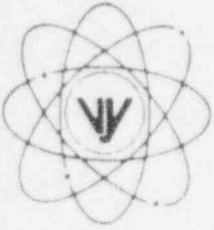


VERMONT YANKEE NUCLEAR POWER CORPORATION



P.O. Box 157, Governor Hunt Road
Vernon, Vermont 05354-0157
(802) 257-7711

September 01, 1994

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

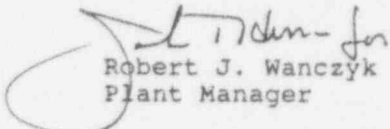
REFERENCE: Operating License DPR-28
Docket No. 50-271
Reportable Occurrence No. LER

Dear Sirs:

As defined by 10 CFR 50.73, we are reporting the attached Reportable Occurrence as LER 94-009. A 14-day extension was granted on 08/19/94 by Mr. James Linville of Region I for this LER.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION


Robert J. Wanczyk
Plant Manager

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

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NRC Form 366 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 (P-350), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20603.																																						
FACILITY NAME (1) VERMONT YANKEE NUCLEAR POWER STATION															DOCKET NO. (2) 0 5 0 0 0 2 7 1										PAGE (3) 0 1 OF 1 0																												
TITLE (4) INADVERTENT PRIMARY CONTAINMENT ISOLATION SYSTEM ACTUATION DUE TO AN UNEXPECTED TRANSFER OF THE 120/240VAC VITAL BUS TO ITS ALTERNATE POWER SOURCE DURING A LIGHTNING STORM																																																					
EVENT DATE (5) MONTH DAY YEAR 0 7 2 0 9 4									LER NUMBER (6) YEAR SEQ # REV # 9 4 - 0 0 9 - 0 0									REPORT DATE (7) MONTH DAY YEAR 0 9 0 1 9 4									OTHER FACILITIES INVOLVED (8) FACILITY NAMES DOCKET NO. (5) 0 5 0 0 0 0																										
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO REQ'TS OF 10 CFR §: CHECK ONE OR MORE (11)																																																			
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NAME ROBERT J. WANCZYK, PLANT MANAGER																									TELEPHONE NO. AREA CODE 8 0 2					2 5 7 - 7 7 1 1																							
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																																																					
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YES (If yes, complete EXPECTED SUBMISSION DATE)																									X NO																												

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

On 07/20/94, at 1832 hours, with the Reactor at approximately 100% power, a lightning strike resulted in a transfer of the 120/240V Vital AC Bus from the "normal" motor-generator power source to the "alternate" source. This momentary interruption of Vital Bus power resulted in Primary Containment Isolation System (PCIS) partial isolations, the initiation of the "A" Standby Gas Treatment System (SBGTS), a partial Reactor Building Ventilation isolation, the shutdown of the Electronic Pressure Regulator (EPR), and lockups of the Feedwater Regulation Valves and Recirculation Pump Motor-Generator Set Scoop Tubes. Operators immediately reset the Feedwater Regulation Valve lockups to regain control of reactor water level, and the Mechanical Pressure Regulator (MPR) automatically assumed control of reactor pressure. These actions maintained the monitored parameters of the Reactor Protection System (RPS) within the required ranges, thus averting a Reactor Scram. In addition to the Vital AC transfer, several Technical Specification Limiting Conditions for Operation (LCOs) were entered due to other equipment inoperabilities.

The root cause of the event was a lightning strike to the plant site which resulted in the failure of various pieces of plant equipment including an apparent failure internal to the Vital AC transfer switch. The installation of additional surge/lightning suppression devices on the affected equipment is currently being evaluated.

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

loss of control power to the Electronic Pressure Regulator (EPR). These actions maintained the monitored parameters of the Reactor Protection System (RPS) within the required ranges, thus averting a Reactor Scram. Reactor power remained at approximately 100% during the event. Upon verification that control rod movement had not occurred, nor was expected, operators manually reset the control rod drift alarms.

At 1843 hours, the scoop tube lockup on the 'A' Recirculation MG Set was reset to reestablish manual control of Reactor recirculation flow. This resulted in a decrease in Reactor power to approximately 85% due to an 8% reduction in core flow caused by the repositioning of the scoop tube to the actual speed demand signal of the Recirculation Flow Control System. At approximately 1847 hours, Reactor power operation was returned to 100%, and the partial PCIS Group 2B and 5B Isolations were reset. At 1857 hours, the partial PCIS Group 3B isolation was reset; however, SBTG remained in service due to unsuccessful attempts to restore normal Reactor Building Ventilation. At 2133 hours, the Reactor Water Cleanup System (RWCU)(EIS = CE) was returned to service.

