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)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Dresden Nuclear Power Station, Unit 2	05000237	1 OF 8

TITLE (4)
Failure of Diesel Generator Output Breaker to Close During Testing Due to Inadequate Technical Documentation

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 NAME	DOCKET NUMBER
01	13	96	96	-- 001 --	01	05	14	96	None	
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N
POWER LEVEL (10)	000

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

	20.2201(b)		20.2203(a)(3)(i)		50.73(a)(2)(iii)		73.71(b)
	20.2203(a)(1)		20.2203(a)(3)(ii)		50.73(a)(2)(iv)		73.71(c)
	20.2203(a)(2)(i)		20.2203(a)(4)		50.73(a)(2)(v)		OTHER
	20.2203(a)(2)(ii)		50.36(c)(1)	X	50.73(a)(2)(vii)		(Specify in Abstract below and in Text, NRC Form 366A)
	20.2203(a)(2)(iii)		50.36(c)(2)		50.73(a)(2)(viii)(A)		
	20.2203(a)(2)(iv)		50.73(a)(2)(i)		50.73(a)(2)(viii)(B)		
	20.2203(a)(2)(v)		50.73(a)(2)(ii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
R. Jackson, Maintenance Staff Ext. 2483	(815) 942-2920

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
X	EK	52	G080	YES						

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 January 13, 1996, with Unit 2 in the refuel mode, during surveillance testing, the Unit 2 Diesel Generator (DG) output breaker (152-2422) failed to close and energize emergency Bus 24-1 after simulation of a loss of offsite power (LOOP) and loss of coolant accident (LOCA). A contact in the electrical interlock from the Bus 24-1 to Bus 34-1 Tie failed to operate properly and prevented the closing circuitry of DG output breaker from being completed. The failure of the contact to close was due to improper auxiliary contact alignment. The root cause of the improper alignment of the auxiliary contact linkage was due to a lack of technical documentation which led to inadequate preventive maintenance. The auxiliary contact linkage was replaced with a new linkage assembly and the DG output breaker close circuitry was successfully tested.

EVENT IDENTIFICATION:

Failure of Diesel Generator Output Breaker to Close During Testing Due to Inadequate Technical Documentation

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 2 Event Date: 01/13/96 Event Time: 1210

Reactor Mode: N Mode Name: Refuel Power Level: 0

Reactor Coolant System Pressure: 0 psig

B. DESCRIPTION OF EVENT:

On January 13, 1996, with Unit 2 in Refuel, the Unit 2 Diesel Generator (DG) [EK] output breaker (152-2422) failed to close onto 4160 volt emergency Bus 24-1 during the performance of Dresden Operating Surveillance (DOS) 6600-05, "Bus Undervoltage and ECCS Integrated Functional Test". During the failed portion of the surveillance, Bus 24-1 was first de-energized with the Unit 2 DG blocked from starting on bus undervoltage. The Unit 2 DG was then automatically started by simulating a Loss of Coolant Accident (LOCA) signal. The DG output breaker is designed to close when the DG achieves nominal voltage and the ECCS pumps are designed to automatically start in sequential time intervals after the output breaker closure. The output breaker failed to close and the ECCS loads failed to start due to bus undervoltage. Bus 29, which is the power source for the Unit 2 DG vital auxiliary systems, also remained de-energized due to the breaker failure. Immediate actions were to reset the LOCA signal and place the DG control switch in STOP. The DG entered its cooldown sequence as designed and subsequently ran unloaded without cooling water until it tripped on high temperature. The 2/3 DG was not tripped automatically due to the equipment operator being unavailable as a result of investigating the DG output breaker failure at bus 24-1. After being notified of the high temperature alarm and upon arriving to the 2/3 DG room, the operator noticed that the DG had just tripped from high temperature.

Prior to the event, on January 11, 1996, a pre-surveillance check of the DG output breaker interlock logic was performed. Plant Engineering had tested contacts in the Unit 2 DG breaker logic per Dresden Technical Surveillance (DTS) 6600-03, Safety Related Contact Testing. During this testing, the DG output breaker failed to operate while racked to the test position. It was determined that a "B" auxiliary contact (closed when the breaker is open) from the Bus 24-1 to Bus 34-1 crosstie breaker cubicle at Bus 24-1 (152-2432) failed to operate properly. The "B" contact was open when the crosstie breaker was placed in the open position when it should have been closed.

