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FACIL: 50-261 H. B. Robinson Plant, Unit 2, Carolina Power & Light C 05000261

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SUBJECT: LER 88-003-00: on 880128, design single-failure discrepancy that may result to loss of safety injection pump autostart & seven more similar scenarios found. Caused by original design deficiency. Mod implemented & review planned. W/880227 ltr.

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NRC Form 366 (9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2	0 5 0 0 0 2 6 1	1 OF 0 6

TITLE (4)
LOSS OF SAFETY INJECTION PUMP AUTOSTART DUE TO EIGHT SINGLE-FAILURE SCENARIOS

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 NAMES	DOCKET NUMBER(S)
0 1	2 8	8 8	8 8	— 0 0 3 —	0 0	0 2	2 7	8 8		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): N

POWER LEVEL (10): 1 0 0

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

[ ] 20.402(b)	[ ] 20.405(c)	[ ] 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 *(Specify in Abstract below and in Text, NRC Form 366A)*
[ ] 20.405(a)(1)(iii)	[ ] 50.73(a)(2)(i)	[ ] 50.73(a)(2)(viii)(A)	
[ ] 20.405(a)(1)(iv)	[X] 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
Don Sayre, Senior Specialist - Regulatory Compliance	AREA CODE 8 0 3 3 8 3 - 1 2 4 2

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
B	B Q		W 1 2 0	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

[X] YES *(If yes, complete EXPECTED SUBMISSION DATE)* [ ] NO

EXPECTED SUBMISSION DATE (15): MONTH 0 7 DAY 0 1 YEAR 8 8

ABSTRACT *(Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines)* (16)

During review for an NRC Request for Additional Information, the licensee found an original design single-failure discrepancy: failure of "B" Battery (dc control power) during safety injection (SI) could leave only one SI pump available for autostart. The Plant Nuclear Safety Committee was convened and determined this was an unanalyzed condition since safety analyses assume two SI pumps available. The NRC was notified at 1749 hours, January 28, 1988, per 10CFR50.72(b)(1)(ii)(A). Hot shutdown was required within eight hours. At 2356 hours, the NRC was notified that the discrepancy had been resolved and the Plant was returned to full power at 0535 hours, January 29. Then, at 1410, the NRC was notified of another aspect of the unanalyzed condition: loss of "A" Battery could result in loss of "A" diesel generator and emergency bus E-1, the power supply for two of the three injection pumps. Hot shutdown was achieved at 2026 and cold shutdown at 1942 January 30. Further review found seven additional scenarios for a total of eight postulated single-failure events. Seven scenarios were resolved by February 12, with one remaining, pending NRC approval of a license amendment restricting maximum power to 60% with automatic operation of only one injection pump assuming a single failure. This amendment will permit operation at reduced power while final resolution is pursued. This LER is submitted pursuant to 10CFR50.72(a)(2)(ii)(A).

NRC Form 366A (9-83)

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

I. DESCRIPTION OF EVENT

During review of Plant documents in response to an NRC Request for Additional Information on the automatic transfer scheme for Safety Injection Pump "B" (SIP-B), the licensee identified a design discrepancy.[1,2] As originally designed, a single failure of the "B" Battery during a safety injection could result in only one SI pump (SIP-A) being available for automatic start on a Safeguards signal.[3,4,5] The tie bus between the E-1 and E-2 emergency busses would be energized from the E-1, but there would be no control power to close the breakers for SI pumps "B" and "C".[6,4] The closing power for the SIP-B breaker comes from the "B" Battery.

A special session of the Plant Nuclear Safety Committee (PNSC) was convened at 1625 hours, Thursday, January 28, 1988, to review the issue. At 1700 hours, the PNSC determined that an unanalyzed condition existed since the safety analyses for a Large Break Loss of Coolant Accident, Small Break Loss of Coolant Accident, and Main Steam Line Break assume two SI pumps avaiable. At 1749 hours, the licensee notified the NRC Emergency Operations Center of a non-emergency one-hour reportable condition in accordance with 10CFR50.72(b)(1)(ii)(A) via the Emergency Notification System (ENS).

