

10 CFR 50.73



**BOSTON EDISON**  
Pilgrim Nuclear Power Station  
Rocky Hill Road  
Plymouth, Massachusetts 02360

George W. Davis  
Senior Vice President - Nuclear

April 24, 1991  
BECo Ltr. 91-060

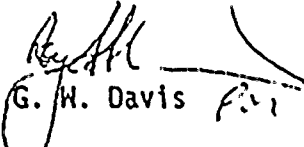
U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Docket No. 50-293  
License No. DPR-35

Dear Sir:

The enclosed Licensee Event Report (LER) 91-006-00, "High Pressure Coolant Injection and Reactor Core Isolation Cooling Systems Became Inoperable Due to Tripped Inverters", is submitted in accordance with 10 CFR Part 50.73.

Please do not hesitate to contact me if there are any questions regarding this report.

  
G. W. Davis

GJB/bal

Enclosure: LER 91-006-00

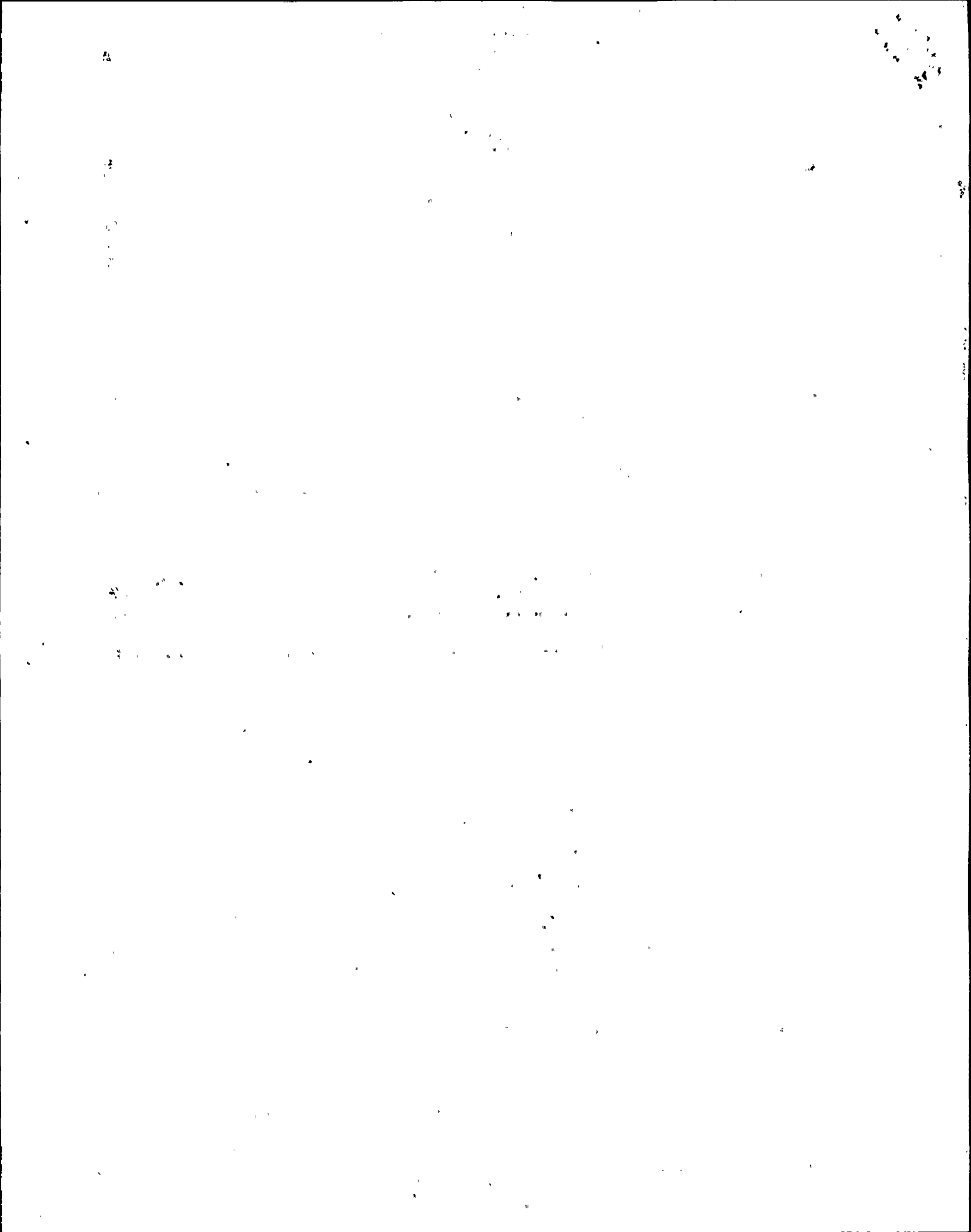
cc: Mr. Thomas T. Martin  
Regional Administrator, Region I  
U.S. Nuclear Regulatory Commission  
475 Allendale Rd.  
King of Prussia, PA 19406

