

Detroit
Edison

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10CFR50.73



Nuclear
Operations

March 11, 1991
NRC-91-0027

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. 90-006-01

Please find enclosed Supplemental LER No. 90-006-01, dated March 11, 1991, for a reportable event that occurred on July 27, 1990. A copy of this LER is also being sent to the Regional Administrator, USNRC Region III.

If you have any questions, please contact Barbara Siemasz, Compliance Engineer, at (313) 586-1682.

Sincerely,

Enclosure: NRC Forms 366, 366A

cc: A. B. Davis
J. R. Eckert
R. W. DeFayette
W. G. Rogers
J. F. Stang

Wayne County Emergency
Management Division

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)
Fermi 2DOCKET NUMBER (2)
0 5 0 0 0 3 4 1 1 OF 0 6TITLE (4)
CCHVAC SSFI Observation: Unanalyzed Condition Resulting From A Single Active Failure

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 (8)	
07	26	90	90	006	01	03	11	91			0 5 0 0 0 0 0 0	
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)									
1			20.402(b)			20.405(c)			60.73(a)(2)(iv)			73.71(b)
POWER LEVEL (10)			20.405(a)(1)(ii)			60.73(a)(1)			X 60.73(a)(2)(v)			73.71(a)
100			20.405(a)(1)(iii)			60.73(a)(2)			60.73(a)(2)(vi)			OTHER (Specify in Abstract below and in Text, NRC Form 306A)
			20.405(a)(1)(iv)			60.73(a)(2)(i)			60.73(a)(2)(vii)(A)			
			20.405(a)(1)(v)			60.73(a)(2)(ii)			60.73(a)(2)(vii)(B)			
			20.405(a)(1)(vi)			60.73(a)(2)(iii)			60.73(a)(2)(viii)			

LICENSEE CONTACT FOR THIS LER (12)

NAME
Barbara G. Siemasz, Compliance EngineerTELEPHONE NUMBER
AREA CODE
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)

YES (If yes, complete EXPECTED SUBMISSION DATE) ☒ NOEXPECTED SUBMISSION DATE (15)
MONTH DAY YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 14 lines single-space typewritten lines) (16)

A site Safety System Functional Inspection review of the Control Center Heating, Ventilation and Air Conditioning (CCHVAC) system revealed that a previously unanalyzed condition could result from a single active failure of either one of two CCHVAC chlorine detectors followed by a LOCA with a radiation release.

An Engineering Functional Analysis was performed that determined that the CCHVAC system was operable.

The immediate actions taken were to instruct the operators on specific actions required while in the chlorine mode should a LOCA signal be received; and to revise applicable procedures. In addition, chlorine cylinders were removed from the Circulating Water Pump House.

Currently, an engineering design change is being prepared for the CCHVAC system that would allow the automatic control logic for the recirculation mode priority over the chlorine mode in the event of a LOCA with a radiation release.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST, SEND THIS FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F430), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0106), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 05000341	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		90	006	01	02	OF 06

TEXT: If more space is required, use additional NRC Form 396A's (17)

Initial Plant Conditions:

Operating Condition: 1 (Power Operation)
Reactor Power: 100%
Reactor Pressure: 1008 psig
Reactor Temperature: 535 degrees Fahrenheit

Description of Event:

On July 26, 1990, as a result of a site initiated internal design review [i.e., Safety System Functional Inspection (SSFI)] of the Control Center Heating, Ventilation and Air Conditioning ((CCHVAC)(VI)) system, a previously unanalyzed condition was postulated that, if it occurred, could prevent the fulfillment of an automatic safety function of CCHVAC needed to mitigate the consequences of an accident. The single active failure of either of two CCHVAC chlorine detectors (DET) located in the CCHVAC normal intake duct could cause the CCHVAC system to automatically shift to the chlorine mode. If a single failure of either CCHVAC chlorine detector occurs, followed by a LOCA with a radiation release, the positive pressure in the main control room required to meet General Design Criterion (GDC, 19 of 10CFR50, Appendix A, would not be automatically maintained. The chlorine mode has no make-up air to maintain the required net positive pressure in the control room against radiation in-leakage. The automatic shift to the recirculation mode is inhibited by the above postulated failure.