As initially understood, the one single failure scenario, loss of the "B" Battery, could result in the loss of the Plant's ability to automatically start two SI pumps as required by the Plant Final Safety Analysis Report (FSAR).

The condition placed the Plant into Technical Specification 3.0 which required the reactor to be in hot shutdown by 0100 hours,January 29, 1988, if the condition could not be corrected. An alternative breaker alignment and related procedure changes were pursued as an interim approach to eliminate the common mode failure.

At 2356 hours, January 28, a followup notification to the Emergency Operations Center was made by the licensee. In this communication, the NRC was informed that the procedure changes had been made and that a functional test of SIP-B had been performed. These actions allowed termination of the Limiting Condition for Operation at 2343 hours, January 28.

Technical Specification Action Statement 3.0 when entered required hot shutdown in eight hours. The Plant had begun a 10 percent per hour descent in power. Prior to hot shutdown, however, the breaker arrangement problem was resolved and the Plant was returned to full power at 0535 hours, January 29.

[1]NRC letter NRC-88-017 dated January 14, 1988.
[2]H. B. Robinson Unit No. 2 is a Westinghouse 700 MW Pressurized Water Reactor in commercial operation since March 1971.
[3]Battery EIIS Codes: System - EJ; Component - BTRY; Manufacturer - G185.
[4]SIP EIIS Codes: System - BQ; Component - P; Manufacturer - W318.
[5]Safeguards EIIS Codes: System - JE; Component - Not Available; Manufacturer - W120.
[6]Bus EIIS Codes: System - EK; Component - BU; Manufacturer - W120.

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

Later in the day, January 29, during follow-up of the event, it was discovered that a single failure of the "A" Battery could result in a loss of the "A" Emergency Diesel Generator during a design basis event since the "A" Battery supplies control power to this diesel generator. Loss of the "A" Emergency Diesel Generator (and emergency bus E-1) would result in the loss of SIP-A and SIP-B since the tie bus feeding SIP-B is normally fed from E-1. The tripping power for the tie bus normal feed breaker from E-1 would also be lost due to the assumed failure of the "A" Battery. Since the normal tie bus feeder breaker would not automatically open, the interlock necessary for the alternate supply breaker from E-2 to close would not be satisfied. Therefore, without manual actions, SIP-B would not start. This again placed the Plant in an unanalyzed condition. Technical Specification 3.0 was entered, requiring the reactor to be in hot shutdown in eight hours and cold shutdown in the next 30 hours. At 1410 hours, the licensee notified the Emergency Operations Center of this unanalyzed condition in accordance with 10CFR50.72(b)(1)(ii)(A) via the ENS. Since it appeared that other single failures could be postulated, the licensee decided to conduct a more detailed review. The Plant proceeded to hot shutdown, then to cold shutdown.

At 2036 hours, January 29, the licensee made a followup notification to the Emergency Operations Center to report the reactor in hot shutdown at 2026 hours.

At 2035 hours, January 30, the licensee made a followup notification to the Emergency Operations Center to report the reactor in cold shutdown at 1942 hours.

The Plant entered a forced outage for resolution of the conditions identified and to allow for further design review, to determine whether there may be other single-failure scenarios. This continued investigation identified a total of eight scenarios under which the electrical distribution system may not meet the Plant licensing basis concerning single-failure vulnerability. The Plant remains in cold shutdown as of this writing.

Seven of the eight scenarios were resolved by the licensee by February 12, 1988. Resolution of the remaining scenario requires additional extensive engineering review and has been addressed on an interim basis by analysis justifying the need for only one SI pump at steady state reactor core power levels no greater than 60 percent (1380 Megawatts thermal). A request for a license amendment to address restricted power operation was submitted to the NRC on February 24, 1988.

The eight single-failure scenarios have been described in letters submitted to the NRC.[7,8]

[7]Letter, M. A. McDuffie, CP&L, to USNRC dated February 12, 1988 (Serial NLS-88-035).

