Duke Power
A Duke Energy Company

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June 3, 2003

U. S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Duke Energy Corporation
Catawba Nuclear Station Unit 1
Docket Nos. 50-413
Licensee Event Report 413/03-003 Revision 0
Failure of 4160 Volt Breaker Renders 1B1 Component Cooling Water Pump Inoperable for Longer than Technical Specifications Allow

Attached please find Licensee Event Report 413/03-003 Revision 0, entitled "Failure of 4160 Volt Breaker Renders 1B1 Component Cooling Water Pump Inoperable for Longer than Technical Specifications Allow."

This Licensee Event Report does not contain any regulatory commitments. This event is considered to be of no significance with respect to the health and safety of the public. Questions regarding this Licensee Event Report should be directed to R. D. Hart at (803) 831-3622.

Sincerely,

G. R. Peterson

Attachment

IE22

xc:

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NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Failure of 4160 Volt Breaker Renders 1B1 Component Cooling Water Pump Inoperable for Longer than Technical Specifications Allow

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									None	
04	04	2003	2003	- 003 -	00	06	03	2003	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	1
10. POWER LEVEL	100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

	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)		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)	X	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)	X	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	TELEPHONE NUMBER (Include Area Code)
R. D. Hart, Regulatory Compliance	803-831-3622

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	EB	BKR	B455	Y					

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

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

On April 4, 2003 during a start attempt on the 1B1 Component Cooling Water (CCW) pump, the pump would not start with the push button in the control room. The 1B1 CCW pump was declared inoperable and the actions of technical specifications (TS) were applied. Troubleshooting indicated that the failure was internal to the breaker 1ETB6. The breaker was replaced with a spare breaker and the 1B1 CCW pump was satisfactorily tested and declared operable. Additional testing narrowed the failure to the control device on the breaker. The control device was sent to the manufacturer for analysis. The vendor found an intermittent interference problem internal to the control device. Examination of the failure mode led to the conclusion that the breaker was most likely in this condition since the last time the breaker had been operated. Prior to this event, the 1B1 CCW pump had been started to support CCW system testing and had last been closed and tripped on 4/01/03. Therefore, 1B1 CCW pump had been inoperable since 4/1/03. This time frame exceeded the required action time of TS 3.7.7. The overall safety significance of this event was determined to be minimal and there was no actual impact on the health and safety of the public.

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

BACKGROUND

Catawba Nuclear Station Units 1 and 2 are Westinghouse Pressurized Water Reactors [EIIS: RCT].

The Component Cooling Water (CCW) System [EIIS: CC] provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, the CCW System also provides this function for various nonessential components. The CCW System serves as a barrier to the release of radioactive byproducts between potentially radioactive systems and the Nuclear Service Water System (NSWS) [EIIS: BI], and thus to the environment.

The CCW System is arranged as two independent, full capacity cooling loops, and has isolatable non-safety related components. Each safety related train includes two 50% capacity pumps [EIIS: P], surge tank [EIIS: TK], heat exchanger [EIIS: HX], piping [EIIS: PSP], valves [EIIS: V], and instrumentation. Each safety related train is powered from a separate bus [EIIS: BU]. An open surge tank in the system provides sufficient inventory to protect the pumps from a lack of net positive suction head available (NPSHA) due to a moderate energy line break. The pumps have sufficient NPSHA with the surge tank empty provided the piping up to the tank is filled. The pumps on each train are automatically started on receipt of a safety injection signal, and all nonessential components are isolated.

Technical Specification (TS) 3.7.7 requires two (2) operable CCW trains in modes 1-4. A CCW train is considered OPERABLE when:

a. Both pumps and associated surge tank are OPERABLE; and

b. The associated piping, valves, heat exchanger, and instrumentation and controls required to perform the safety related function are OPERABLE.

If one CCW train is inoperable, action must be taken to restore OPERABLE status within 72 hours. If the CCW train cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

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This event is being reported under 10 CFR 50.73(a)(2)(i)(B) (any operation or condition prohibited by the plant's Technical Specifications (TS)), and 10CFR50.36(c)(2)(i) (Limiting Condition for Operation (LCO) not met). No structures, systems, or components were out of service at the time of this event that contributed to the event. At the time these conditions were identified, Unit 1 was operating in Mode 1, Power Operation.

