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A Centerior Energy Company

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AB-92-024
NP-33-91-008, Rev. 1

Docket No. 50-346

License No. NPF-3

April 28, 1992

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

Gentlemen:

LER 91-008, Revision 1
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence - December 10, 1991

Enclosed please find Revision 1 to Licensee Event Report 91-008. The changes are marked with a revision bar in the margin. Please destroy or mark superseded any previous copies of this LER.

Very truly yours,

Louis F. Storz
Plant Manager
Davis-Besse Nuclear Power Station

LFS/ed

Enclosure

cc: Mr. A. Bert Davis
Regional Administrator
USNRC Region III

Mr. William Levis
DB-1 NRC Sr. Resident Inspector

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NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Davis-Besse Unit No. 1	0 5 0 0 0 3 4 6	1 OF 0 5

TITLE (4)
Reactor Trip Due to Blown Fuse During Maintenance on Non-Essential 4160V AC Bus D2

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 5 0 0 0
1 2	1 0	9 1	9 1	–	0 0 8	–	0 1	0 4	2 8	9 2		0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
3	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0 1 0 0	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)	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
	AREA CODE
Mark A. Turkal, Engineer - Nuclear Licensing	4 1 9 3 2 1 1 - 7 3 7 7

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)	XX NO				

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

On December 10, 1991 at 0906, with the plant in Mode 3, work was beirg performed on non-essential 4160V AC Bus D2 which resulted in a blovn fuse. This caused the reverse phase sequence undervoltage relay for Bus D2 (relay 47/D2) to actuate. Although no actual undervoltage condition existed, actuation of relay 47/D2 caused select Bus D2 load breakers to trip including the Motor Driven Feedwater Pump (MDFP) feeder breaker. The loss of the MDFP resulted in a loss of feedwater to the Once Through Steam Generators (OTSGs), and the subsequent actuation of the Steam and Feedwater Rupture Control System (SFRCS). The SFRCS initiated Auxiliary Feedwater, isolated Main Feedwater, and isolated Main Steam, as designed. In addition, the SFRCS actuation initiated the Anticipatory Reactor Trip System (ARTS) which tripped open the Control Rod Drive (CRD) trip breakers. The group one rods, which were 100% withdrawn, properly inserted into the reactor core. Automatic plant response was satisfactory and operator actions were appropriate. The blown fuse was replaced and feedwater was restored by restarting the MDFP approximately 15 minutes after it tripped.

Based on the results of a multi-disciplinary review team, the following corrective actions will be implemented to prevent similar events: development of a checklist for work affecting 4160V or 13.8KV PT fuses; enhanced pre-evolution briefings; and additional training for Electrical Maintenance Relay Technicians.

Description of Occurrence:

On December 10, 1991 at 0906, the plant was in Mode 1 at normal operating temperature and pressure, during a forced outage for repairs of Emergency Diesel Generator 1-2 (EK). Reactor core decay heat removal was via the Once Through Steam Generators (OTSGs-SD) and the Main Condenser (SG). The Motor Driven Feedwater Pump (MDFP-SJ) was supplying feedwater to the OTSGs. Electricians were performing Station Blackout (SBO) Diesel Generator modification work on the non-essential 4160V AC Bus D2 (EA) in accordance with a maintenance work order.

The work, in part, consisted of disconnecting wires from terminal block 8 in Bus D2 cubicle 3 (AD203). These wires supply power to cubicle 13 (breaker AD213) from the potential transformer, PT, located in cubicle 3. The PT supplies bus phase and voltage instrumentation which includes the bus undervoltage relay. The electricians were performing a preliminary voltage check on the circuitry with one voltmeter lead landed on terminal block 8 when a ground occurred between the secondary side of the cubicle 3 PT and the terminal block 8 shorting bar. Grounding the PT output blew a secondary side PT fuse which properly caused the reverse phase sequence undervoltage relay for Bus D2 (relay 47/D2) to actuate. Although no actual undervoltage condition existed, actuation of relay 47/D2 resulted in tripping of select Bus D2 load breakers which included MDFP feeder breaker.

The loss of the MDFP resulted in a loss of feedwater to the OTSGs. The Steam and Feedwater Rupture Control System (SFRCS-JB) subsequently actuated due to high reverse delta pressure (i.e. OTSG pressure to main feedwater discharge pressure miss-match). The SFRCS initiated Auxiliary Feedwater (BA), isolated Main Feedwater (SJ), and isolated Main Steam (SB), as designed. In addition, the SFRCS actuation initiated the Anticipatory Reactor Trip System (ARTS) which opened the Control Rod Drive (CRD-AA) trip breakers. The group one rods, which were 100% withdrawn, properly inserted into the reactor core. Automatic plant response was satisfactory and operator actions were appropriate. The blown fuse was replaced and the MDFP restarted approximately 15 minutes after it tripped.

This event was reported to the NRC at 1228 hours via the ENS per 10 CFR 50.72(b)(2)(ii) and is being reported as an LER in accordance with 10 CFR 50.73(a)(2)(iv) as an automatic reactor trip.