Sr. NRC Resident Inspector - Pilgrim Station

Standard BECo LER Distribution

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 500 THIS 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 20501

FACILITY NAME (1) **Pilgrim Nuclear Power Station** DOCKET NUMBER (2) **0 5 1 0 0 0 2 9 3** PAGE (3) **1 OF 0 4**

TITLE (4) **High Pressure Coolant Injection and Reactor Core Isolation Cooling Systems Became Inoperable Due to Tripped Inverters**

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 (5)														
0	3	2	6	9	1	9	1	0	0	6	0	0	0	4	2	4	9	1	N/A	0	5	1	0	0	0
												N/A		0	5	1	0	0	0						

OPERATING MODE (9) **N** THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.406(c)	50.73(a)(2)(iv)	73.71(b)
20.406(a)(1)(i)	50.73(a)(1)(i)	<input checked="" type="checkbox"/> 50.73(a)(2)(v) (D)	73.71(c)
20.406(a)(1)(ii)	50.73(a)(2)	50.73(a)(2)(v)	OTHER (Specify in Abstract below and in Text NRC Form 366A)
20.406(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(v)(A)	
20.406(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(v)(B)	
20.406(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(v)	

LICENSEE CONTACT FOR THIS LER (12)

NAME **Gary J. Basileco - Senior Compliance Engineer** TELEPHONE NUMBER **5 1 0 8 7 4 7 1 - 8 5 3 1 4**

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)  NO

EXPECTED SUBMISSION DATE (15)

