

Detroit
Edison

William E. Orser
Senior Vice President

Fermi 2
6400 North Dixie Highway
Newport, Michigan 48166
(313) 586-5201



Nuclear
Operations

10CFR50.73

January 10, 1992
NRC-92-0003

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Reference: Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: Licensee Event Report (LER) No. 91-022

Please find enclosed LER No. 91-022, dated January 10, 1992, for a reportable event that occurred on December 11, 1991. A copy of this LER is also being sent to the Regional Administrator, USWRC Region III.

If you have any questions, please contact Joseph Pendergast, Compliance Engineer, at (313) 586-1682

Sincerely,

Enclosure: NRC Forms 366, 366A

cc: C. E. Carpenter, Jr.
A. B. Davis
R. W. DeFayette
S. Stasek
P. L. Torpey

Wayne County Emergency
Management Division

9201150202 920110
PDR ADOCK 05000341
S PDR

Handwritten initials/signature in the bottom right corner.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Fermi 2										DOCKET NUMBER (2) 0 5 0 0 0 3 4 1										PAGE (3) 1 OF 5							
TITLE (4) Primary Containment Negative Pressure During Plant Shutdown																											
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)									
1 2 1		1 9 1		9 1		-		0 2 2		-		0 0 0		1 1 0		9 2		0 5 0 0 0									
OPERATING MODE (9)		4		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)																							
POWER LEVEL (10)		10		20.402(b)						20.405(c)						<input checked="" type="checkbox"/> 50.73(a)(2)(iv)						73.71(b)					
				20.405(a)(1)(i)						50.38(a)(1)						50.73(a)(2)(v)						73.71(c)					
				20.405(a)(1)(ii)						50.38(a)(2)						50.73(a)(2)(vi)						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)(vii)(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)(ix)											
LICENSEE CONTACT FOR THIS LER (12)																											
NAME												TELEPHONE NUMBER															
Joseph M. Pendergast, Compliance Engineer												3 1 3 5 8 6 - 1 6 8 2															
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC																	
SUPPLEMENTAL REPORT EXPECTED (14)												EXPECTED SUBMISSION DATE (15)						MONTH DAY YEAR									
YES (If yes, complete EXPECTED SUBMISSION DATE)												<input checked="" type="checkbox"/> NO															

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

On December 11, 1991, operations personnel were proceeding with the planned plant shutdown for replacement of the 2A main unit transformer. The shutdown plan included utilizing two mechanical vacuum pumps to maintain Main Condenser vacuum for locating a suspected tube leak in the condenser. At 1212 hours, Drywell pressure started decreasing from 15.2 psia to 14.4 psia. The Torus to Drywell and Reactor Building to Torus vacuum breakers began lifting at 1226 hours, as designed, to control the negative pressure. At 1553 hours, the third MSIVs were closed and the Primary Containment Vacuum Breakers stopped cycling. Primary Containment pressure began increasing due to addition of nitrogen which had been started two hours earlier. Drywell pressure was restored to normal and nitrogen addition was terminated at 1922 hours.

Investigation established that the cause of this pressure event was a reverse flow through the Safety Relief Valves (SRVs). The flowpath was from the Drywell through the SRV vacuum breakers, producing reverse flow through the SRVs into the Main Steam Line Drains and to the Condenser, which was at a vacuum condition created by operating two Mechanical Vacuum Pumps. Operations and Plant Support Personnel were not familiar with SRV operation in the abnormal condition of a vacuum environment. Operations, Maintenance and Technical Staff and Managers training will review this event. This training will be completed the first quarter of 1992.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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) Fermi 2	DOCKET NUMBER (2) 0500034191	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		91	022	000	2	OF	05

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

Initial Plant Conditions:

Operational Condition: 4 (Cold Shutdown)
Reactor Power: 0 Percent
Reactor Pressure: 14.7 psia
Reactor Temperature: 169 Degrees Fahrenheit

Description of the Event:

On December 11, 1991, operations personnel were proceeding with the planned plant shutdown for replacement of the 2A main unit transformer (XFMR). The shutdown plan included utilizing Main Condenser (SG) vacuum for locating a suspected tube leak in the condenser. Plans were to maintain condenser vacuum as high as possible to facilitate condenser tube leak location following the reactor shutdown. This was accomplished with the use of both Mechanical Vacuum Pumps (SH). Two Mechanical Vacuum Pumps were in service, each having a capacity of 1345 Standard Cubic Feet per Minute (SCFM) at 10 inches Hg absolute.

