Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

Ashok S. Bhatnagar
Vice President, Browns Ferry Nuclear Plant

December 20, 2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop OWFN, P1-35
Washington, D. C. 20555-0001

10 CFR 50.73

Dear Sir:

TENNESSEE VALLEY AUTHORITY - BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 3 - DOCKET 50-296 - FACILITY OPERATING LICENSE DPR-68 - LICENSEE EVENT REPORT (LER) 50-296/2002-004-00

The enclosed report provides details of an unplanned inoperability condition of the Unit 3 high pressure coolant injection (HPCI) system which resulted from a loss of the system's flow controller power supply. The power supply was lost as a result of a battery charger failure during a maintenance activity.

In accordance with 10 CFR 50.73(a)(2)(v), TVA is reporting this event as a condition that could have prevented the fulfillment of the HPCI system safety functions of removing residual heat and mitigating the consequences of an accident.

There are no commitments contained in this letter.

Sincerely,

Ashok S. Bhatnagar

cc: See page 2

IE22

Enclosure
cc (Enclosure):
(Via NRC Electronic Distribution)

Mr. Kahtan N. Jabbour, Project Manager
U.S. Nuclear Regulatory Commission
(MS 08G9)
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

Mr. Stephen J. Cahill, Branch Chief
U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-8931

NRC Resident Inspector
Browns Ferry Nuclear Plant
10833 Shaw Road
Athens, Alabama 35611-6970

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004
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 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Nuclear Plant Unit 3	05000296	1 OF 8

4. TITLE
Loss of High Pressure Coolant Injection (HPCI) Flow Controller Power Supply

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME: Brown Ferry U2	DOCKET NUMBER: 05000260
10	22	2002	2002 -	004 -	00	12	20	2002	FACILITY NAME: None	DOCKET NUMBER: N/A

9. OPERATING MODE	1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:(Check all that apply)							
			20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
10. POWER LEVEL	100		20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)
			20.2203(a)(1)		50.36(c)(1)(i)(A)		50.73(a)(2)(iv)(A)		73.71(a)(4)
			20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)
			20.2203(a)(2)(ii)		50.36(c)(2)	x	50.73(a)(2)(v)(B)		OTHER
			20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)		specify in Abstract below or in
			20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)	x	50.73(a)(2)(v)(D)		NRC Form 366A
			20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
			20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
			20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Paul S. Heck, Nuclear Engineer, Licensing and Industry Affairs	256-729-3624

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

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

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On 10/22/02, Electrical Maintenance personnel were engaged in a maintenance activity on 250 VDC Battery Charger 4. To aid in the repair of out-of-service Battery Charger 4, a supporting work activity was being performed to obtain comparison waveform data from in-service Battery Charger 3. While connecting an oscilloscope to the Battery Charger 3 circuitry as part of this supporting work, a malfunction was inadvertently induced which resulted in the charger output going to its maximum value. This abnormally high output voltage was briefly applied to Battery Board 3 and its associated loads before the charger was automatically tripped by electrical protective devices. As a result of the application of this abnormally high voltage, fuses of two Emergency Core Cooling System Analog Trip Unit (ECCS ATU) Inverters cleared. One of these ECCS ATU inverters supplied Unit 2 loads. With Unit 2 shutdown in a mid-cycle outage, the loss of this inverter had no operational impact. The other inverter supplied Unit 3 loads. These loads included the flow controller for the high pressure coolant injection (HPCI) system. The capability to control HPCI flow was lost as a consequence.

The root causes of this event were: 1) the failures of personnel to identify all possible failure modes of the charger, 2) the work authorization process did not require a reassessment of the work activity following a change in the original work scope to include additional equipment. Operations, Maintenance, and Engineering personnel will be trained on the possibilities of introducing grounds into circuits via M&TE use. The work authorization process will be revised.

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

I. PLANT CONDITION(S)

During this event Unit 3 was in Mode 1 at 100 percent reactor power (approximately 3458 megawatts thermal). Unit 1 was shutdown and defueled and was unaffected by the event. Unit 2 was in Mode 5 (refueling) with the reactor cavity flooded. Unit 2 equipment was affected by this event, but this equipment was not required with the unit in Mode 5.

