

VERMONT YANKEE NUCLEAR POWER CORPORATION

P. O. BOX 137
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VERNON, VERMONT 05354

September 4, 1992

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

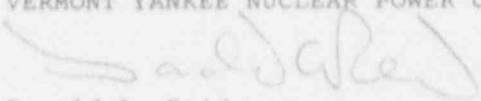
REFERENCE: Operating License DPR-28
Docket No. 50-271
Reportable Occurrence No. LER 92-018

Dear Sirs:

As defined by 10 CFR 50.73, we are reporting the attached Reportable Occurrence as LER

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION


Donald A. Reid
Plant Manager

cc: Regional Administrator
USNRC
Region I
475 Allendale Road
King of Prussia, PA 19406

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NRC Form 300 U.S. NUCLEAR REGULATORY COMMISSION (8-89)	APPROVED OMB NO. 3150-0104 EXPIRES 4/30/92 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 (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20603.
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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) VERMONT YANKEE NUCLEAR POWER STATION	DOCKET No. (2) 0 5 0 0 0 2 7	PAGE (3) 0 1 OF 0 4
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TITLE (4)
 Unusual Event As A Result of a Design Weakness in the Uninterruptible Power System Control Circuitry

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	REQ #	REV#	MONTH	DAY	YEAR	FACILITY NAME		
0 6	2 7	9 2	9 2	0 1 8	0 1	0 6	0 4	9 2			
DOCKET NO. (9) 0 5 0 0 0											

OPERATING MODE (9) N

THIS REPORT IS SUBMITTED PURSUANT TO REQ'MENT OF 10 CFR 31. CHECK ONE OR MORE (11)

POWER LEVEL (10)	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
100	20.405(a)(1)(ii)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
	20.405(a)(1)(iii)	50.36(c)(2)	50.73(a)(2)(vi)	OTHER
	20.405(a)(1)(iv)	50.73(a)(2)(i)	50.73(a)(2)(vii)(A)	
	20.405(a)(1)(v)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
	20.405(a)(1)(vi)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NO.
DONALD A. REI, PLANT MANAGER	AREA CODE: 8 0 2 2 5 7 - 7 2 1 1

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

MODE	SYST	COMPONENT	MFR	REPORTABLE TO NFRDS	CAUSE	SYST	COMPONENT	MFR	REPORTABLE TO NFRDS

SUPPLEMENTAL COMMENTS EXPECTED (14)

EXPECTED SUBMISSION DATE (15)

MO DAY YR
0 1 3 1 9 3

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

On 6/27/92 at 1830 hours, with the plant at 100% power and the A Diesel Generator (DG) inoperable for repairs, an Uninterruptible Power System (UPS) 1A trouble alarm was received. The alarm was the result of a voltage transient which occurred during the performance of surveillance on the Electric Fire Pump. A circuit breaker on the UPS Control cabinet had tripped and a reverse current alarm had occurred. The breaker was reset and the alarms cleared at 1910 hours. At 1950 hours it was recognized that although output power was never lost, the UPS had not been able to perform its design function for the period of approximately 40 minutes that the breaker was open. An Unusual Event (UE) was declared and terminated because with the A DG and the A UPS inoperable, a shutdown was required by Technical Specification Section 3.5.4.6.

The cause of the UPS breaker trip is thought to be design weakness in the UPS control circuitry however troubleshooting is continuing to confirm this root cause.

Corrective actions consist of implementing a control circuit modification, procedure, circuitry, and voltage study reviews and assessment of the need for additional training.