As stated in the UFSAR, Section 9.4.1.1, the CCHVAC system is designed to accomplish its design objectives assuming a single active component failure. As a result of the above postulated event, there is a single active component failure that could prohibit CCHVAC from accomplishing its automatic Engineered Safety Feature function.

UFSAR Section 6.4.2.3.1 describes the operation of the chlorine and the recirculation modes. The chlorine mode of the CCHVAC system operates by closing all outside intakes to prevent ingress of chlorine and then recirculates the ventilating air through the emergency recirculation filter. The recirculation mode operates by filtering 1800 cubic feet per minute (cfm) of outside air which mixes with 1200 cfm recirculated air. The air is filtered again to provide removal of contaminants during a radiation release emergency. A positive pressure is maintained in the control center itself to prevent inleakage of radioactive contaminants.

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 (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 0500034190	LER NUMBER (6)			PAGE (3)		
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TEXT (If more space is required, use additional NRC Form 386A's) (7)

It should be noted that, if a LOCA with a radiation release occurs resulting in an automatic shift to the recirculation mode prior to a single failure of either CCHVAC chlorine detector, the CCHVAC system would remain in the recirculation mode as designed thereby providing the required net positive pressure to the control room.

The CCHVAC system was evaluated as operable at the time of discovery, since all applicable Technical Specification Limiting Conditions for Operation had been met. This operability determination was supported by the Engineering Functional Analysis (EFA) that was performed at that time. A Deviation Event Report (DER 90-0455) was written to investigate and evaluate the potential unanalyzed condition. An evaluation of the adequacy of the system design in terms of the ability of the chlorine mode to provide sufficient radiological protection for the control room personnel has determined that the post-LOCA thyroid dose for the duration of the accident (30 days) would be 22.9 Rem. This is less than the 30 Rem limit in Standard Review Plan (SRP) 6.4. This evaluation assumes that the operator shifts CCHVAC to the recirculation mode at the end of the ten minute post-LOCA time frame.

With the present design, the CCHVAC must be manually shifted to the recirculation mode should a LOCA occur with the system operating in the chlorine mode. Based on the EFA, the immediate action taken was to implement administrative controls to manually shift the CCHVAC system from the chlorine mode to the recirculation mode by the end of the ten minute post-LOCA time frame. Operators were instructed on specific actions required per an Operation's night order which addressed the DER. Subsequently, a short term corrective action was performed to revise the applicable procedures identifying the requirement for operators to manually shift to the recirculation mode from the chlorine mode when a LOCA signal is received.

An evaluation of the existing design has been completed. As a result of this evaluation, the one ton chlorine cylinders located at the Circulating Water Pump House (CWPH) have been removed. An engineering design change is being prepared to allow the automatic control logic for the recirculation mode of CCHVAC priority over the chlorine mode.

Cause of the Event:

The chlorine mode was added to the CCHVAC design in 1977. In the initial design it was assumed a railroad tank car of chlorine would be on site. When the decision was later made not to have the tank car, reanalysis of the need for the chlorine mode was not performed. Currently, the chlorine used on site is contained in one ton cylinders.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (5)			PAGE (3)		
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TEXT (If more space is required, use additional NRC Form 305A's) (17)

The postulated unanalyzed failure, a single active failure of either one of two CCHVAC chlorine detectors resulting in the system shifting to the chlorine mode and inhibiting the automatic actuation of the ESF recirculation mode, was not considered nor addressed in the initial system design. The original design looked at events involving the CCHVAC chlorine detectors and a LOCA with a radiation release from a "chlorine accident" perspective. Since a chlorine accident is the most immediate threat to operator health, the original design prioritized the chlorine mode of operation. This meant that, in the original design, if the CCHVAC system was operating in the chlorine mode and a signal was received requiring the recirculation mode, neither an automatic or a manual transfer could be made.

In 1982, it was identified that a chlorine detector failure would result in the initiation of the chlorine mode which, as originally designed, would "lockout" the recirculation mode. A modification was then made which allowed the operator to manually establish the recirculation mode following a single failure of a chlorine detector by placing the system mode select switch to "recirc" and then depressing the reset pushbutton. This modification maintained the original design of prioritizing the chlorine mode of operation.

Analysis of Event:

Two engineering reviews were performed to ensure protection for control room personnel from radiation and chlorine, respectively, while in either the recirculation or chlorine mode of CCHVAC.