At 1212 hours, Drywell pressure started decreasing from 15.2 psia to 14.4 psia. The Torus to Drywell and Reactor Building to Torus vacuum breakers began lifting, as designed, to control the negative pressure at 1226 hours.

The Reactor Water Cleanup (RWCU) (CE) pumps had tripped at 1159 hours, during plant shutdown. The pump trip caused a loss of the Non-Regenerative Heat Exchanger heat input to the Reactor Building Closed Cooling Water (RBCCW) system. Manual temperature control was in effect on this system. A 6 degree Fahrenheit temperature drop occurred on RBCCW heat exchanger outlet. Several Drywell cooling fan outlet temperatures changed. Operators took action to minimize the effect of this loss of heat load on Drywell pressure. These actions included shutdown of Drywell cooling fans and closing the RBCCW Bypass valve (manual temperature control mechanism). The result of these actions had no impact on the Primary Containment vacuum breakers that were cycling on Drywell pressure.

Unsuccessful attempts were made to increase drywell pressure with nitrogen (LK) addition and isolation of the Main Steam Line Drains (SA). Analyses of other possible Primary Containment to Main Condenser gas space flowpaths were also conducted. The Main Steam

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 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)	LER NUMBER (6)	PAGE (3)
		YEAR SEQUENTIAL NUMBER REVISION NUMBER	
Fermi 2	0 5 0 0 0 3 4 1 9 1	- 0 2 2 - 0 0	0 3 OF 0 5

TEXT (If more space is required, use additional NRC Form 365A's) (17)

Lines were specifically reviewed, but the SPVs were thought to be effective isolation boundaries. However, the Primary Containment atmosphere had been drawn through the Safety Relief Valve (SRV) vacuum breakers, resulting in reverse flow through the SRVs into the Main Steam Lines and to the Main Condenser.

At 1553 hours, the third MSIVs were closed and the Primary Containment Vacuum Breakers stopped cycling. Primary Containment pressure began increasing due to nitrogen addition which had been started two hours earlier. Drywell pressure was restored to normal and the nitrogen addition was terminated at 1922 hours.

Cause of the Event:

The Reactor Pressure Coolant Boundary (RCPB) is connected to the Main Condenser through the Main Steam Lines and Steam Line Drain system. The Main Condenser had been maintained under vacuum with two Mechanical Vacuum Pumps to aid in locating a failed tube in the Main Condenser.

The Primary Containment conditions (i.e., low pressure) indicated that mass exchange had occurred. The Primary Containment pressure had dropped rapidly resulting in the Primary Containment Vacuum Breakers operating as designed until the event was terminated. The depressurization rate between Primary Containment vacuum breaker actuations appeared constant and consistent with the initial drop, suggesting a constant mass removal. The average Drywell temperature remained constant during this period, eliminating the possibility of any temperature related pressure change. Drywell oxygen concentration increased from 1% to 18% in a three hour period.