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 (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20603.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NO (2)	LER NUMBER (5)						PAGE (3)	
		YEAR	SEQ #	REV #					
VERMONT YANKEE NUCLEAR POWER STATION	050006271	92	018	00			02	OF 04	

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

DESCRIPTION OF EVENT

On 6/27/92 at 1830 hours, with the plant at 100% power and the A Diesel Generator (DG) (EIIS=EK) inoperable for repairs, an Uninterruptible Power System (UPS) 1A (EIIS=EF) trouble alarm was received. The alarm was the result of a voltage transient which occurred during the performance of surveillance on the Electric Fire Pump (EIIS=KP). Upon investigation of the alarm by Maintenance and Operations Department personnel it was determined that a circuit breaker on the UPS control cabinet had tripped and that a reverse current alarm had occurred. The breaker was reset and the alarms cleared at 1910 hours with the initial incorrect conclusion being that the alternating current (AC) input breaker had tripped due to the reverse current alarm. At this time it was believed that with the AC input breaker tripped the machine was operating on the direct current (DC) input from the battery and therefore able to perform its design function. At 1945 hours, after additional investigation into the event, it was recognized that it was actually the DC input breaker that had been tripped and that the machine would not have been able to perform its design function during the period that the DC breaker was inoperable.

At 1945 hours, as a result of the recognition that although output power had never been lost, the UPS had not been able to perform its design function for the period of approximately 4 minutes, an Unusual Event (UE) was declared and terminated. Technical Specification (TS) section 3.5.A.4 allows one UPS to be inoperable for 7 days provided that both diesel generators are operable. Since the A DG was inoperable, a shutdown was required by TS 3.5.A.6. A UE was declared and terminated since the inoperability of the UPS was not recognized until after the UPS was restored to operable. At 2000 hours appropriate notifications required for the event were initiated.

At approximately 2200 hours a preliminary review of the UPS operation and confirmation of equipment operability was completed by Engineering and Maintenance personnel. It was determined that the trip of the DC breaker is the appropriate response to a Reverse Current condition and that the reverse current condition was caused by a voltage transient on 480 Volt Bus 9 which was caused by immediate restart of the 250 horsepower electric fire pump. UPS-1A was confirmed to be operable by verification of normal breaker positions and indications.

Additional notifications under 10CFR50.72 were made to the Commission on 7/21/92 as a result of further review of the event.

CAUSE OF EVENT

The immediate cause of the event was the bus voltage transient resulting from a restart of the electric fire pump immediately following securing of the pump.

The root cause of the event is thought to be a design weakness in that the designer did not anticipate and design the UPS control circuitry to withstand or adjust to a sustained or recurring undervoltage condition. Troubleshooting performed in preparation to performing a Technical Modification to address this weakness was unable to substantiate this root cause or duplicate the event. Further troubleshooting is being performed to determine/verify the cause of the trip and will be reported as a supplement to this LER when identified.

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LICENSEE EVENT REPORT (LER)
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VERMONT YANKEE NUCLEAR POWER STATION	0500027192	-	018		-	00	03	OF	04

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

ANALYSIS OF EVENT

The UPS units are motor generator sets with both AC and DC motors which drive an AC generator to power a 480 Volt AC Motor Control Center (MCC). The MCC's feed motor operators for valves in the Low Pressure Coolant Injection (LPCI) mode of the Residual Heat Removal (RHR) system and the Reactor Recirculation system. The normal operating mode of the UPS units is to operate on the AC drive motor and upon loss of the AC input, the control circuitry senses the condition and transfers to the DC drive motor. Upon restoration of the AC input a retransfer to AC drive is initiated. In the event of a Loss of Normal Power (LNP) and/or an Emergency Core Cooling System (ECCS) initiation the AC Distribution System feeder breaker on the 480 volt switchgear is shed, thereby initiating an UPS transfer to the DC supply. This action isolates the UPS from the power system and provides for a power source that is independent from the rest of the power division. This is required by the Vermont Yankee Design Basis as the LPCI injection valves are required to operate, for some line break scenarios, to inject water from the RHR pump powered by the opposite division of the 4160 Volt AC system. With the A DG inoperable and the A UPS made inoperable by the DC breaker trip, only one of the minimum two required low pressure pumps were available for the 40 minute duration considering an accident in the B loop.