The crosstie breaker was removed from the cubicle and the auxiliary switch operating arm on the breaker was found to be bent. From observation of scratches on the linkage, the arm appeared to have slipped past the linkage without actuating it when the breaker closed. When the breaker was tripped, it is postulated that the arm moved down on top of the linkage, forcing the linkage

forward and actuating the switch. The incorrect position of the "B" contact was the result of the bent breaker arm.

A spare breaker was installed into the cubicle on January 11, 1996, and DTS 6600-03 was successfully completed on the breaker in the test position. However, all auxiliary contacts were not tested with the breaker connected to the bus prior to continuing the DG testing/surveillance.

The DG testing proceeded and failure of the auxiliary contacts to properly line up occurred on January 13, 1996. The breaker was removed from the cubicle and the cubicle auxiliary linkages were identified with loose and improperly configured components.

An inspection was performed on the crosstie breaker. This breaker was stored outside of the designated breaker cubicle with appropriate Foreign Materiel Exclusion (FME) controls established during the outage from 8/8/95 to 9/29/95.

A burr was located on one edge of the operating arm such that an impact at this point could cause the linkage arm to bend into the as found failed position. The FME cover removed from the breaker had a hole at the bottom. The hole in the FME cover corresponded the arm position. Based on this it is believed that during the time of storage outside of the breaker cubicle something impinged upon the covered breaker and damaged the linkage.

The 4Kv breaker periodic maintenance is in DES 6700-04 "Inspection and Maintenance Of General Electric 4Kv Magne-Blast Circuit Breakers Type AMH-4.76-250-OD" for the cubicles, and DES 6700-03, "Inspection and maintenance Of General Electric MC-4.76 Horizontal Drawout Metal-Clad Switchgear" for the breakers.

The scope of DES 6700-04 entails cleaning, lubrication, meggering of the breaker cubicle, verifying the dielectric properties of the insulating components, and replacing of the position switch and aux switch. The position switches and aux switches were in the past changed each time the PM was performed. At the present time, the switches are replaced based upon the date code only. No alignments or checks of alignments of the cubicle's sub-components is made. Based on the current vendor manual, there is no adjustment for the aux operating arm. The procedure for inspection of the aux linkage requires verification that the linkage is properly connected, the cotter pin is in place and the linkage is tight. However, no drawings or dimensions are provided to assure the linkage is properly installed and in the proper configuration. Based on interviews, adjustments to the auxiliary operating arm linkages was historically performed manually with hand tools. Previous versions of the maintenance procedure included the requirement to adjust the aux operating arm and a conflicting note was also included stating that the arm is not adjustable. No guidance was previously provided in the procedure on how to perform this adjustment. The potential to distort the linkage beyond the desired configuration was thus introduced by previous maintenance activities on the breakers.

The failure of the bus crosstie breaker to provide the permissive interlock to the DG output breaker was due to the improper configuration of the station auxiliary switch linkage in the 24-1 and 34-1 crosstie breaker cubicle. When

the crosstie breaker was racked to the "test" position for the logic interlock surveillance, the operating arm on the breaker slipped past the linkage and ended up on top of the linkage instead of remaining under the actuating cam, thereby, changing the configuration of the linkage. When the spare breaker was racked in to the "connect" position and subsequently tripped for the test, the operating arm on the breaker forced the test position operating cam downward into a position below its standby position, which defeated the logic interlock needed to close the DG output breaker.

C. CAUSE OF EVENT:

The root cause of this event was a Management Deficiency, NRC Cause Code E, because the 4Kv breaker preventive maintenance program was inadequate due to a lack of technical documentation for established procedures. Specific deficiencies included:

1. Because 4Kv breaker dimensional drawings of the breaker and cubicle sub-components was not included in the vendor manual and was not available from the vendor, the specified PM performed could not maintain the proper cubicle alignments which resulted in the recurring failures.

