

Commonwealth Edison Company
Braidwood Generating Station
Route #1, Box 84
Braceville, IL 60407-9619
Tel 815-458-2801

ComEd

February 16, 1996
BW/96-0019

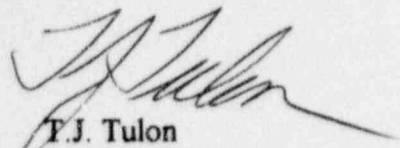
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Washington, D.C. 20555

ComEd men:

The enclosed Licensee Event Report from Braidwood Generating Station is being transmitted in accordance with the requirement of 10 CFR 50.73 (a)(2)(iv), which requires a 30-day report.

This report is number 96-001-00, Docket No. 50-457.

Yours truly,


T.J. Tulon
Station Manager
Braidwood Nuclear Station

TJT/PS/ema
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Encl: Licensee Event Report
No. 457-96-001-00

cc: NRC Region III Administrator
NRC Resident Inspector
INPO Record Center
ComEd Distribution Center
I.D.N.S.
I.D.N.S. Resident Inspector

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PDR ADOCK 05000457
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EXPIRES 04/30/98

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

FACILITY NAME (1)

Braidwood Unit 2

DOCKET NUMBER (2)

05000457

PAGE (3)

1 OF 6

TITLE (4)

inadequate control of staged roofing materials leads to a Loss of Offsite Power due to a loss of both Unit 2 Station Auxiliary Transformers

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	18	96	96	-- 001	-- 00	02	15	96	None	
									FACILITY NAME	DOCKET NUMBER
									FACILITY NAME	DOCKET NUMBER
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)							
			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)		100	20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(ii)	50.73(a)(2)(x)
			20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(ii)			20.2203(a)(4)		X	50.73(a)(2)(iv)	OTHER
			20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME

M. Olson - Root Cause Team

TELEPHONE NUMBER (Include Area Code)

(815) 458-2801 x 2028

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS
E									
X	EBF	TRANSF	A500	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

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

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

At 1232 on 01/18/96, Braidwood Unit 2 lost offsite power due to a loss of both Station Auxiliary Transformers (SAT's). Foreign material, possibly flashing from the Service Building roof, caused a phase-to-ground arc on SAT 242-1. Both Emergency Diesel Generators automatically started and all safe shutdown loads automatically sequenced onto the ESF buses as designed. All automatic bus transfers occurred as designed, maintaining power to the 6.9KV and 4KV non-ESF buses from the Unit Auxiliary Transformers. The reactor remained stable at 100% throughout the transient. A Generating Station Emergency Plan Unusual Event was declared at 1250 due to the loss of offsite power for greater than fifteen (15) minutes. State and local agencies were notified via the Nuclear Accident Reporting System (NARS) at 1302. At 1303, the appropriate NRC notification was made via the ENS phone system pursuant to 10CFR50.72 (b)(2)(ii). By 1425, both Unit 2 ESF buses were cross-tied to their respective Unit 1 ESF buses (141 and 142). All loads that were started by the safe shutdown sequencer were returned to standby, and both Emergency Diesel Generators were shut down. Following testing of SAT 242-2, all buses normally powered from the SAT's during power operation were re-energized via SAT 242-2 and LCOAR 8.1.1-1a for AC Sources operating was exited at 0442 on 01/20/96. Corrective actions address control of staged construction materials onsite and heightened personnel awareness of this event.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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FACILITY NAME (1)		DOCKET NUMBER (2)	LER NUMBER (6)			PAGE# (3)
Braidwood Unit 2		05000457	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 6
			96	-- 001 --	00	

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

A. PLANT CONDITIONS PRIOR TO EVENT:

UNIT: Braidwood Unit 2 EVENT DATE: 01/18/96
EVENT TIME: 1232
MODE: 1 RX POWER: 100%
RCS [AB] TEMPERATURE/PRESSURE: NOT/NOP

B. DESCRIPTION OF EVENT:

There were no systems or components inoperable at the beginning of this event that contributed to the severity of the event.