The UPS control circuitry was reviewed in detail as a result of the event and found to have a design weakness that can result in a trip of the DC breaker upon retransfer to AC drive, following a sustained, or recurring undervoltage condition on the AC input. The UPS DC motor also functions as a generator, which charges the battery bank, during normal operation on the AC drive motor. The reverse current sensing circuitry acts to detect power flow out of the battery and trip the DC breaker, when the machine is on the AC drive, and in the battery charging mode. Upon transfer to DC drive the direction of power flow to the battery changes as the battery becomes the source of motive power. The reverse current sensing circuitry is inhibited when the machine transfers to DC drive. A design weakness was identified in this inhibiting circuit such that after a retransfer to AC drive, following a sustained or recurring undervoltage condition on the AC input, a trip of the DC breaker could result.

The events of this report did not have adverse safety impact. The UPS unit was inoperable for a short period of time as a result of an atypical voltage transient caused by immediate restart of the electric fire pump at a time when the 480 Volt AC bus voltage was at the lower end of the normal range. These UPS units have been installed at Vermont Yankee for approximately 3 years and this is the first time that a DC breaker trip has occurred. During this time numerous pump starts and several grid disturbances have occurred which have not resulted in any similar occurrences. Transfers to DC drive and the resulting trouble alarm have however occurred during previous fire pump starts. It is considered extremely unlikely that the specific combination of events required to result in the DC breaker trip would occur in conjunction with or immediately preceding a loss of coolant accident.

If an LNP and LOCA had occurred during the event on 6/27/92, alternate power was available to 4160 volt Bus 4 from the tie line to the Vernon Hydroelectric station. This power source could have been used to make a Core Spray pump immediately available or aligned via a maintenance tie to power the MCC associated with UPS-1A. This could have been achieved by switching capability that exists in the Main Control Room.

NRC FORM 365A U.S. NUCLEAR REGULATORY COMMISSION (6-89)		APPROVED OMS NO. 3150-0104 EXPIRES 4/30/92 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 20603.					
LICENSEE EVENT REPORT (LER) TEXT CONTINUATION							
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TEXT (If more space is required, use additional NRC Form 365A) (17)

ANALYSIS OF EVENT (continued)

It should be noted that the UPS units were specifically designed for Vermont Yankee and are the only units built of this design configuration and as such no generic industry concern relative to the design weakness exists.

CORRECTIVE ACTIONS

1. The circuitry was reviewed and the manufacturer was contacted to assist in identification of the cause of the occurrence. (complete)
2. The circuitry was reviewed and a circuit modification has been designed that will correctly inhibit the reverse current trip of the DC breaker while the machine is on DC drive and during retransfer to AC drive. This modification can be achieved by a minor wiring change utilizing available control contacts. The modification was coordinated with and approved by the manufacturers original Design Engineer. (complete)
- 2a. Troubleshooting is continuing to be performed to identify/verify the cause of the event. Replacement parts for all suspected components are on order and when on hand further detailed troubleshooting will be performed.
3. Circuit modifications will be implemented into both UPS units after verification of the root cause. (completion forecast by 12/31/92)
4. The procedure governing surveillance of the Electric Fire Pump and the control circuitry will be reviewed and enhancements initiated as deemed appropriate to minimize the potential for 480 Volt AC Bus transients as a result of restart of the pump. (completion forecast for 9/18/92)
5. This event will be reviewed relative to system voltage studies in order to determine if any additional corrective actions are required. (completion forecast for 12/31/92)
6. The need for additional training on the UPS units will be assessed for applicable Operations and Maintenance Department personnel. (completion forecast for 12/31/92)
7. The need for additional training on the design basis of the Core and Containment Cooling Systems and the requirements relative to the AC Distribution System will be assessed for Engineering and Management personnel. (completion forecast for 1/30/93)

ADDITIONAL INFORMATION

There have been no similar events reported in the last five years.