EVENT DESCRIPTION
(Dates and times are approximate)

Date/Time	Event Description
04/01/03~0137	Started CCW pump 1B1 to place CCW system in parallel operations to support CCW system testing.
04/01/03~0237	Stopped CCW pump 1B1 due to CCW system testing completed.
04/04/03~0259	Attempted to start CCW pump 1B1 to support flushing of idle CCW components. When the "on" pushbutton was depressed the pump did not start. The 1B1 CCW pump was declared inoperable and an entry into the Technical Specification Action Item Log (TSAIL) was made.
04/04/03~0754	Engineering, Maintenance and Operations began trouble shooting the 1B1 CCW pump failure to start. Maintenance found an open circuit in the close circuit within the breaker 1ETB6. The breaker was racked-out of its cubicle and visually inspected and cycled. The failure was found to be repeatable and the decision was made to replace the breaker with a spare.
04/04/03~1638	Replaced 1B1 CCW pump 4160 volt breaker and started pump for functional test. The old breaker was quarantined for further evaluation.
04/04/03~1754	The 1B1 CCW pump was declared operable.

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After the breaker was replaced, additional testing narrowed the failure to the control device on the breaker. The control device was sent to the manufacturer for analysis. The vendor found an intermittent interference problem internal to the control device. Examination of the failure mode led to the conclusion that the breaker was most likely in this condition since the last time the breaker had been operated. Prior to this event, the 1B1 CCW pump had been started to support CCW system testing and had last been closed and tripped on 4/01/03. The 1B1 CCW pump was restored to operable status at 1754 on 4/4/03. Therefore, 1B1 CCW pump had been inoperable since 0137 on 4/1/03. This resulted in the 1B1 CCW pump being inoperable for over 88 hours. This time frame exceeded the required action time of TS 3.7.7 (72 hours plus 6 hours to be in hot standby).

There was no indication that the 1B1 CCW pump breaker had failed after the start performed on April 1, 2003. The breaker performed satisfactorily during the testing on April 1, 2003 and the breaker open indication was normal. During this time period routine maintenance activities on both units resulted in several pieces of equipment being taken out of service during the time period that the 1B1 CCW pump was unknowingly inoperable. This did not result in any additional incidents of non-compliance with TS.

CAUSAL FACTORS

The cause of the 1B1 CCW pump breaker failing to close was a failure of limit switch 2 (LS2, contact 10 - 11), to make in the breaker's close circuit in the control device. There are two root causes for the contact failure. One root cause was most likely improper assembly of the breaker's control device. The assembly problem left the control device internals in a bind and caused an intermittent open contact in the breaker's control device disabling the close circuit on the breaker. This root cause is not definite as the failure cannot be intentionally repeated either by site persons or the equipment manufacturer. The second root cause was a weak lever arm return spring on the control device. This spring was also found to be longer than the manufacturer's specifications. These two spring problems would result in less than adequate force on the lever arm and would exacerbate any additional resistance to movement created by an improper assembly.

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CORRECTIVE ACTIONS

Immediate:

1. The breaker for the 1B1 CCW pump was replaced with a spare breaker. The 1B1 CCW pump was tested satisfactorily and declared operable.

Subsequent:

1. The control device on the failed breaker was sent to the manufacturer for analysis.

2. The pre-job briefs for metal clad breaker maintenance have been enhanced by including lessons learned from this event.

Planned:

1. Procedural guidance for post maintenance checks on control devices will be enhanced in maintenance procedures IP/0/A/4974/003, Inspection and Maintenance of 5 HK Air Circuit Breakers, IP/0/B/4974/004, Inspection and Maintenance of 7.5 and 15 HK Air Circuit Breakers, IP/0/B/4974/033, Inspection and Maintenance of 15 VHKX Circuit Breakers.

2. Engineering will evaluate the control device components for possible enhancement and/or replacement. This evaluation will include reviewing information obtained from Duke analyses with the manufacturer.

The planned corrective actions as well as any future corrective actions will be addressed via the Catawba Corrective Action Program. There are no NRC commitments contained in this LER.

SAFETY ANALYSIS

During the time period that the 1B1 CCW pump was inoperable, the 1A CCW train was operable and no equipment was taken out of service that would have rendered this train inoperable. The 1B2 CCW pump was operable along with the 1B diesel generator. A review of

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operator logs did not discover any A train equipment that was taken out of service that would have prevented the A train from performing its intended function.