At 1232 on 01/18/96, Station Auxiliary Transformer (SAT) 242-1 automatically tripped causing a loss of offsite power for Unit 2. Unit 2 was at 100% power at the time. All automatic bus transfers operated as designed, maintaining power from the Unit Auxiliary Transformers (UAT's) to all 6.9KV and 4KV non-ESF buses. Both Unit 2 ESF [JE] buses (241 and 242) were de-energized. 2A and 2B Emergency Diesel Generators (EDG's) [EK] automatically started and closed onto the ESF buses. All safe shutdown loads automatically started and sequenced onto the ESF buses as designed. Abnormal Operating Procedure, 2BWOA ELEC-3 for the loss of a 4KV ESF bus, was performed by the Operators in the Main Control Room. Unit 2 remained stable at 100% power throughout the event. LCOAR 8.1.1-1a was entered for both units.

Immediate inspection of SAT 242-1 identified damage to the B and C phase bushings and a gas detector relay on top of the transformer where heavy arcing occurred. One 345KV switchyard breaker, OCB 11-14, which connects the Unit 2 SAT bank with the switchyard ring bus, was also found damaged with approximately a one square foot section of the phase B bushing blown out.

At 1250 the Control Room declared a Generating Station Emergency Plan (GSEP) Unusual Event based upon Emergency Action Level (EAL) MU1, loss of offsite power for greater than fifteen (15) minutes. State and local agencies were notified via the Nuclear Accident Reporting System (NARS) at 1302.

At 1303 the appropriate NRC notification was made via the ENS phone system pursuant to 10CFR50.72(b)(2)(ii), any event or condition that results in a manual or automatic actuation of any Engineered Safety Feature (ESF) system, including the Reactor Protection System (RPS).

LICENSEE EVENT REPORT (LER)

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

B. DESCRIPTION OF EVENT (continued)

By 1425, both Unit 2 ESF buses were cross-tied to their respective Unit 1 ESF buses. All safe shutdown loads that had automatically started on the Undervoltage sequencer were returned to standby operation, and both Unit 2 Emergency Diesel Generators had been shutdown. SAT's 242-1 and 242-2 were electrically isolated and taken out-of-service for testing and repairs.

The Operational Analysis Department (OAD) tested SAT 242-2 for collateral damage. Oil samples showed no combustible gases present that would indicate internal damage. A turns ratio test, megger test, low voltage excitation test, and high potential test of the bushings and lightning arrestors all indicated that no damage to SAT 242-2 existed. At 0422 on 01/20/96, SAT 242-2 was restored to service and all loads that are normally powered by the SAT bank at power were re-energized via SAT 242-2. LCOAR 8.1.1-1a was exited at this time. SAT 242-1 remained isolated for further testing and repair.

OAD performed the same sequence of tests on SAT 242-1. In addition, a double test was performed on the bushings and lightning arrestors for current leakage paths. The SAT tested satisfactorily with no internal damage indicated. Damaged thermocouple leads were repaired and the gas detector relay was replaced. It was decided to wait for re-energization of SAT 242-1 until repairs to the 11-14 breaker were completed.

Oscillograph traces obtained during the event indicated that all relaying and tripping occurred as designed. Breakers 11-14 and 14-15 both tripped within four (4) cycles. The traces indicate that a phase C arc to ground was the initiating event and that a B to C phase-to-phase arc occurred during the last half of the third cycle, causing the damage observed to the B phase bushing on OCB 11-14. Breaker trips resulted from bus 14, system 1, C phase bus differential and system 2 distance relays. There was no surge present on the oscillograph traces that would indicate a lightning strike prior to the event.

This event is being reported pursuant to 10CFR50.73(a)(2)(iv) - Any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF) system, including the Reactor Protection System (RPS).

NRC FORM 366A
(5-92)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104

EXPIRES 04/30/98

LICENSEE EVENT REPORT (LER)
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Braidwood Unit 2	05000457	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 6
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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

C. CAUSE OF EVENT:

In addition to visual inspections, Substation Construction and the Operational Analysis Department performed numerous tests on the transformer and bushings. All electrical tests performed and oil samples taken indicated no problems existed internally to the SAT. Oil samples showed normal gas levels and no evidence of internal arcing. All damage that was found was externally visible on the B and C phase bushings, a gas detector relay, thermocouple instrument leads, and on a fire protection line deluge head where it appears phase-to-phase and phase-to-ground arcing occurred. Based upon the damage location and relatively good condition of the transformer, a lightning strike and/or internal fault are not considered to be the most likely cause of the failure. No sudden pressure or fault relays were actuated on 2PA23J which would indicate an internal electrical fault, nor was any lightning activity observed in the area prior to or after the event. Evaluation of the oscillograph data obtained after the event showed no surges that would normally be attributable to a lightning strike.