II. DESCRIPTION OF EVENT

A. Event:

On October 22, 2002, Electrical Maintenance (EM) personnel [utility - non-licensed] were engaged in a corrective maintenance activity on 250 VDC Battery Charger 4 [EI]. In order to aid in the repair of Battery Charger 4, which was out of service, a supporting work activity was being performed to obtain comparison waveform data from in-service Battery Charger 3 [EJ]. During the connection of an oscilloscope to the Battery Charger 3 circuitry as part of this supporting work, a malfunction was inadvertently induced which resulted in the output of the charger going to its maximum value. This abnormally high output voltage was briefly applied to Battery Board 3 [EJ] and its associated loads before Battery Charger 3 was automatically tripped by electrical protective devices. As a result of the application of this abnormally high voltage, fuses of two Emergency Core Cooling System Analog Trip Unit (ECCS ATU) Inverters [EF] cleared. One of these ECCS ATU inverters supplied Unit 2 loads. With Unit 2 shutdown in a mid-cycle outage, the loss of this inverter had no operational impact. The other inverter supplied Unit 3 loads. These loads included:

- the flow controller for the high pressure coolant injection (HPCI) system [BJ]
- the B channel of the high reactor water level trip logic for the main turbine [JJ] and reactor feed pump (RFP) turbines [JK]
- one of two power supplies which provide 24 VDC power to ECCS ATU logic panel 3-9-82 [JE]
- one division of torus temperature monitoring instrumentation [IM]

The A and C channels of the main and RFP high water level trip logic remained operable, the redundant 24 VDC power supply in panel 3-9-82 continued to provide power to the associated ECCS instrumentation, and torus temperature monitoring remained available via the unaffected division. These functions were not lost as a consequence of this event. The HPCI system flow controller, however, has no redundant power supply, therefore the capability to control HPCI flow was lost as a consequence of this event.

Because this event involved a condition that could have prevented the fulfillment of the HPCI system safety functions of removing residual heat and mitigating the consequences of an accident, it is reportable in accordance with 10 CFR 50.73 (a) (2) (v) (B) and (D).

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

None

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2002	-- 004	-- 00	3 OF 8

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

C. Dates and Approximate Times of Major Occurrences:

October 22, 2002	1252 hours CDT	Battery Charger 3 output went high and then failed during a maintenance activity. ECCS ATU inverters 3-INV-256-0002 and 2-INV-256-0001 cleared fuses and de-energized.
	1348 hours CDT	Spare Battery Charger 2B aligned to supply Battery Board 3.
	1517 hours CDT	Unit 3 Division II ECCS ATU inverter fuses replaced and the inverter returned to service
	1634 hours CDT	Required eight-hour report was made via telephone to the NRC Operations Center
	1639 hours CDT	Operations declared Unit 3 HPCI operable
	1718 hours CDT	Unit 2 Division I ECCS ATU inverter fuses replaced and the inverter returned to service

D. Other Systems or Secondary Functions Affected

	Unit 2	Unit 3
Equipment Affected Note: None of the Unit 2 equipment which lost power was required for service with the unit shutdown in a mid-cycle outage (Mode 5) with the reactor cavity flooded.	With the loss of 2-INV-256-0001, 120 VAC power to the following inverter loads was lost: • the flow controller for the reactor core isolation cooling (RCIC) system • the A channel of the high reactor water level trip logic for the main turbine and reactor feed pump (RFP) turbines • one of two power supplies which provide 24 VDC power to ECCS ATU logic panel 2-9-81 • Division I of the U2 torus temperature monitoring instrumentation	With the loss of 3-INV-256-0002, 120 VAC power to the following inverter loads was lost: • the flow controller for the HPCI system • the B channel of the high reactor water level trip logic for the main turbine and reactor feed pump (RFP) turbines • one of two power supplies which provide 24 VDC power to ECCS ATU logic panel 3-9-82 • Division II of the U3 torus temperature monitoring instrumentation