[8]Letter, M. A. McDuffie, CP&L, to USNRC dated February 24, 1988 (Serial: NLS-88-044).

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

II. CAUSE OF EVENT

The cause of the single-failure susceptibility appears to be inherent in the design of SIP-"B" and the emergency ac and dc distribution systems in how they provide control power and motor power for SIP-"B". Specifically, the SIP-"B" was designed to be powered automatically from either the "A" or "B" Train (480V emergency power) via a tie bus arrangement (Figure 1). Power would be preferentially supplied by the "A" Train (bus E-1) through a tie breaker. If power was unavailable, the selection logic would sense this tie breaker open and the opposite tie breaker would be closed by the SI sequencer, providing power from the "B" Train (bus E-2) However, control power for SIP-"B" would be provided by only the "B" Train ("B" dc distribution system). It was this configuration (two trains of power, one train of control) and the interrelation of the "A" and "B" Train logics associated with automatic starting of SIP "B" that created the various combinations of single-failure scenarios.

The design deficiency occurred during the original design of the Plant and details as to the reasons are still being investigated. Additional details will be provided in a supplement to this LER when the investigation is complete.

III. ANALYSIS OF EVENT

The single failure resulting in the potential loss of two of the three automatically initiated SI pumps resulted in an unanalyzed condition since the safety analyses assume a flow from two SI pumps to mitigate the consequences of the accidents analyzed. As the first single-failure susceptibility was recognized, immediate corrective was taken to eliminate it by a change in breaker alignment. However, a second aspect was recognized shortly thereafter and it was recognized that a more indepth review was needed to determine the potential for additional single failures. Accordingly, the reactor was taken to cold shutdown.

Analyses are being conducted to support return to power operation. Results from these analyses will be used to provide a more detailed event analysis in a supplement to this LER.

IV. CORRECTIVE ACTIONS

Corrective action for each of the scenarios identified are detailed in the previously referenced correspondence.[7,8] Permanent corrective action for one scenario required more extensive engineering review. Accordingly, as a interim measure to return the Plant to operation, analyses have been performed to establish a power level at which operation with only two available automatically initiated SI pumps (and assuming a single failure of one) could be justified. That power level has been determined to be 60% of rated power (1380 Megawatts thermal). Accordingly, a modification has been implemented to remove the automatic start feature of SIP-"B" and thus eliminate the single failure. As a longer term solution and as additional corrective actions are implemented, appropriate licensing action will be initiated. These actions will be detailed in a supplement to this LER.

*U.S.GPO:1986-0-624-538/455

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

V. ADDITIONAL INFORMATION

A. Failed Component Identification

The emergency electrical distribution dc system is of Westinghouse design, 125 volts, two independent battery banks with separate battery chargers fed by the two emergency diesel generators.

B. Previous Similar Events

No other postulated single-failure scenarios have been identified or reported on with regard to the SI emergency electrical dc control power distribution system.

LER-87-030-00 of December 17, 1987, reported a potential single-failure that could prevent two redundant Safety Injection and Residual Heat Removal Valves from opening remotely from the Unit 2 Control Room.

LER-87-026-00 of November 12, 1987, reported a potential for degraded recirculation flow for the Residual Heat Removal Pumps due to a common miniflow recirculation configuration.