2. Previous maintenance practices using earlier revisions of the 4Kv breaker procedure during the late 1980s and into the 1990s included adjusting the breaker aux operating arm and resulted in distortion of the arm in both the horizontal and vertical directions. In addition, since the breakers were previously stored out of the cubicle, near the bus, some breakers became damaged, including the aux operating arm. In this particular event, it is believed that the failed breaker was damaged by a cart or heavy object since there was heavy traffic in the area. When the breaker was installed into the cubicle, the mis-alignment of the breaker arm could be transferred to the cubicle linkages, resulting in bent, loose, broken linkages, and/or aux switch contacts not properly making up, depending on the degree of distortion of the breaker aux operating arm.

3. When any sub-component parts were replaced on the breaker/cubicle, no re-alignment of the breaker/cubicle interface was performed. Contributing to these mis-alignments was the replacement of the aux switch during each PM. When replacing the aux switch, the aux linkage would have to be disconnected providing another opportunity to introduce some distortion to the linkages, especially since there were no drawings of how the linkages were to be set-up.

The following three additional causes contributed to this event:

1) There was insufficient testing performed after installation of a replacement breaker. The testing which was performed with the breaker in the test position did not detect any abnormalities. This testing was not repeated with the breaker correctly racked into the in-service position.

2) Improper control of 4KV breakers. This breaker was stored outside the cubicle secured to the curb for approximately two months with heavy traffic in the area.

3) Inadequate corrective actions from previous events. There have been three previous LERs involving failure of aux switch linkages on 4KV breakers. The corrective actions from these events have not prevented recurrence of this type of failure.

D. SAFETY ANALYSIS:

The failure of the Unit 2 DG output breaker resulted in the inability to supply emergency AC power to Division 2 safety buses in the event of a loss of the normal AC supply to the bus. The bus crosstie breaker which provided the permissive signal to the DG output breaker was damaged while removed from its associated switchgear cubicle and stored in a temporary location during the refuel outage. The failure was detected during plant testing which was performed prior to Bus 24-1 or the Unit 2 DG being declared operable. Therefore, it has been concluded that this failure was not present during plant operations prior to the D2R14 outage or the associated bus 24-1 and Unit 2 DG work.

A review has been performed to determine if this failure could be present in other plant installations. This review evaluated failure data on similar breakers over the past 2 years. Conclusions are that although problems have occurred during storage, testing and installation, no failures of in-service plant equipment have occurred due to a failure of a breaker to open or close on demand.

Dresden Station's emergency on site AC power consists of a Unit DG sized to carry the units ECCS power requirements or supply the power necessary to safely shutdown the unit. Another DG is shared by Units 2 and 3. Had this event occurred when the Unit 2 DG was required to be OPERABLE, the failure of the Unit 2 DG output breaker to close would be mitigated by the ability of the Unit 2/3 DG to supply emergency power to redundant safety equipment. Additionally, the Unit 2 DG was available to be manually loaded to bus 24-1.

Therefore, the safety significance of this event is considered minimal.

E. CORRECTIVE ACTIONS:

The Bus 24-1 to Bus 34-1 Tie breaker cubicle linkage at Bus 24-1 was repaired with the manufacturer specified replacement linkage assembly. Post Maintenance Testing was successfully completed.

The Unit 2 DG was assessed for damage due to the brief run without auxiliary systems by Plant Engineering. This evaluation, which was documented in CHRON 314211, determined that the DG was not adversely impacted by lack of adequate cooling. The operability of the Unit 2 DG was re-established by the successful completion of DOS 6600-05.