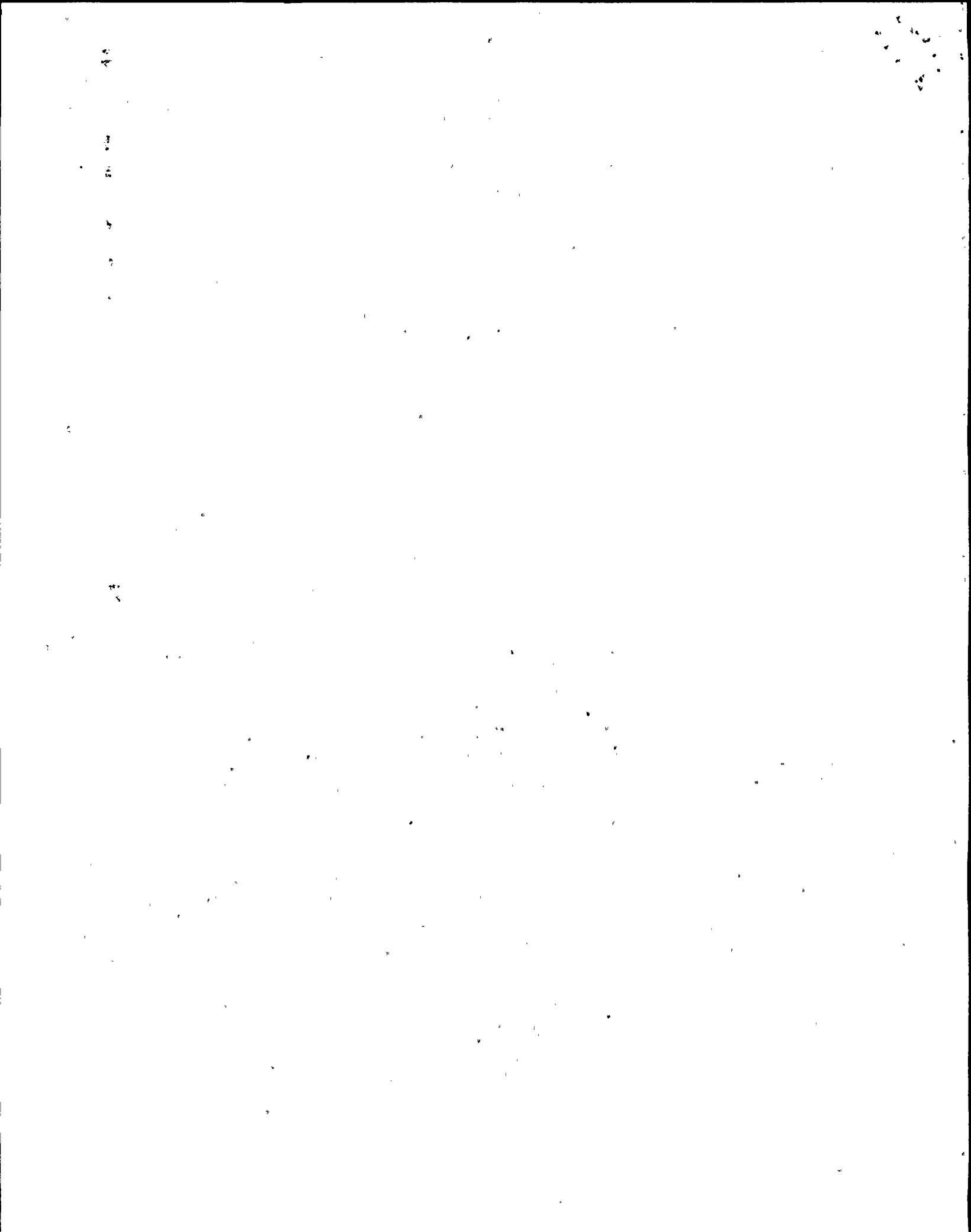
MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces or approximately fifteen single space typewritten lines) (16)

On March 26, 1991 when starting the 'B' Reactor Recirculation Pump, the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) System inverters tripped on high voltage. The HPCI and RCIC Systems were inoperable for nine minutes. The cause of the inverter trips was a voltage fluctuation that occurred during pump start. The load required by the pump start caused the battery charger that supplies DC voltage to the inverters to overcompensate resulting in a voltage surge. The trip setpoint of the inverters was exceeded during this surge.

Corrective action was taken to reset the inverters. An engineering evaluation has been initiated to investigate enhancements to preclude the inverters from tripping as a result of large pump starts. Interim measures will include an administrative change to caution operations personnel that the potential for inverter trips exists. The inverters were manufactured by Topaz Electronics, Model No. 125-GW-125 (60).

The event occurred at power operation with the reactor mode selector switch in the RUN position. The Reactor Vessel (RV) pressure was approximately 956 psig and the RV water temperature was 542 degrees Fahrenheit. The reactor power level was 30 percent. This report is submitted in accordance with 10 CFR 50.73(a)(2)(v)(D) and the event posed no threat to the public health and safety.



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 6301, U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

FACILITY NAME (1)  Pilgrim Nuclear Power Station	DOCKET NUMBER (2)  0   5   0   0   0   2   9   3 9   1	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
			- 0   0   6	- 0   0	0   2	OF 0   4

TEXT (If more space is required, use additional NRC Form 308A's) (17)

EVENT DESCRIPTION

On March 26, 1991 at 0043 hours when starting the 'B' Reactor Recirculation Pump, the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) System inverters tripped on high voltage. This made the HPCI and RCIC Systems inoperable. The Recirculation Pump was being started because of a prior event that resulted in a lockout of the emergency 4160 volt bus A-6 and subsequent trip of the 'B' Recirculation Pump (see LER 91-005-00 for details). The pump was started in accordance with Procedure 2.2.84 (Rev. 33), "Reactor Recirculation System". The inverters tripped when the pump was started and the inverter failure alarms were received at control room panels 903C and 904L for HPCI and RCIC, respectively.

