

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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.

FACILITY NAME (1)
Browns Ferry Nuclear Plant (BFN) Unit 3

DOCKET NUMBER (2)
05000296

PAGE (3)
1 OF 6

TITLE (4)
Loss of the Emergency Core Cooling Systems (ECCS) Division II Instrumentation Renders ECCS Equipment Inoperable.

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
12	17	96	96	008	00	01	15	97	N/A	
									N/A	

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)					
POWER LEVEL (10)	99	20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)(B)	50.73(a)(2)(viii)
		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)		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)	X	50.73(a)(2)(vii)	

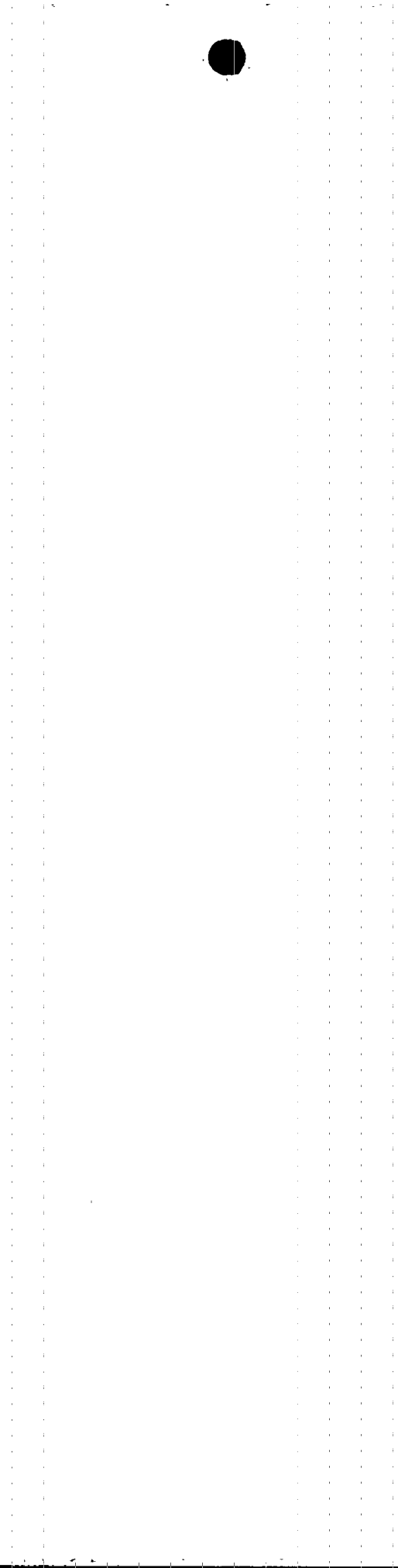
LICENSEE CONTACT FOR THIS LER (12)
NAME: James E. Wallace, Compliance Licensing Engineer
TELEPHONE NUMBER (include Area Code): (205) 729-7874

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	
X	AD	FU	B569	Y						
X	AD	SCR	H177	Y						

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).		NO					

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)
On December 17, 1996, with Units 2 and 3 at approximately 100 percent and 99 percent power, respectively, and Unit 1 shutdown and defueled, Unit 3 operators declared ECCS Division II instrumentation inoperable, in accordance with TS 3.2.B. This event was caused by a cleared fuse and shorted Silicon Controlled Rectifier (SCR) in the ECCS Division II Analog Trip Unit Inverter, which resulted in the loss of the inverter output. Unit 3 entered several limiting condition for operations (LCO). TVA considers this event as the fourth Unit 3 inverter failure as identified in LER 50-296/96004. Final corrective actions for this event will be included in a supplemental report to LER 50-296/96004. Immediate corrective actions taken for this event were the replacement of the cleared fuse and shorted SCR. Based on these replacements, TVA concluded that the ATU inverter was operational, and the inverter was returned to service.
This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(vii) as any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems designed to remove residual heat or mitigate the consequences of an accident. Additionally, this event is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) for a condition prohibited by Technical Specifications.
Previous LERs on similar events were: 260/94001, 260/94006, 260/94010, 296/96004, and 296/96006.

9701210398 970115
PDR ADOCK 05000296
S PDR



LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Unit 3	05000296	96	-- 008	-- 00	2 of 6

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

I. PLANT CONDITIONS

At the time of discovery, Units 2 and 3 were operating at approximately 100 percent power and 99 percent power, respectively. Unit 1 was shutdown and defueled.

