LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Fermi 2	0 5 0 0 0 3 4 1	1 OF 4

TITLE (4) Calibration of Primary Containment Oxygen Monitor in De-inerted Environment Challenging Operability of Monitor in Inerted Environment

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MON	DAY	YR	YR	SEQUENTIAL NUMBER	REVISION NUMBER	MON	DAY	YR	FACILITY NAMES	DOCKET NUMBER (5)
03	04	97	97	- 0 0 4 -	0 1	08	01	97		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 4

POWER LEVEL (10): 0 0 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (11)

X 10 CFR 50.73(a)(2)(i)(B)

OTHER -

(Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

	TELEPHONE NUMBER	
	AREA CODE	
Mari Jaworsky - Compliance Engineer	313	586-1427

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)	[X] NO				

Following an engineering evaluation it was determined on March 4, 1997 that if the Primary Containment oxygen monitor is calibrated in the de-inerted containment, it cannot be considered operable in the inerted containment. This is based on a "zero-shift" anomaly which occurs when the containment environment changes from an oxygen to a nitrogen environment. On several occasions in the past the oxygen monitor was calibrated in a de-inerted environment and subsequently operated in an inerted environment.

The preliminary investigation presented questions related to response time of the oxygen sensor. Preliminary laboratory results on two spare oxygen sensors indicated that these sensors do not respond to environmental changes as originally expected. A test of the oxygen monitoring system conducted by the vendor indicates that environmental factors and the housing where the sensor is mounted also affects the rate of response. Either factor appears to be an inherent design feature that has impact on the current calibration process with respect to dwell times of the applied calibration gases that were recommended by the vendor.

Troubleshooting and data-gathering has been performed to verify the preliminary laboratory results regarding sensor response to a change in environment. The oxygen sensor calibration procedures and channel checks have been revised based on the results from the troubleshooting and data-gathering prior to startup from the most recent outage to ensure proper calibration of the oxygen sensor. All commitments made in the original submittal of this LER have been completed.

Initial Plant Condition:

Operational Condition:	4 (Cold Shutdown)
Reactor Power:	0 Percent
Reactor Pressure:	0 psig
Reactor Temperature:	125 degrees Fahrenheit

Description of the Event:

Following startup from a forced outage in April 1996 and after the oxygen sensors were calibrated while the containment was de-inerted, an anomalous Primary Containment Oxygen reading was observed. This particularly low reading was initially attributed to a thorough inerting of the containment. After the next calibration which was performed while the containment was inerted, the oxygen concentration levels were observed to be consistent with expected typical indications.

During startup from Fifth Refueling Outage a question was raised regarding the operability of the hydrogen-oxygen containment monitor when calibrated in one environment and operated in another. Engineering evaluations were performed which involved consultation with the vendor. The vendor recognized that calibrating the oxygen monitor [PI][45] when the containment is de-inerted may produce anomalous readings due to a "zero-shift" anomaly which the vendor had observed in other applications. To date, the vendor has not been able to determine the cause of the "zero-shift" anomaly. The "zero-shift" anomaly is a shift of the monitor scale by approximately one to two volume percent in a non-conservative direction if the oxygen monitoring system is calibrated while the Primary Containment [NH] is de-inerted and then used when the Primary Containment is inerted. After an engineering evaluation it was determined that:

- The hydrogen monitoring system [PI] can be considered operable in both inerted and de-inerted containment conditions regardless of whether the containment is inerted or de-inerted during the calibration.

- The oxygen monitoring system can be considered operable in both inerted and de-inerted containment conditions if the containment is inerted during the calibration. The inerted calibration is valid and the oxygen monitoring system remains operable for subsequent de-inerted and inerted containment conditions. However, in the de-inerted containment condition, oxygen monitoring system indication may be higher than actual containment conditions.

Following further evaluation it was determined on March 4, 1997 that if the oxygen monitor is calibrated in the de-inerted containment, it cannot be considered operable in the inerted containment. This is based on the "zero-shift" anomaly which occurs when the containment environment changes from an oxygen to a nitrogen environment. On several occasions in the past the oxygen monitor was

calibrated in a de-inerted environment and subsequently operated in an inerted environment. After a more comprehensive review of the operating history for the oxygen monitor which included a review of containment grab sample data, it was determined that the Technical Specification 3.6.6.2, "Drywell and Suppression Chamber Oxygen Concentration", limit of four percent for oxygen was not exceeded during those occasions. Technical Specification 3.3.7.5, "Accident Monitoring Instrumentation", requires a minimum of one oxygen monitoring channel in Operational Conditions 1 and 2. Therefore, on those occasions when the oxygen monitors were inoperable Fermi 2 operated in a condition prohibited by Technical Specifications and this LER is being submitted in accordance with 10CFR50.73(a)(2)(i)(B).

Cause of the Event:

The root cause of this event was found to be an unanticipated interaction of systems or components. Specifically, if the sensor is calibrated in an oxygen rich environment, then the sensor is electrochemically altered such that it will respond differently when it is used in an oxygen deficient environment. This was not known by Fermi or the manufacturer at the time that this was discovered. The design of the oxygen sensor membrane and its associated permeability along with the humidity of the sample gas are contributing factors which affect the oxygen sensor calibrations.

Analysis of the Event:

Since both hydrogen and oxygen would be generated following a Loss of Coolant Accident (LOCA), both hydrogen and oxygen are used to determine the level of combustible gases in the containment. The hydrogen monitoring system has been determined to be operable in both inerted and de-inerted containment conditions regardless of whether the containment is inerted or de-inerted during the calibration, and therefore, would provide appropriate indications of hydrogen levels in the Primary Containment. During an emergency the Emergency Operating Procedures (EOP's) require containment venting or purging if there is a perceptible increase in hydrogen concentration. If hydrogen cannot be maintained below one percent, the containment Combustible Gas Control System is initiated.

At five percent oxygen and six percent hydrogen the EOP's require that the hydrogen recombiners be shutdown. If the oxygen concentration is understated this step could be delayed. However, the possibility of reaching five percent oxygen and six percent hydrogen levels is judged to be unlikely as it would require additional failures to occur. Hydrogen production is assumed to occur quickly following a LOCA, while oxygen concentration increases slowly, allowing ample time for the reduction of containment hydrogen by venting or purging or by using the Combustible Gas Control system. Thus, had a LOCA occurred, an assessment of increasing oxygen levels could still have been made prior to reaching combustible levels. Therefore, the health and safety of the public were not adversely affected by this event.

Corrective Actions:

Troubleshooting and data-gathering has been performed to verify the preliminary lab results regarding sensor response to a change in environment. The purpose of this troubleshooting and data-gathering was to verify the presence of the "zero-shift," determine its magnitude, determine the best percentages to be used for calibration gases, and assist in determining appropriate calibration process improvements. The oxygen sensor calibration procedures and channel checks were revised as required based on the troubleshooting and data-gathering results prior to startup from the most recent outage to ensure proper calibration of the oxygen sensor. The results may also be used to justify appropriate changes to the Technical Specifications.

The manufacturer also performed additional investigations of the oxygen sensor "zero-shift" anomaly. The manufacturer's investigation could not recreate a "zero shift" of the magnitude originally assumed in the laboratory under simulated plant conditions. Investigations performed by Fermi 2 led to the conclusion that the "zero shift" is in the range of one to two volume percent. All commitments made in the original submittal of this LER have been completed.

Additional Information

A. Failed Components

None

B. Previous LER's on Similar Problems

None