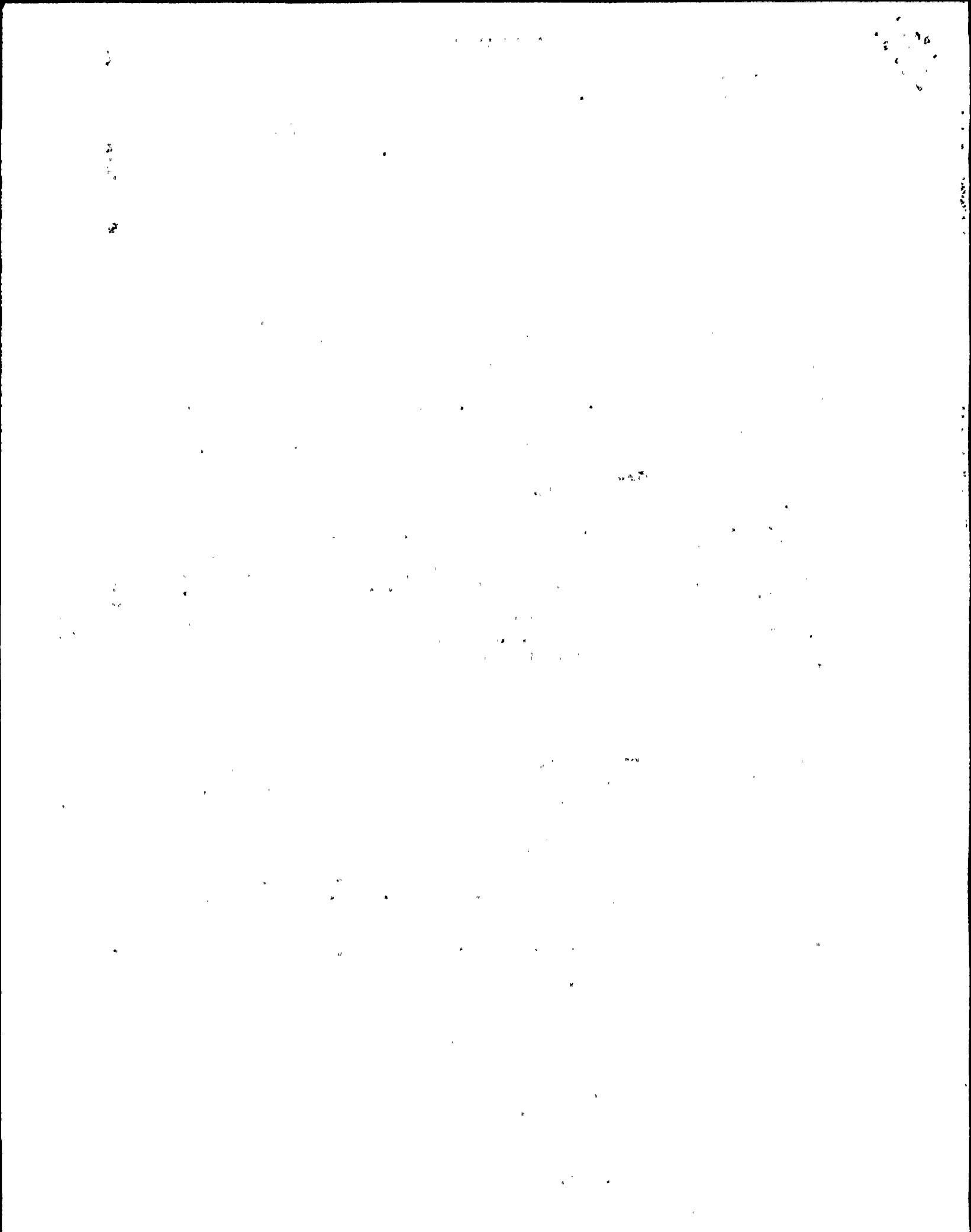
Corrective action was taken to reset the inverters at 0052 hours at the associated panels in the Control Room. Failure and Malfunction Report 91-103 was written to document the event. The NRC Operations Center was notified as required by 10CFR 50.72 on April 10, 1991 at 0927 hours. The late call was made because at the time the inverters tripped, the HPCI and RCIC Systems were not considered inoperable. A Limiting Condition of Operation was not entered as the inverters were promptly reset, nine minutes after tripping.