Apparent Cause of Occurrence:

The root cause of the SFRCS actuation and subsequent reactor trip can be attributed to several contributing factors. The actual ground occurred as a result of personnel error on the part of the electrician performing the preliminary voltage check. This work was made more difficult by physical conditions in the field. Due to the configuration of the installed circuitry, with PT leads landed on a current transformer, CT, terminal block, there was a greater potential for grounding when dealing with energized leads. This made completion of the design corrections very difficult.

The work in progress on the non-essential 4160V AC Bus D2 was intended to correct a design weakness in the circuitry associated with the SBO Diesel Generator. Specifically, the installed circuitry had PT leads landed on a CT terminal block. CT terminal blocks have a shorting bar which creates a greater potential for grounding when dealing with energized leads. The PT leads were installed on a CT shorting block because the vendor drawings used during the design did not clearly identify the block as a CT shorting block. The design required use of six spare terminals and the CT block was the only block in the panel with available terminals. This circuitry configuration is not a standard design practice at Davis-Besse. The design review performed by Davis-Besse Engineering failed to identify this situation and the modification was installed with the design weakness.

The final factor contributing to this event was a lack of adequate communication of the risk associated with the maintenance activities. The risk associated with performing the design enhancement with Bus D2 energized was known. However, a briefing held with the Shift Manager prior to commencing work did not include all members of the Operating Shift and did not adequately address the potential risk to the plant. Thus, actual field work commenced with group one control rods 100% withdrawn and the SFRCS and ARTS armed. When the inadvertent grounding occurred and the MDFP tripped, the SFRCS and ARTS functioned properly and an automatic reactor trip occurred.

Analysis of Occurrence:

The SFRCS and ARTS systems responded as designed. The inadvertent SFRCS actuation in Mode 3 had no effect on plant safety. All group 1 control rods properly inserted into the reactor core. The plant was subcritical both before and after the event. Automatic plant response was satisfactory and operator actions were appropriate.

Corrective Action:

A review team consisting of Maintenance, Design Engineering, Independent Safety Engineering, Systems Engineering and Operations personnel was assembled to review this and similar occurrences to determine what additional precautions should be taken to prevent future events. The following team recommendations will be implemented at Davis-Besse:

1. Electrical Maintenance, Systems Engineering, Planning and Operations will develop a checklist for work that could impact 4160V or 13.8KV PT fuses. This checklist will be included in the MWO package and will contain sufficient information such as relays to be defeated, the effect of bus loss, the basis for scheduling, and other precautions, to allow the Shift Supervisor to make an informed decision to allow, modify, or prevent conduct of the activity. This checklist will be in use by May 29, 1992.

2. Appropriate procedural changes will be made by May 29, 1992 to enhance the existing requirements for content of pre-evolution briefings. The pre-evolution briefings will include the Operating Crew, the Craft Supervisor, Craft Personnel, the appropriate Systems or Maintenance Engineer, and the Design Engineer (for modifications) and will normally be held in the Control Room. The briefing should identify the individual responsible for performing the evolution, the purpose and objective of the evolution, and the equipment or systems involved. In addition, the briefing will review the responsibilities of all personnel involved and the expected system responses and clearly specify values for parameters at which action will be directed to be taken to stop the evolution or mitigate possible failures.

3. Training provided for Electrical Maintenance personnel performing relay maintenance will be modified. The modified training will address the overall operation of electrical systems with associated relaying rather than simply the relay equipment operation. The training will include more hands-on laboratory sessions as well as demonstrations on the Davis-Besse plant specific simulator. The revised training will be implemented by December 4, 1992.

Interim corrective actions have been taken to help prevent recurrence. The importance of proper communication of planned activities, both during shift turnover meetings and during pre-job briefings, was stressed with the Operations and Maintenance organizations. These discussions highlighted the need to ensure

Corrective Action (Continued):

that appropriate personnel are aware of existing plant conditions and the impact the planned activity may have. This event was also reviewed by Operations personnel as part of their required reading. These actions were completed by January 31, 1992

The specific details of this design weakness and the consequences on the plant have been discussed with the Design Engineering Section. This LER was reviewed by Design Engineering personnel by January 31, 1992.

The design deficiency in the SBO diesel circuitry will be corrected during the eighth refueling outage when the non-essential 4160V AC Bus D2 is removed from service.

Failure Data:

Previous instances where the loss of an electrical bus resulted in an unplanned automatic actuation reported under 10 CFR 50.73(a)(2)(iv) include LER 90-006, Inadvertent SFAS Actuation While Defueled When Breaker Switch HAAE2 Was Bumped Open, and LER 90-010, Inadvertent Safety Features Actuation With Injection Of 1,000 Gallons Of Borated Water.

Two previous instances of inadvertent SFRCS initiations have been reported under 10 CFR 50.73(a)(2)(iv). They are LER 88-025, Inadvertent Initiation Of Steam And Feedwater Rupture Control System, and LER 88-026, Inadvertent Initiation Of Steam And Feedwater Rupture Control.

Report No.: NP-33-91-008 PCAQ No.: 91-0612