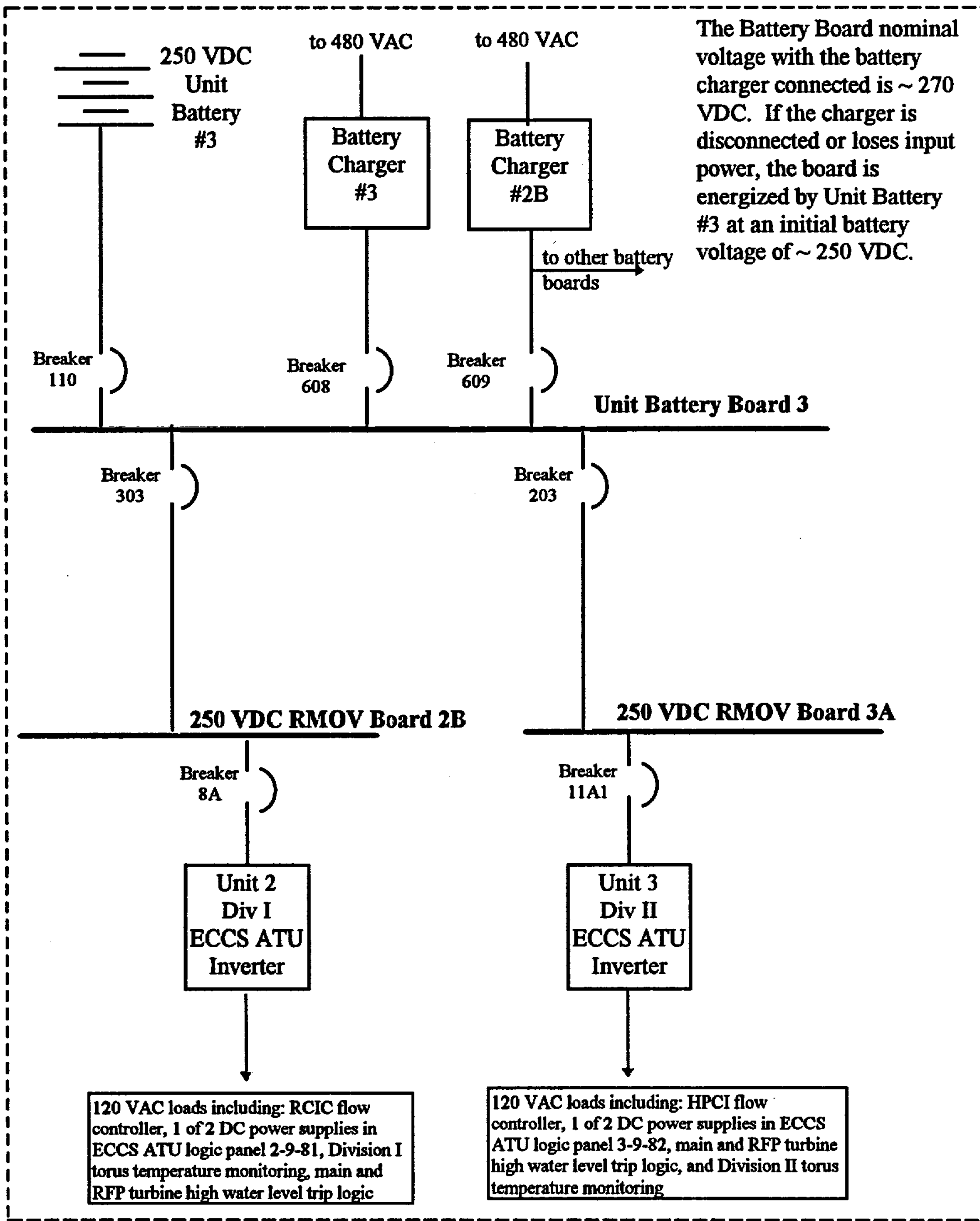
Figure 1 on the following page depicts these loading connections.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2002	-- 004	-- 00	4 OF 8

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

Figure 1



FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2002	-- 004	-- 00	5 OF 8

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

E. Method of Discovery

This event was immediately identified by the individuals working on the battery charger and by the operating crew through numerous indications and alarms in the respective control rooms.

F. Operator Actions

All operator actions taken in response to the loss of the Battery Charger 3 and the two ECCS ATU inverters and in the recovery from the event were appropriate. These actions included entering the appropriate Technical Specifications (TS) limiting conditions for operation, prioritizing the work necessary to restore the charging function to Battery Board 3, and to replace the fuses to re-energize the inverters. No system or component operation was expected as a result of this event, and none occurred.

G. Safety System Responses

All equipment operated in accordance with the plant design during this event. No operational transient was induced by the failure of the charger and the loss of the ECCS inverter on Unit 3. The unit remained in steady state power operation. The failure also did not produce spurious logic system operation which would require a safety-system response. On Unit 2, with the reactor in an outage, the equipment functions lost as a result of the charger and inverter failures were of no operational significance.

III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause of this event was a Battery Charger 3 malfunction which was inadvertently induced during the connection of an oscilloscope to the charger circuitry. Points on the charger voltage regulator card were inadvertently connected to ground through the oscilloscope power plug neutral. This grounding caused the card to malfunction, resulting in the charger output going into an overvoltage condition.

B. Root Cause

1. The work control procedure did not require the same level of review for the subject emergent work activity, since it was planned as a scope change to an existing activity, as would have been required had an independent work document been initiated.

2. The Operations Unit Supervisor [utility - licensed - SRO] that reviewed and authorized this work activity and the involved Electrical Maintenance personnel [utility - non-licensed] that connected the test leads did not fully understand the potential for the failure mode which occurred.