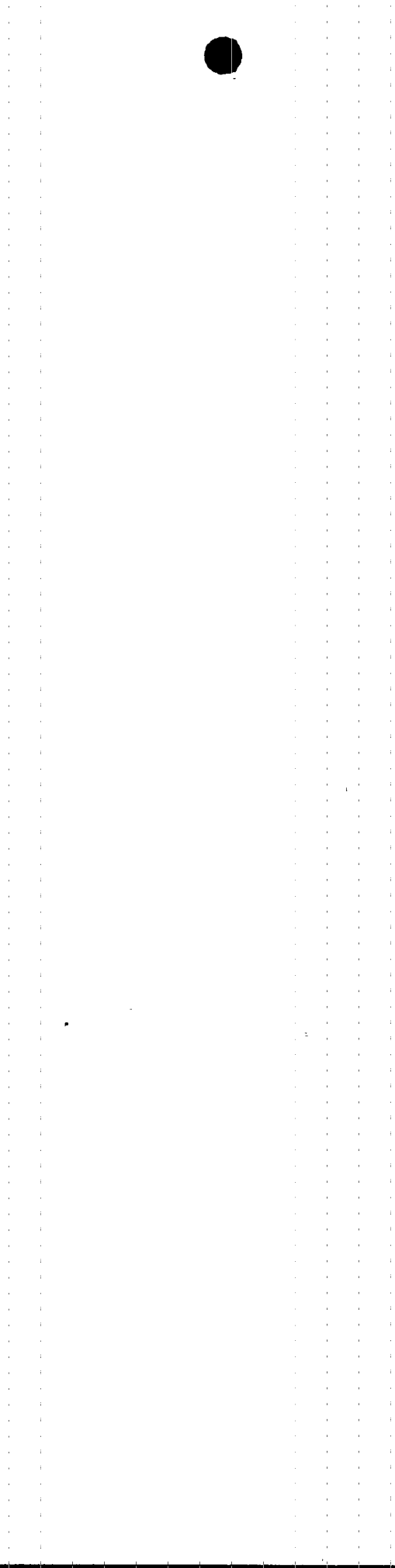
II. DESCRIPTION OF EVENT

A. Event

On December 17, 1996, at 1236 hours Central Standard Time (CST), the Unit 3, Division II Emergency Core Cooling Systems (ECCS) Analog Trip Unit (ATU) inverter power was lost due to a cleared fuse and a shorted Silicon Controlled Rectifier (SCR) in the ECCS Division II Analog Trip Unit Inverter. (NOTE: TVA considers this event as the fourth failure of the Unit 3 ATU inverters as identified in LER 50-296/96004). This failure affected two of the four channels of the drywell pressure and reactor water level sensors. These sensors feed both divisions of initiation logic for the ECCS (Residual heat removal (RHR) [BO] system, core spray (CS) [BG] system, high pressure core injection (HPCI) [BJ] system, automatic depressurization systems (ADS) [JC], Anticipated Transient Without Scram (ATWS) [JC], and the Unit 3 diesel generators (EDG) [EK]).

The above ECCS were declared inoperable due to the loss of logic inputs as delineated in Technical Specifications (TS) Table 3.2.B. Since the ADS was declared inoperable, the plant was placed in limiting condition for operations (LCO) requiring the unit to be in hot shutdown within 12 hours. Additionally, TS 3.5.A.3 and 3.5.B.8 for RHR and CS require the unit to be in cold shutdown within 24 hours. These were the most restrictive LCOs. At 1500 hours, the ECCS ATU Inverter was repaired by the replacement of the cleared fuse and the shorted SCR. At that time, LCO 3.2.B was exited. At 1522 hours, a four-hour notification was made to the NRC in accordance with 10 CFR 50.72(b)(2)(iii) as any event or condition which alone could have prevented the fulfillment of the safety functions of systems that are needed to remove residual heat or mitigate the consequences of an accident.

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(vii) as any event where a single cause or condition caused at least one independent train or channel to become inoperable in multiple systems designed to remove residual heat or mitigate the consequences of an accident. This event is also being submitted in accordance with 10 CFR 50.73(a)(2)(i)(B) for any operation or condition prohibited by Technical Specifications.



LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Unit 3	05000296	96	-- 008	-- 00	3 of 6

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

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

C. Dates and Approximate Times of Major Occurrences:

December 17, 1996,
at 1236 hours, CST Unit 3 ECCS ATU Inverter power failed due to a cleared fuse and a shorted SCR.

at 1500 hours, CST Unit 3 inverter fuse and SCR were replaced, and the inverter was returned to service. LCO 3.2.B was exited.

at 1522 hours, CST NRC was notified.

D. Other Systems or Secondary Functions Affected:

None.

E. Method of Discovery:

This event was promptly discovered when control room alarms indicated ECCS Division II instrumentation problems. One of the received alarms was ECCS ATU Trouble alarm.

F. Operator Actions:

There were no TS safety initiations required of the control room operators. The steps taken to identify the problem and initiate maintenance actions were appropriate.

G. Safety System Responses:

None.

III. CAUSE OF THE EVENT

A. Immediate Cause:

The immediate cause of the event was a loss of Unit 3 ECCS ATU inverter output.



LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Unit 3	05000296	96	-- 008	-- 00	4 of 6

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

B. Root Cause:

The apparent cause of the event was a cleared fuse and a shorted SCR. The fuse and the shorted SCR were replaced. At that time, the inverter was returned to service. TVA considers this event as the fourth Unit 3 ATU inverter failure as identified in LER 50-296/96004. At this time, the root cause for the failures has not been determined. Efforts are continuing to identify the cause. When the cause is determined, it will be reported in a supplement to LER 50-296/96004.

C. Contributing Factors:

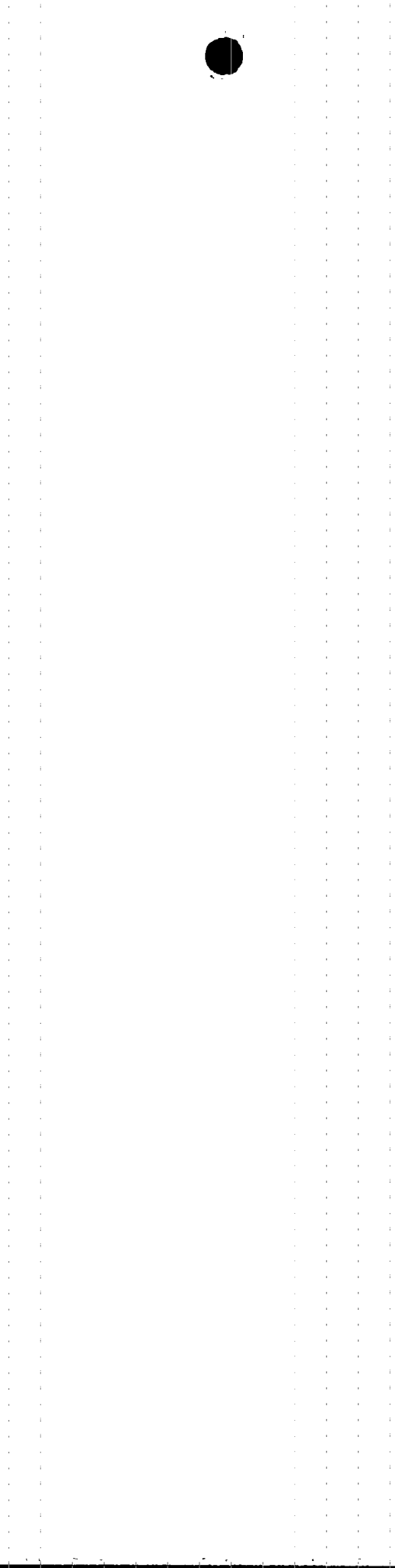
None.

IV. ANALYSIS OF THE EVENT

The failed ECCS Division II ATU Inverter caused a loss of level and/or pressure input signals to the HPCI, CS, RHR, ATWS, and ADS from their respective instrumentation logic systems.

This event did not result in a condition outside the plant's design basis for the following reasons:

- This event resulted from a power supply failure to the instrumentation logic of the Division II of the ECCS. However, Division I instrumentation remained available for automatic initiation of ECCS Division I and Division II equipment during this event. Division I and Division II ECCS equipment remained available with the following exceptions: (1) HPCI would not automatically inject water into the reactor vessel as a result of a loss of flow controller power. However, RCIC was available to initiate and to inject water into the reactor vessel, and (2) Core Spray (CS) loop II would also not inject water into the reactor vessel due to the loss of the inboard injection valve control circuit to sense a reactor pressure less than 450 psig. However, CS loop II inboard injection valve could be manually opened to allow water to inject into the reactor vessel.
- The BFN Final Safety Analysis Report (FSAR), Section 6.5.2, states in part "...the reliability and the redundancy of the controls and instrumentation of the Emergency Core Cooling Systems show that no failure of a single initiating sensor either prevents or falsely starts the initiations of these cooling systems. No single control failure prevents the combined cooling systems from providing the core with adequate cooling."
- The event did not result in any plant transient described in the BFN FSAR, Chapter 14, Accident Analyses.



LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Unit 3	05000296	96 --	008 --	00	5 of 6

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

Therefore, based on the above, this event did not result in a condition outside the design basis of the plant, nor did it adversely affect the health and safety of plant personnel or the public.

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

The cleared fuse and the shorted SCR were replaced in the Unit 3 ECCS Division II ATU Inverter. The instrumentation logic was restored. The LCOs were exited.

B. Corrective Actions To Prevent Recurrence:

TVA considers this event as the fourth Unit 3 ATU inverter failure as identified in LER 50-296/96004. Final long-term corrective actions to resolve this fourth inverter failure will be addressed in a supplemental report to LER 50-296/96004.

Corrective Actions Taken or Planned:

TVA sent a failed SCR to an independent laboratory and one to the SCR vendor. Results of their analysis are due by January 21, 1997 and by March 1, 1997, respectively. Based on the results of the independent laboratory, TVA plans to conduct in situ monitoring to detect any transient condition that might have caused/contributed to the inverter failures.

Division II had new SCRs with higher steady state amperage ratings installed. TVA plans to replace Division I SCRs during the next refueling outage. Additionally, TVA plans to change fuse sizes on Division I and II during the next Unit 3 refueling outage.

Finally, TVA plans to install an alternate power supply to each ECCS ATU inverter cabinet that is independent of the cabinet's associated ECCS ATU inverter. This modification will be implemented during the next Unit 2 and Unit 3 refueling outages, respectively. As a result of this modification, one 120 VAC to 24 VDC power supply will be removed from each ECCS ATU inverter cabinet and replaced with a 250 VDC to 24VDC converter allowing uninterrupted operation of the ATUs in the event of an inverter failure.

VI. ADDITIONAL INFORMATION

A. Failed Components:

- BUSS Semiconductor fuse, Part No. FWH-125A, 550v AC/DC manufactured by Bussmann, Inc.



LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Unit 3	05000296	96	-- 008	-- 00	6 of 6

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

- Silicon Controlled Rectifier, Part TD 42 F-HDR 681310 13C1 manufactured by HDR Power Systems, Inc.

B. Previous LERs on Similar Events:

TVA has reviewed previous BFN LERs to determine if similar events have occurred. Five previous events have occurred:

LER 260/94001 was written as a result of a Unit 2 ATU DC input fuse failure. However, the root cause of the event was determined to be a failure of the ECCS ATU Inverter control board. A control board failure was not involved in this LER 50-296/96008 event.

LER 260/94006 described the failure of a Unit 2 ECCS Division I ATU Inverter, 250v DC reactor motor operator valve (RMOV) breaker trip. This ECCS RMOV breaker tripped as a result of a shorted SCR. The LER 260/94006 event occurred on Unit 2 while LER 50-296/96008 happened on Unit 3 (See SCR issue in LER 296/96004 writeup below).

LER 260/94010 addressed the failure of C1 capacitor in the Unit 2 Division II ATU Inverter capacitor bank. This failed capacitor was a result of a manufacturing defect. A failed capacitor was not the cause of the LER 50-296/96008 event.

LER 296/96004 addressed two failed SCRs of the Unit 3 Division I ATU Inverter. As a result of these SCR failures, a Design Change Notice (DCN) was initiated to replace the SCRs in Unit 3 Division II inverter circuit. However, at the time of the 50-296/96008 event, the DCN had not been implemented. A supplemental report for LER 50-296/96004 is scheduled to be submitted on February 5, 1997. This supplemental report will address final corrective actions to prevent recurrence for the July 17, 1996, and August 6, 1996, events as well as for 50-296/96006 and this event, 50-296/96008.

LER 50-296/96006 addressed the third Unit 3 Division I inverter failure due to a cleared fuse. Final corrective actions to preclude recurrence will be addressed in the supplemental report to LER 50-296/96004 along with the LER 50-296/96008 event.

VII. COMMITMENTS

None.

Energy Industry Identification System (EIIS) system and component codes are identified in the text with brackets (e.g., [XX]).

