
6	7 TOTAL 2 FOR YEAR 3 FOR SEQUENTIAL NUMBER 2 FOR REVISION NUMBER	LER NUMBER
7	6 TOTAL 2 PER BLOCK	REPORT DATE
8	UP TO 18 -- FACILITY NAME 8 TOTAL -- DOCKET NUMBER 3 IN ADDITION TO 05000	OTHER FACILITIES INVOLVED
9	1	OPERATING MODE
10	3	POWER LEVEL
11	1 CHECK BOX THAT APPLIES	REQUIREMENTS OF 10 CFR
12	UP TO 50 FOR NAME 14 FOR TELEPHONE	LICENSEE CONTACT
13	CAUSE VARIES 2 FOR SYSTEM 4 FOR COMPONENT 4 FOR MANUFACTURER NPRDS VARIES	EACH COMPONENT FAILURE
14	1 CHECK BOX THAT APPLIES	SUPPLEMENTAL REPORT EXPECTED
15	6 TOTAL 2 PER BLOCK	EXPECTED SUBMISSION DATE

BACKGROUND

The Reactor Trip System [EIIS:JC] automatically keeps the reactor [EIIS:RCT] operating within a safe region by shutting down the reactor whenever the limits of the region are approached. This system can also be manually actuated.

The following systems make up the Reactor Trip System:

1. Process Instrumentation and Control System [EIIS:JF]
2. Nuclear Instrumentation System [EIIS:IG]
3. Solid State Logic Protection System
4. Reactor Trip Switchgear [EIIS:SWGR]
5. Manual Actuation Circuit

The Reactor Trip System consists of sensors which, when connected with analog circuitry consisting of two to four redundant channels, monitor various plant parameters; and digital circuitry, consisting of two redundant logic trains, which receives inputs from the analog protection channels to complete the logic necessary to automatically open the reactor trip breakers [EIIS:52].

Each of the two logic trains, A and B, is capable of opening a separate and independent reactor trip breaker, RTA and RTB, respectively. When either of the trip breakers opens, power is interrupted to the rod drive power supply [EIIS:JD], and the control rods [EIIS:ROD] fall, by gravity, into the core. The rods cannot be withdrawn until the trip breakers are manually reset.

The Reactor Trip System initiates a turbine [EIIS:TRB] trip signal whenever reactor trip is initiated to prevent the reactivity insertion that would otherwise result from excessive reactor system cooldown and to avoid unnecessary actuation of the Engineered Safety Features Actuation System [EIIS:JE].

EVENT DESCRIPTION

On August 30, 1994, with Unit 2 in Mode 1 and power operation at 100% power, the control room received an events recorder point alarm for "manual safety injection/reactor trip" on RTA.

The control room notified Maintenance of the problem with the events recorder point being in alarm. Maintenance technicians obtained a copy of the events recorder printout, reviewed the events recorder and computer point summary documents, and pulled drawings in preparation for troubleshooting.

The technicians began limited troubleshooting by taking various voltage readings. During this process, the technicians noted some voltage readings that were not expected. These technicians were unable to conclusively determine the problem during this initial troubleshooting phase. The technicians determined that a more detailed troubleshooting plan was needed and subsequently issued work order 94066235-01 in preparation for turning over the work to night shift personnel.

At approximately 1930 hours, following a turnover from day shift two night shift technicians assigned this task assembled the necessary drawings and prepared a more detailed troubleshooting plan using troubleshooting procedure IP/0/A/3890/01. At this point, the technicians suspected that an optical isolator in the circuit was defective. Due to the results of the initial troubleshooting being inconclusive, the technicians were not able to gain any useful information from the day shift personnel. The technicians contacted the control room prior to beginning work.

At approximately 2100 hours, the technicians went to the work location and began taking some initial voltage readings. Based on these readings and the standard practice of troubleshooting optical isolators, Technician A placed a jumper between sliding links A21 and A22 trying to get the optical isolator to change states. The optical isolator did not change states as expected. At that time, Technician A felt that he was dealing with an energized optical isolator. The Technician reviewed the electrical elementary again and visually checked the cabinet circuitry and determined that opening link A21 would remove power from the optical isolator. Technician A contacted the control room again and informed them he was going to open link A21 and that they may receive alarms on computer and events recorder points. From review of the electrical elementary, the technician concluded that his action could only affect these alarm indications.

At 2130 hours, a reactor trip occurred when link A-21 was opened due to the 48vdc current being removed from the UV trip coil. Following the reactor trip, Operations and Maintenance technicians began to investigate the cause. The investigation determined that drawing CNEE-0274-01.11 listed the wrong link number for the events recorder point circuit.

The control room entered EP/2/A/5000/E-O, REACTOR TRIP OR SAFETY INJECTION, then entered EP/2/A/5000/ES-0.1, REACTOR TRIP RESPONSE, and recovered from this event.