3. The vendor manual being used to support this maintenance activity did not contain warnings against the use of grounded test equipment.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2002	-- 004	-- 00	6 OF 8

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

C. Contributing Factors

None

IV. ANALYSIS OF THE EVENT

The purpose of the safety-related 250 VDC system is to provide highly reliable power to various plant loads without dependence on AC power. While a battery charging scheme is required, and this charging system does require AC power, the 250 VDC batteries themselves contain stored energy sufficient to meet the needs of the powered equipment for all analyzed conditions. In addition to the DC loads directly supplied by the battery boards, the safety-related inverters convert the 250 VDC power to an uninterruptable 120 VAC to supply critical instrumentation and control loads.

A fully charged battery initially provides approximately 250 VDC to its connected loads, and in the normal alignment with a battery charger connected, a voltage of approximately 270 VDC is applied by the charger both to the battery and to the connected loads. In this event the maintenance activity induced a Battery Charger 3 malfunction which resulted in an abnormally high voltage being applied briefly to Battery Board 3 and its downstream loads. When the charger subsequently failed, the board voltage dropped to the voltage supplied by the battery itself.

The DC loads remained fully functional during this event. These loads are designed to accommodate reduced voltages, and this equipment will operate at voltages well below the nominal 250 VDC. The capability to operate at reduced voltage is necessary to allow for the unavoidable battery terminal voltage decrease which will occur when no charger is connected and loads are drawing energy from the battery. The rate of voltage decrease depends on the actual load on the battery. In this event, the battery load was low, and the battery voltage decrease was negligibly small. No design operating voltage limits were approached.

The ECCS Inverter input fuses functioned properly to protect the devices from the abnormally high currents generated during the voltage transient resulting from the charger failure. The loss of the Unit 3 Division II inverter resulted in the loss of the equipment detailed in Section II.D above. The loss of the inverter output left the Unit 3 HPCI flow controller with no instrument power and thus non-functional. This condition lasted for approximately 4 hours.

All operator actions in response to the loss of the battery charger were appropriate.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The Browns Ferry Unit 3 TS allow for power operation of the reactor for up to 14 days with an inoperable HPCI system. This allowed outage time reflects the fact that events requiring HPCI operation are of low probability. In this event HPCI was inoperable for only a small fraction of the time allowed under the TS. Additionally, all other ECCS equipment remained fully functional and available for service. Accidents and transients occurring in situations where HPCI is unavailable have been analyzed, and these analyses show that the consequences of such accidents can be mitigated, with wide safety margins, by the remaining complement of safety equipment. Because these analyses take no credit for certain other systems, such as the main feedwater system or the RCIC system, additional mitigation margins realistically exist beyond those described in the analyses. These other systems (e.g., main feedwater and RCIC) can be very effectively used in mitigating such events.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2002	-- 004	-- 00	7 OF 8

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

Given the wide safety margins briefly described above, the health and safety of the public was not affected by the subject event.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

The spare Battery Charger 2B was aligned to provide power to Battery Board 3 and charging to the associated 250 VDC battery.

The fuses were replaced in the ECCS ATU inverters 3-INV-256-0002 and 2-INV-256-0001 and the inverters were returned to service.

B. Corrective Actions to Prevent Recurrence[1]

1. The work control procedure will be changed to ensure that revised work documents whose scope involves additional equipment will be approved through the same review process as a newly initiated work document.

2. The Operations, Maintenance, and Engineering Support Personnel continuing training programs will present a discussion of this event and its causes to the appropriate training population.

3. This event will be reviewed by the Maintenance and Engineering Support Personnel Curriculum Review Committees. These programs will be revised as necessary to include appropriate training to the respective training populations regarding the proper use of measuring and test equipment.

4. The battery charger vendor manual will be revised to include precautions against the use of grounded test equipment.

VII. ADDITIONAL INFORMATION

A. Failed Components

None (i.e., no failures occurred other than those induced by the maintenance activity itself)

B. Previous LERs on Similar Events

None

C. Additional Information

None

[1] TVA does not consider these corrective actions as regulatory commitments. The completion of these actions will be tracked in TVA's Corrective Action Program.

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 3	05000296	2002	-- 004	-- 00	8 OF 8

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

D. **Safety System Functional Failure Consideration:**

This event involves a safety system functional failure as referenced in 10CFR 50.73(a)(2)(v), and it will be included in Performance Indicator reporting in accordance with NEI 99-02.

E. **Loss of Normal Heat Removal Consideration:**

N/A This event did not involve a reactor scram.

VIII. COMMITMENTS

None