The event occurred at power operation with the reactor mode selector switch in the RUN position. The Reactor Vessel (RV) pressure was approximately 956 psig and the RV water temperature was 542 degrees Fahrenheit. The reactor power level was approximately 30 percent.

CAUSE

The cause of the inverter trips was a fluctuation of the input DC voltage that resulted when the 'B' Recirculation Pump was started. A reduction in voltage occurred on the 4160V AC bus A-6 due to the load demand caused by the pump start. This also caused a voltage reduction on the 480V AC buses that feed the battery chargers. The battery chargers supply DC power to the HPCI and RCIC inverters. The battery charger maintains a constant DC output provided the AC input does not vary by more than ± 10 percent. When the Recirculation Pump was started, the input voltage to the chargers went below its 10 percent input voltage margin. With the input voltage reduced the battery charger output voltage was also reduced. The battery charger responded by overcompensating for the low output voltage. This resulted in a voltage surge thereby causing the inverters to trip.

The trip range of the inverters was not sufficient to endure the transient. The inverters are calibrated to trip at approximately 140V DC. Values obtained from plant recorders at the time of the trips were 145V and 149V DC for the HPCI and RCIC inverters, respectively. The inverters convert 125V DC power to AC power for the HPCI and RCIC flow controllers and square root converters. With the inverters tripped, the systems would not automatically reach rated speed nor full flow conditions. The inverters were manufactured by Topaz Electronics, Model No. 125-GW-125 (60).



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (8)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Pilgrim Nuclear Power Station	05000293	91	006	00	03	OF	04

TEXT (If more space is required, use additional NRC Form 306A's) (17)

CORRECTIVE ACTION

Immediate corrective action was to follow the Alarm Response Procedures (ARPs) 903C and 904L for the trip of the HPCI and RCIC inverters. The applicable breakers in distribution panels D4 and D5 were checked to verify 125V DC power was available to the inverters, and the inverters were reset at 0052 hours.

An Engineering Service Request (91-249) was generated to investigate adjusting the trip setpoints on the inverters or installing an inverter that can accommodate such voltage fluctuations. In addition, the battery charger response with respect to AC supply voltage fluctuations is being evaluated. An update to this report will be submitted if significant new information becomes available.

Interim measures to be taken include a change to Procedure 2.2.84 to caution operations personnel of the potential for inverter trips when placing the Recirculation Pumps in service. The procedure will require the operators to promptly reset the inverters as required by the ARP. With regards to the late notification to the NRC Operations Center, a night order was issued to instruct the operators that when the HPCI and RCIC inverters trip the systems are to be considered inoperable until the circuitry is reset. The appropriate notifications will be made.