The increase in conditional core damage probability (CCDP) for the period of the breaker unavailability has been estimated to be approximately 2.4E-07. This CCDP estimate excludes the effects of external events (i.e., fire, tornado, and seismic). This estimate also considered an important change to the current base case PRA (Revision 2b). Catawba has recently completed the replacement of the reactor coolant pump seal packages on all reactor coolant pumps. The new seal packages include the high temperature o-ring material which significantly improves the seal performance when subjected to a loss of seal cooling. The PRA model has been modified for this analysis to reflect the expected improvement in RCP seal performance. The dominant sequences that contribute to the increase in CDF are LOCA initiated sequences with failure of sump recirculation.

The change in early containment failure probability (ECFP) has been estimated to be approximately 1.2E-08 for the time period of concern. For the condition that is the subject of this LER, the change in ECFP is an appropriate indicator of the change in the large early release probability. This estimate is arrived at by assuming that the change in core damage probability is dominated by sequences in which the containment air return fans and hydrogen igniters are available, which would be expected since the failed KC pump breaker has no implications for power to this equipment. This is confirmed by reviewing the dominant cut sets which are LOCA initiated sequences with no loss of AC power. The conditional probability of early containment failure is assumed to be 0.05 which is consistent with NUREG/CR-6595 for high pressure core damage sequences with fans and igniters available. The assumption of high pressure core damage is a conservative simplifying assumption. In summary, the breaker unavailability had only a small impact on the core damage and large early release probabilities.

Catawba performed a search of an industry data base and identified four reported cases of failed breaker control devices. Only one of these, a 1990 report, involved the same type ABB control device. In that case the contact guide (black molded plastic part that holds contacts) was broken and caused a failure to close. This was

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a different failure mode than involved with 1ETB6. No reports on the data base identified any failure similar to the 1ETB6 failure. Knowledgeable station personnel for this equipment do not recall any other instances of this type of failure at Catawba or any other Duke facilities. A previous 4 KV breaker failure to close was due to loose contact parts inside the control device that prevented closure of one of the contacts in the breaker close coil circuit. That failure mode is different from the one experienced in the event that led to this LER. That event was reported in Catawba LER 414-00-001.

Both Catawba and the vendor indicate they have seen some control devices not operate correctly following assembly during the immediate hand held checkout before installation. This problem results in a disassembly and re-assembly of the control device with nothing known to have been changed only to have it work properly when assembled. While this is not common it is known among technicians and is usually caught in pre-installation checks. The vendor has experienced no installed failures of control devices in the manner experienced on 1ETB6 and has heard of none within the industry.

The binding of control devices has been seen to be an occurrence that can happen but to result in failure it must be coupled with an unusually weak spring. The population is viewed as being limited to HK breakers for a total of 188 breakers. The reason for this limited population is that there are design differences in the K-Line control device lever arm, lever arm actuation, and application of the return spring. Based on the above discussion it is not felt that there is a widespread population of binding control devices. Therefore, it has been determined that this breaker failure is random in nature.

In conclusion, the overall safety significance of this event was determined to be minimal and there was no actual impact on the health and safety of the public.

ADDITIONAL INFORMATION

A review of LERs from the last three (3) years found two LERs written for failure of a 4160 volt breaker to close when given a close signal. LER 414-00-001 described an event where a 4160 volt breaker failed to close due to loose contact parts inside the

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control device that prevented closure of one of the contacts in the breaker close coil circuit. LER 413-02-006 described an event where a 4160 volt breaker failed to close due to a failed ring lug wiring connection at the motor disconnect switch. The failure modes in LER 414-00-001 and 413-02-006 are not similar to the event reported in this LER, so this event is not considered to be recurring.

Energy Industry Identification System (EIIS) codes are identified in the text as [EIIS: XX]. This event did involve an equipment failure and is reportable to the Equipment Performance and Information Exchange (EPIX) program.

The breaker is an Asea Brown Boveri (ABB) model 5HK 250, 1200 amp breaker. The breaker has a 5 year preventive maintenance (PM) and a 10 year refurbishment schedule. This work is done onsite under inspection procedure (IP) IP/0/A/4974/003, Inspection & Maintenance of 5 HK air circuit breakers. This breaker was put into service in its current application in November 2000 and was within its scheduled preventative maintenance frequency.

This event did not include a Safety System Functional Failure. There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.