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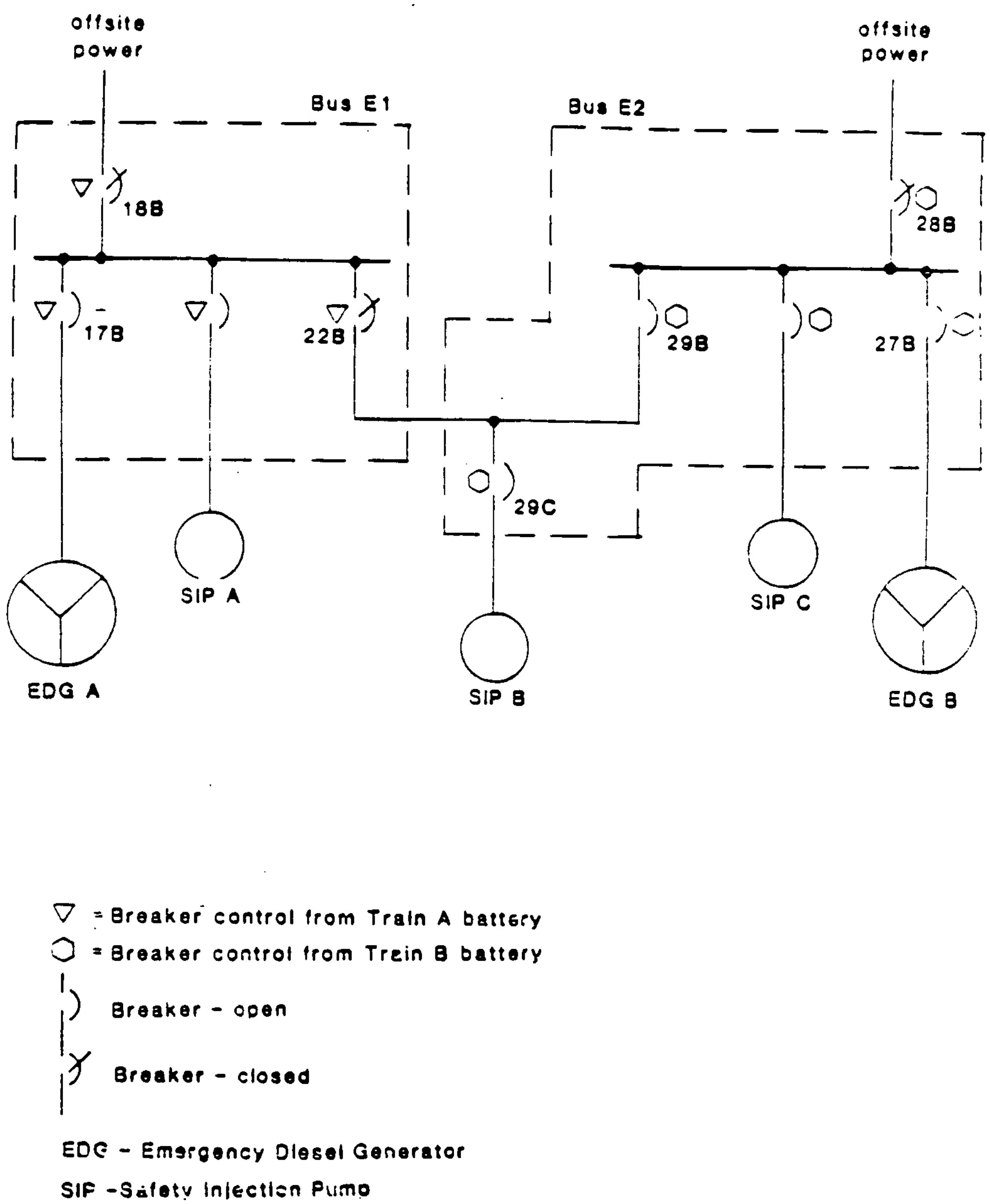
TEXT (If more space is required, use additional NRC Form 366A's) (17)

Figure 1

Normal Emergency Bus Lineup

(Before Jan 28, 1988)



NRC FORM 366A (9-83)

★U.S.GPO:1986-0-624-538/455

CP&L

Carolina Power & Light Company

ROBINSON NUCLEAR PROJECT DEPARTMENT
POST OFFICE BOX 790
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FEB. 27 1988

Robinson File No: 13510C

Serial: RNPD/88-1084
(10 CFR 50.73)

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
LICENSEE EVENT REPORT 88-003-00

Gentlemen:

The enclosed Licensee Event Report (LER) is submitted in accordance with 10 CFR 50.73 and NUREG-1022 including Supplements No. 1 and 2.

Very truly yours,

R. E. Morgan
General Manager
H. B. Robinson S. E. Plant

DAS:jch

Enclosure

cc: Dr. J. N. Grace
Mr. L. W. Garner
INPO

IE22
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