With assistance from the I&C technicians, called in as a result of the event, the scoop tube lockup on the 'B' Recirculation MG Set was reset at 2154 hours, and normal Reactor Building Ventilation was restored at 2217 hours.

In an effort to determine how the lightning strike effects were imposed on the Vital AC System, Engineering performed a review of the loads fed from Vital AC. The focus was on the system loads because, at the time of the lightning strike, the Vital AC Bus was isolated from the plant's electrical distribution system through the MG Set. This review found that one of the circuits extends to the stack base to provide control power for offgas isolation valve FCV-11. The path by which the lightning affected the Vital AC system is believed to be via this circuit since no other Vital AC circuits were identified that extend out to the Plant Stack or 115kV/345kV Switchyards. Currently no surge suppression equipment has been applied to this circuit.

In addition to the Vital AC System, the following equipment was also affected as a result of the lightning storm:

- Stack Gas II Radiation Monitor Rendered Inoperable (EIS = IL).
[Tech Spec: Indef-LCO, Declared Inop: 07/20/94 @ 2300 hours, Declared Operable: 07/21/94 @ 1345 hours]
- Ground indication and a loss of battery charger output power on the Division I ECCS 24VDC System (EIS = EJ).
[Tech Spec: 3-Day LCO, Declared Inop: 07/20/94 @ 2345 hours, Declared Operable: 07/22/94 @ 0840 hours]

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CAUSE OF EVENT

The root cause of the 07/20/94 event was a lightning strike to the plant site which resulted in the failure of various pieces of plant equipment due to the lightning induced voltage transients on the equipment.

The cause of the Vital AC power supply transfer events is an apparent lightning induced failure at the Vital AC transfer switch. The lightning surge appears to have been imposed on the system via the Vital AC circuit that extends to the Stack base for control of offgas isolation valve FCV-11. To date, all of the major components of the "normal" Vital AC power supply have been tested with the exception of the transfer switch. Since the comprehensive testing performed on the MG Set did not identify any problems with the unit, the failure is believed to be internal to this switch.

ANALYSIS OF EVENT

The lightning event had significant impact on the facility and resulted in several Technical Specification LCOs being entered due to equipment inoperabilities; however, there were no adverse safety implications to the public because 1) the monitored parameters of the Reactor Protection System were maintained within the required ranges and 2) Technical Specification system operability requirements remained satisfied at all times. The engineered safety feature (ESF) equipment actuations that occurred were the partial PCIS Group 2B, 3B, and 5B isolations and the initiation of the 'A' Standby Gas Treatment System; however, as previously discussed, these system responses were not the result of valid PCIS isolation signals.

The lockup of the Recirculation MG Set Scoop Tubes, the Feedwater Regulation Valve lockups, and the transfer of Reactor vessel pressure control from the EPR to the MPR are expected system responses to a momentary or sustained loss of power to the Vital AC Bus and are identified as such in the Vital AC System operating procedure.

A review of the PCIS control logic by Operations and Engineering personnel verified that the partial PCIS isolations and resulting SGBT System "A" initiation are also expected system responses to a momentary or sustained loss of power to the Vital AC Bus. These partial isolations may not have occurred in the past during intentional manual transfers between the "normal" and "alternate" power sources because the response time of the transfer switch is believed to be sufficiently short to prevent the "normally energized / seal-in" PCIS relays from dropping out. However, on an automatic transfer to the "alternate" source, the period the bus is de-energized is significantly longer than during a manual transfer because the transfer does not occur until approximately one second after the protective relaying senses the undervoltage and/or underfrequency condition. As experienced in the two events described, this additional time delay is sufficient for receiving the partial PCIS isolations.

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With the exception of the Vital AC transfer switch, the equipment identified as impacted by the event has been repaired and returned to service. Transfer switch testing has not yet been performed because this device interfaces with both the "normal" and "alternate" Vital AC power sources. It was determined that testing of the switch in an energized state would constitute an unnecessary personnel hazard, and could also result in a plant trip.

Based on the results of the Vital MG testing and the high probability that the problem is internal to the Vital AC transfer switch, a replacement transfer switch is being procured on a priority basis and plans are being developed for its installation. A Basis for Maintaining Operation (BMO) and a 10CFR50.59 safety evaluation were prepared to document the acceptability of continued operation with the Vital AC System on the "alternate" power source. The safety evaluation performed a comprehensive review of such areas as Appendix R, Station Blackout, Alternate Shutdown, and Vital/Instrument AC Separation Criteria, as well as verified the continued operability of the Reactor Core Isolation Cooling (RCIC) system (EIS = BN) which relies on Vital AC power for operation from the Control Room. The evaluation concluded the existing Vital AC configuration did not involve an unreviewed safety question.