The most plausible failure mode is attributed to some type of foreign material causing phase-to-ground and/or phase-to-phase arcing on the transformer. During the external inspection, small deposits were found on the B and C phase bushings at the point of visible arcing. Samples of these deposits were collected and sent to the Systems Materials Analysis Department. The first sample was removed from the top of the transformer C phase insulator. It was gray in color, slightly magnetic, and 5 to 8 mm on its sides. Its physical appearance suggested that it had been melted. The surface oxidation was removed revealing a shiny metallic material. An analysis with a Scanning Electron Microscope equipped with an X-ray detector indicated that its source was from a 300 series stainless steel. A second sample was taken by wiping the lower insulator with a clean rag. Visual examination found a gray discoloration on the rag. Further microscopic examination revealed very fine, metallic particles that also appeared to have been subjected to heat. These were determined to be mostly aluminum and most likely originated from the gas detector relay on top of the transformer when it failed.

Weather at the time of the event was heavy rain and very windy with sustained winds of 42-45 mph gusting to over 50 mph. Construction materials

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being used in re-roofing of the Service Building were observed to be blowing from the roof to the Northwest side of the Service Building, away from the transformers. Data obtained from the site meteorological tower and eyewitness accounts show a slight shift in wind direction just prior to the loss of the SAT. Other debris was being blown around the protected area due to the high winds, however, eye witnesses do not recall seeing any airborne debris in the area of the transformers prior to the event and no large debris of any substance was found in the immediate area after the event.

Additional samples of materials removed from the roof that were used in the re-roofing project were also sent to SMAD for analysis. Results indicate that some of the flashing material used matched the metallic composition of the sample taken from the top of the C phase bushing.

A contributing cause in this event is a Management deficiency. This is attributed to ineffective corrective actions following three previously identified occurrences of roofing material being blown from the Service Building roof during the re-roofing project.

D. SAFETY ANALYSIS:

This event had no effect on plant or public safety. Both Emergency Diesel Generators automatically started and all ESF safe shutdown loads sequenced onto the ESF buses as designed. The Unit 1 SAT's were available to supply offsite AC power at all times during the event. Unit 2 remained stable at 100% power throughout the event. A loss of offsite power concurrent with a design basis accident is enveloped by the Station's Final Safety Analysis Report.

E. CORRECTIVE ACTIONS:

SAT 242-2 was tested satisfactorily and returned to service with no maintenance required. SAT 242-1 tested satisfactorily for no internal damage. The damaged bushings were refurbished in place and the damaged gas detector relay was replaced. Breaker 11-14 B phase bushing and internal operating contacts have been replaced by Substation Construction.

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Replacement of the Turbine and Service building roofs has been completed and all loose materials have been removed.

SAT 242-1 was returned to service following completion of repairs to switchyard breaker 11-14 on 02/09/96.

To prevent recurrence of staged construction materials from blowing off the roof, materials staged on the roof will be limited to materials that will not blow off the roof, such as buckets of tar, etc. Materials that could potentially blow off the roof will be staged on the roof daily for the work to be performed that day or stored in an area that will prevent them from being blown off.

To heighten personnel awareness of the significance of this event, this event and potential consequences will be reviewed in the Braidwood daily newsletter and communicated to all site personnel. This will be tracked to completion by NTS Action Item #457-180-96-00101.

F. PREVIOUS OCCURRENCES:

There have been previous occurrences of electrical problems resulting in the loss of one or more of the Station's transformers. This is the first occurrence of foreign materials causing the loss. Root causes and corrective actions for the previous events do not apply and would not have prevented the occurrence of this event.

LER NUMBER	TITLE
20-2-94-003	Reactor Trip due to Main Power Transformer Failure. Cause of this event was an internal high side phase B fault on the 2E Main Power Transformer.

G. COMPONENT FAILURE DATA:

MANUFACTURER	NOMENCLATURE	MODEL	MFG PART NO.
ASEA	Station Auxiliary Transformer	TMY 45	S/N 6311-322