A review has been performed which has determined that this event and other problems encountered with 4KV breakers over recent weeks is indicative of an adverse trend in this area. A root cause team was formed to determine the root cause and recommend corrective actions to prevent recurrence. The results of

this investigation are being reported to the NRC through this document, Revision 1 to LER 2-96-001. (Ref: NTS#2371809600101)

The results of the root cause investigation was reviewed by Station Management prior to D2R14 startup. (Ref: NTS#2371809600102)

Station enhancements related to preventing recurrence of the breaker maintenance program root cause include:

1. A new DEP procedure will be created for the alignment of the cubicle/breaker interface (breaker and cubicle). It will include as a minimum; alignment criteria, drawings of the aux switch linkages, replacement instructions for breaker and cubicle sub-components, and a table describing requirements to operate the aux switch for Post Maintenance Verification. (NTS#237180960010 4S1)

2. The cubicle and breaker PM procedures (DES 6700-04, 09, 03 & 11) will be revised to instruct the worker to perform a specified sub-component replacement and line-up, per the new DEP any time it is replaced or requires adjustment. (NTS#237180960010 5S1).

3. Action requests will be written for the performance of breaker to cubicle alignment (new DEP) during the scheduled PM procedures on the given breakers and cubicles. (NTS#2371809600106S1)

Corrective actions related to the contributing causes include:

1. DOP 6500-7, "Racking in 4160 volt manually operated air circuit breaker (ACB), magne-blast hybrid (AMHG) or SF_6 gas circuit breaker (GCB)" has been revised to include enhanced testing requirements. Whenever breakers on busses 23(33), 23-1(33-1), 24(34) and 24-1(34-1) are installed in their respective switchgear cubicles. This testing verifies proper cubicle linkage and auxiliary contact operation. This testing will continue until permanent corrective actions one through three above have been implemented thus assuring a similar event will not occur. (NTS#2371809600103)

2. EMD will create a procedural process to control 4 Kv breakers. This process will include at a minimum a secure location for spare 4 kv breakers. In addition, the breakers that have been removed for maintenance are to be re-located to specific controlled location away from the bus area. This process will be approved by Operations. (NTS#23718096001 07S1)

3. The before cited enhancements to the breaker maintenance program shall serve to fix the contributing cause of ineffective previous corrective actions. Additionally an effectiveness review of the event's corrective actions will be performed by Plant Engineering personnel. (NTS#237-180-96-00100S1.ER)

F. PREVIOUS OCCURRENCES:

LER/Docket Number Title

93-006/05000237 Inadvertent Auto Start of 2/3 Diesel Generator Due to Bus 33 Main Feed Breaker Auxiliary Switch Failure. This event was due to the stationary auxiliary switch linkage disconnecting at a connection point.

Corrective Actions included:

1. Technical Staff to evaluate the feasibility of replacing the existing linkage with a new design.

2. Electrical Maintenance and Technical Staff will evaluate the need for a test breaker and test breaker cubicle for post-maintenance testing of any breaker work.

3. Nuclear Engineering Department will review this linkage problem for possible design consideration during the upgrade project of the existing 250 MVA buses.

4. Tailgate event with Operations Department.

93-012/05000237 Failure of Unit 2 Diesel Generator Output Breaker Due to Mechanical Failure.

This event was due to a bent linkage on the main feed breaker to bus 24-1 from bus 24. This breaker provides a permissive signal to the DG output breaker.

Corrective Actions included:

1. All of the corrective actions from LER 2-93-06

2. Use two operators to re-install the breaker whenever a breaker is completely removed from the cubicle. This will help to reduce the potential for damage to the breaker roller that operates the auxiliary switch linkage.

95-009/05000237 Dresden Unit 2 Tech Spec Required Shut Down Due to Inoperable Unit DG and Subsequent Reactor Scram to Meet Tech Specs.

This failure of the DG output breaker was due to a combination of a failed closed latch monitoring switch coupled with binding of the breaker closing linkage and resulted in a Unit shutdown.

Corrective Actions included:

1. The breaker preventative maintenance practices have been reviewed and procedure upgrades identified with concentration on rapid cycling as a cause of the CL/MS failure.

2. System Engineering is working with company and industry experts to determine if a method exists to detect random degradation of voltage regulator mag amps.

G. COMPONENT FAILURE DATA:

Manufacturer	Nomenclature	Model Number
General Electric	4610v Breaker	AMH 4.76-250-0D

An NPRDS data search was performed and 688 failures with 4KV breakers were reported. There were 26 failures involving auxiliary switch linkage and operator arm problems.