The engineering review of the effects of the radiological release showed that the overall post-LOCA thyroid dose, for the duration of the accident, from operating in the chlorine mode for the first ten minutes is 22.9 rems. This is less than the requirement of 10CFR50 GDC 19, which equivalently limits the dose to less than 30 rems to the thyroid. This analysis assumes that the operator changes to the recirculation mode of CCHVAC within the 10 minute frame following a LOCA with a radiation release. Thus, there are no radiological health consequences to the control room personnel. Also, there are no safety consequences to the plant during the postulated LOCA with a radiation release while in the chlorine mode.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0106), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Fermi 2	DOCKET NUMBER (2) 0 5 0 0 0 3 4 1 9 0	LER NUMBER (8)			PAGE (3)		
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The other engineering review considered the effects of an accidental chlorine release. The existing calculation for this condition concluded that, if the CCHVAC is in the recirculation mode (drawing outside air), the worst case chlorine concentration in the control room would be approximately 12 ppm. This is less than the 15 ppm toxicity limit established in Regulatory Guide 1.78. However, during the SSFI review, this design calculation was found to be in error. A revision to the analysis was then prepared for postulated chlorine accidents based on a re-calculation performed in Design Calculation (DC-5252).

The preliminary results of DC-5252 indicated that the worst case chlorine concentration in the control room, due to a postulated chlorine accident at the CWPB with CCHVAC in the recirculation mode and drawing in air through the north intake duct, would have exceeded the 15 ppm toxicity limit established in Regulatory Guide 1.78. Final results identify the worst case control room concentration of chlorine would be approximately 98 ppm during this postulated event. Exposure to this level of chlorine in air would have caused short-term physical effects (e.g., coughing, eye burning) to control room personnel. However, these effects would not have incapacitated the operators or otherwise caused lasting health effects. These physical reactions along with a clearly evident chlorine odor would have been immediately noticeable to the operators. Control room personnel have access to and have been trained in the use of respirators. Operators would have taken immediate action to don such equipment, in this case. Additionally, there is a Balance of Plant chlorine detector in the CWPB that would have alarmed in the control room when the presence of chlorine is detected. Thus, these responses to chlorine exposure would have ensured the health of the control room personnel and the safety of the plant. Based on the preliminary results of DC-5252, the chlorine cylinders in the CWPB were removed on 1/24/91.

Postulated chlorine accidents at the General Service Water building and typical transportation routes offsite were addressed and have a worst case chlorine concentration to the control room of approximately 13 ppm. Since chlorine has been removed from the CWPB, any postulated chlorine accident per DC-5252 will result in a control room chlorine concentration less than 15 ppm limit.

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 (F-330), 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)

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TEXT (If more space is required, use additional NRC Form 305A's) (17)

Corrective Actions:

An EFA was performed that determined the CCHVAC system was operable and able to perform its function to prevent operator radiation exposures from exceeding 10CFR50 GDC 19 and SRP based limits. Appropriate operator intervention was postulated to occur at ten minutes after a LOCA.

Licensed operators have completed the urgent required reading of this LER.

As previously stated, Operations personnel were instructed on specific actions required per an Operation's night order which addressed the DER. Also, applicable procedures were revised to include the manual reset of the CCHVAC system from the chlorine mode to the recirculation mode in the event of a LOCA.

In addition to Operation's actions, the EFA was revised, chlorine was removed from the CWPB and an Engineering Design Package (EDP-11889) is being prepared. EDP-11889 will modify the existing logic circuitry for the CCHVAC system to give the automatic initiated recirculation mode priority over the chlorine mode in the event of a LOCA with a radiation release. This EDP will thus eliminate the postulated single failure scenario. EDP-11889 will be implemented prior to startup from the Second Refueling Outage.

Previous Similar Events:

LER 86-044-01, "Potentially Degraded Torus Relief Line Isolation Capability During Postulated Accident Event", described an environmentally induced failure of a limit switch for a drywell vacuum breaker valve postulated to occur under harsh environmental conditions.

LER 87-045-00, "Low Pressure Coolant Injection Swing Bus Design Flaw Identified by Personnel Error", described the loss of LPCI operation by failure of either of two independent circuitry external to the LPCI swing bus.