These facts indicated that there was a flow path between the RCPB and the Primary Containment that was not present when the RCPB was at pressure. Operators attempting to define the source of the pressure decrease surmised that a vacuum existed. Despite their best efforts to eliminate potential causes they were not aware that the SRVs (two stage Target Rock design) will suffer a loss of seating force under this type of vacuum and will actually lift off of their seat and leak by. Initial review of the potential vacuum paths between the Drywell and the condenser identified the SRVs and SRV vacuum breakers as a potential path for Drywell atmosphere to the condenser. However,

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60 HRS. FORWARD COMMENTS REGARDING BURDEN IS/KATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-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)

LER NUMBER (6)

PAGE (3)

Fermi 2

0 5 0 0 0 3 4 1 9 1 — 0 2 2 — 0 0 0 1 OF 0 5

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

initially the SRVs were evaluated as not being the leak path based on previous training and valve performance. Based upon a review of the circumstances, the root cause of this event was determined to be failure of Operations Personnel (Utility Licensed) and Plant Support Personnel (Utility Non-Licensed) to recognize that the SRVs were a viable path for Drywell to Main Condenser airflow.

Analysis of the Event:

The SRVs are located on the Main Steam Lines. The SRV discharge piping is routed to tee quenchers located below the normal level of the Suppression Pool. Each SRV discharge line is equipped with a vacuum breaker to ensure that the water level in the discharge piping is at the same level as the Suppression Pool. This design minimizes the hydrodynamic forces postulated to occur on SRV lift and prevents jet force damage on the Torus structure. The vacuum breakers relieve from the Drywell. During this event, the SRV vacuum breakers responded to the vacuum at the SRVs by admitting Drywell atmosphere to the discharge lines.

The Primary Containment is a leak tight pressure vessel. The major components are the Drywell, the Torus and eight vent pipes connecting the Drywell with the Torus. The vent pipes connect to a vent header. Downcomer pipes extend from the vent header to below the surface of the Suppression Pool contained within the Torus. Vacuum breakers are installed on the downcomer piping system to assure Torus pressure does not exceed Drywell pressure by more than 0.5 psid. This design minimizes the hydrodynamic forces postulated to occur on a Loss of Coolant Accident vent clearing and prevents damage to the Torus structure.

The Primary Containment is designed for a maximum external-to-internal differential pressure of 2 psid. To ensure this design limit is not exceeded, two Torus to Reactor Building vacuum breakers are provided. These open at 0.5 psid to limit Reactor Building to Torus differential pressure (Reactor Building greater than Torus), admitting air from the Reactor Building into the Torus.

During the event, the Torus to Reactor Building and Drywell to Torus vacuum breakers cycled automatically, as designed, to maintain a conservative differential pressure of 0.3 psid between the Primary

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORD AND REPORTS MANAGEMENT BRANCH (F-630) U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 0560034191	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		02	2	00	05	OF	05

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

Containment and the B-actor Building. The cycling of the Primary Containment vacuum breakers is considered to be an ESF actuation.

This event did not place the plant outside the Design Basis for Drywell/Torus negative pressure. The plant had achieved Cold Shutdown status prior to experiencing Drywell or Torus pressure below negative 0.1 psig so Technical Specification 3.6.1.6 was not applicable. The actual Primary Containment structural design limit was not challenged during this event. Other ESF systems and components were reviewed to ensure no adverse effects had occurred due to the negative pressure or the cycling of Primary Containment pressure. The results of this review indicated no adverse consequences had occurred. The cycling of the ESF Drywell to Torus and Torus to Reactor Building vacuum breakers occurred at their nominal setpoints and continued while the plant conditions demanded their function.

Corrective Actions:

Investigation of this event established the cause to be a reverse flow through the SRVs. This cause was confirmed by both the NSSS vendor and the valve manufacturer. The RCPB was subject to a vacuum condition created by operating two Mechanical Vacuum Pumps for locating tube leaks in the Main Condenser. Operations and Plant Support Personnel were not familiar with the SRV reverse flow characteristics. Operations, Maintenance and Technical Staff and Managers training will review this event. This training will be completed the first quarter of 1992. Operations Experience Continuing training will include this event periodically to inform future operations personnel. The General Operating Procedure will be revised to provide a note cautioning the operator about this condition. This revision will be complete by February 14, 1992. Additionally, this event has been reported to the industry via Nuclear Network, to ensure that other utilities are aware of this type of occurrence.

Previous Similar Events:

There have been no previous similar licensee Event Reports describing this type of event.