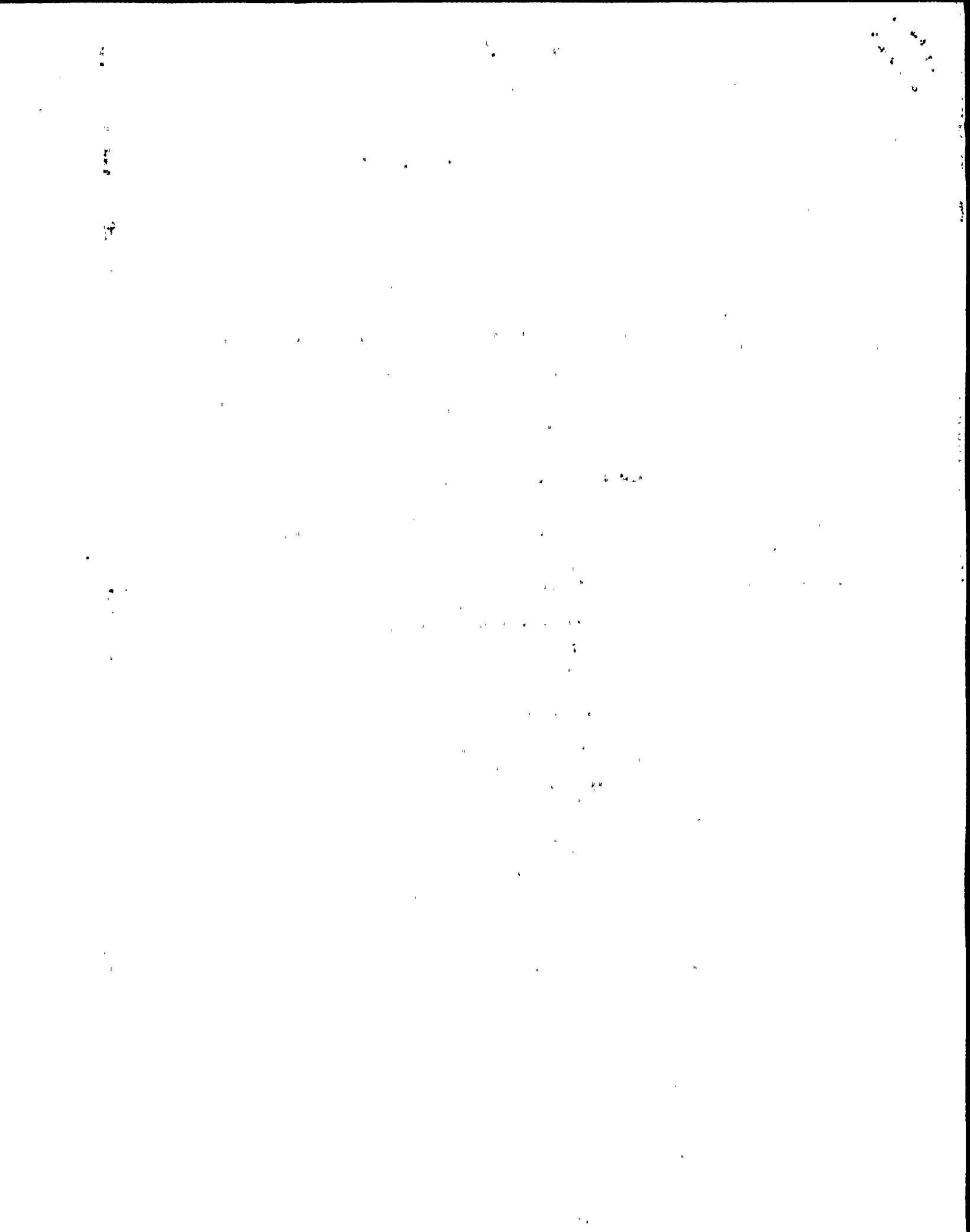
SAFETY CONSEQUENCES

The event posed no threat to the public health and safety.

The trip of the HPCI and RCIC inverters was the designed response. The inverters were reset nine minutes after tripping. If the systems were required to function during the nine minutes, the circuitry could have been reset immediately and the systems would have been available.

During the time HPCI and RCIC were inoperable due to the tripped inverters, the automatic actuation of the Automatic Depressurization System was capable of reducing the Reactor Vessel pressure for low pressure cooling provided independently by the Core Spray System and Residual Heat Removal System/Low Pressure Coolant Injection mode.

The report is submitted in accordance with 10 CFR 50.73(a)(2)(v)(D) because the HPCI and RCIC Systems became inoperable.





**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)  Pilgrim Nuclear Power Station	DOCKET NUMBER (2)  050029391	LER NUMBER (6)			PAGE (3)		
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		91	006	00	4	OF	4

TEXT (If more space is required, use additional NRC Form 368A's) (17)

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station Licensee Event Reports (LERs) issued since January of 1984. The review focused on LERs where HPCI and/or RCIC became inoperable due to tripped inverters. The review revealed one similar event. LER 85-029-00 involved receipt of the HPCI inverter circuitry failure alarms and an ATWS trouble alarm in the Control Room. It was determined that the HPCI inverter and the breaker feeding the ATWS inverter had tripped. Immediate corrective action was to reset the HPCI inverter and ATWS breaker. The cause of the trips was determined to be a fluctuation of the input DC voltage.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS

Inverter  
Charger, battery

CODES

INVT  
BYC

SYSTEMS

High Pressure Coolant Injection (HPCI) System  
Reactor Core Isolation Cooling (RCIC) System  
Low Voltage Power System (480V AC)  
DC Power System

BJ  
BN  
EC  
EI

100-111-1000

100-111-1000

100-111-1000

100-111-1000