CONCLUSION

The reactor trip is attributed to less than adequate work practices in that self-checking was not properly applied because the error was not recognized during an earlier revision to the drawing. Engineering reviewed the drawing and concluded that the drawing has been incorrect since construction. This drawing was redrawn editorially by Minor Mod CE-3515 to make the drawing easier to understand. Because this was an editorial change, only the effected drawings were used in the checking process. This met the expectations for checking editorial changes to drawings at that time. This process will be evaluated to determine if changes are needed to the current work practices. If changes to the current guideline are needed, the appropriate documents will be revised. The corresponding Unit 1 drawings were reviewed and found to be correct. The incorrect Unit 2 drawing has been revised.

The technicians were using the troubleshooting procedure (IP/0/A/3890/01), the optical isolator procedure (IP/0/A/3840/003B), and the appropriate electrical elementary diagram. Using the electrical elementary diagram and having reviewed the physical circuit containing link A-21, the technicians determined that opening link A-21 would only remove power from the optical isolator in the events recorder circuit. When power was removed, the technician expected the optical isolator to change states providing positive indication that the optical isolator was not operating correctly. Technician A reviewed the electrical elementary diagrams to determine what actions to take and what affect those actions would have on plant operation. Technician B, using the same electrical elementary diagrams, verified that these actions were correct and would not affect other plant equipment. When Technician A opened Link A-21, the reactor tripped because of the removal of the 48vdc from the UV trip coil from the reactor trip breaker.

The electrical elementary drawing used when troubleshooting this circuit showed only one wire terminated on each side of the link which was verified by observing the link. This indicated that opening the link should have been an acceptable method for isolating power to the optical isolator without affecting other circuits or components. Through discussions with technicians,

it was determined that normal work practices include use of only the electrical elementary drawing when working with this type of circuit (one wire in; one wire out) and field wiring confirms it is one wire in; one wire out. This work practice was evaluated by Maintenance Management and determined to be acceptable. To ensure consistent expectations are defined and understood by technicians, Maintenance management will review the troubleshooting process to determine if enhancements can be made to improve the quality of the process and set a firm policy on what electrical drawings to use when troubleshooting.

During this investigation, another issue was identified that warrants corrective action but was not determined to be a causal factor for this event. When planning the task of troubleshooting the Events Recorder point in alarm, a technician with limited electrical experience verified the troubleshooting plan. Maintenance management's expectations are that all troubleshooting plans are prepared and verified by fully qualified technicians. Even though this verification did not meet Maintenance management's expectations, it was determined that the verification process would not have affected the outcome of this event and would not have prevented the Rx Trip. Following this event, other experienced technicians reviewed the troubleshooting plan and indicated that they agreed with the logic used during the verification process. Maintenance management will reinforce the expectations for the verification process with all technicians and supervisors.

Control room personnel immediately entered the reactor trip or safety injection emergency procedure, then transitioned to the reactor trip response procedure to place the unit in a safe condition. Following the reactor trip, all systems responded as expected.

This event is not recurring based on a review of operating experience data for the previous 24 months. This review revealed no Licensee Event Reports (LERs) at Catawba due to a drawing error. The Safety Review Group (SRG), using the symptom classification analysis technique, has identified an adverse trend with drawing problems. The SRG will generate a Problem Investigation Process (PIP), identifying this trend to the Engineering Department and will provide Engineering a list of problems for the past 24 months. SRG will assist Engineering in determining commonalities and development of appropriate corrective actions.

CORRECTIVE ACTIONS

IMMEDIATE

1) Control Room Operators entered procedure EP/2/A/5000/E-0, REACTOR TRIP OR SAFETY INJECTION.

SUBSEQUENT

1) The corresponding Unit 1 electrical elementary drawings were reviewed and determined to be correct.

2) Maintenance management reinforced with technicians the expectation of using fully qualified technicians for performing independent verifications.

3) Engineering has revised drawing CNEE-0274-01.11.

4) Engineering counseled the team members involved

PLANNED

1) Engineering guidelines for preparing and checking editorial changes to drawings will be revised to provide clear guidance on the proper cross reference documents to be used during this process.

2) Maintenance Management will review the troubleshooting process to determine if enhancements can be made to improve the quality of the process and set a firm policy on what electrical drawings to use when troubleshooting.

SAFETY ANALYSIS

Unit 2 was in Mode 1 at 100% power upon receipt of a Manual Reactor Trip signal. The trip occurred due to opening a sliding link that removed the 48vdc from the UV trip coil resulting in an undervoltage trip immediately followed by a shunt trip induced by the UV coil tripping. No primary or secondary Power Operated Relief Valves [EIIS:V] or Safeties lifted during this transient. Control Room Operators responded properly to stabilize primary and secondary systems. All systems responded as expected during this event.

The health and safety of the public were not affected by this event.