{Note: A BMO is a Vermont Yankee evaluation which provides the basis for maintaining continued operation with a known deficiency in the analysis, design, or qualification of safety-related, environmentally qualified, or technical specification systems, structures, or components.}

CORRECTIVE ACTIONS

Immediate

1. The Feedwater Regulation Valve lockups were reset and Reactor water level was returned to the normal range.
2. The Recirculation MG Set Scoop Tube lockups were reset to reestablish manual control of reactor vessel recirculation flow.
3. The partial PCIS Group 2B, 3B, and 5B isolations were reset, and the Reactor Building Ventilation and Reactor Water Cleanup systems were returned to normal operation.
4. Operations and Engineering performed reviews of the PCIS control logic to verify the partial PCIS isolations and resulting SGBT System "A" initiation were expected system responses to the momentary interruption of Vital AC power common to both events.

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Short Term

1. The Technical Specification equipment declared inoperable as a result of the 07/20/94 lightning event has been repaired, tested, and returned to service. (Status: complete)
2. Engineering performed a review of the loads fed from Vital AC to determine how the lightning strike effects were imposed on the Vital AC System. This review found that one of the circuits extends to the stack base to provide control power for offgas isolation valve FCV-11. The path by which the lightning affected the Vital AC System is believed to be via this circuit since no other Vital AC circuits were found to extend out to the Plant Stack or 115kV/345kV Switchyards. (Status: complete)
3. The Stack equipment connected to the Vital AC system was inspected for evidence of carbon tracking and/or lightning induced damage. No discrepancies were identified. (Status: complete)
4. A Basis for Maintaining Operation was written and approved to document the acceptability of continued operation with the Vital AC Bus on its "alternate" power source until troubleshooting and repairs of the "normal" MG Set power source are complete. (Status: complete)
5. An independent review of the event and interim plant configuration was performed from an Individual Plant Examination (IPE) / Probabilistic Risk Assessment (PRA) perspective relative to the risk significance of the present plant configuration. The review confirmed the acceptability of this configuration. (Status: complete)
6. A safety evaluation in accordance with 10CFR50.59 was prepared to document the acceptability of operating the Vital AC System on the "alternate" power source for other than a short term basis. (Status: complete)
7. The portion of the ERFIS data acquisition system affected by the event was evaluated in an effort to reduce this part of the systems susceptibility to the voltage transients induced during lightning strikes to the plant site. Based on this, a Temporary Modification (TM) was installed on 08/12/94 that moved the respective ERFIS input module from the Switchyard Relay House to the Cable Vault. It was determined this relocation of equipment would provide improved surge protection of the ERFIS plant signal inputs previously impacted. The subject TM is planned to be made permanent under Engineering Design Change Request 94-405 "Met Tower Improvements." (Status: TM complete)
8. An independent Engineering review was conducted and confirmed the appropriateness of the Vital AC System troubleshooting/testing activities and the resulting conclusions. (Status: complete)

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9. In conjunction with Short Term Corrective Action #4, a replacement Vital AC transfer switch is being procured on a priority basis and plans are being developed for its installation.

Long Term

- Engineering will investigate the installation of additional surge/lightning suppression devices on the plant equipment affected by the 07/20/94 lightning strike event. This review will focus on additional protection of the Vital AC System and the Stack Radiation/Flow Monitoring Technical Specification equipment. Engineering is currently working with surge/lightning protection experts to identify the proper transient suppression equipment and device locations to protect the subject plant equipment. (Expected completion date: November 1994)
- The Vital AC System operating procedure will be revised to include the partial PCIS Isolations and Control Rod drift alarms as expected system responses to a momentary or sustained interruption of power on the Vital AC Bus. The procedure will also be revised to place the MPR in service for vessel pressure control if a manual transfer of the Vital AC Bus is required during normal power operation. This manual swap of pressure regulation to the MPR is based on the anticipated shutdown of the EPR during the Vital AC power supply transfer evolution. (Expected completion date: February 1995)
- The Reactor Recirculation System operating procedure will be revised to verify, during a Recirculation MG Set Scoop Tube lockup, the speed demand signal from the Recirculation Flow Control System is matched to the actual MG set operating speed prior to resetting the lockup. (Expected completion date: February 1995)
- Maintenance will perform a failure analysis of the Vital AC transfer switch upon its removal from service.
- Engineering will review the results of the subsequent testing and failure analysis to be performed on the Vital AC transfer switch after its removal from service. If it is determined the cause of the event is other than an internal failure of the switch, a supplement to the LER will be submitted to the Commission detailing the findings.

ADDITIONAL INFORMATION

There were two events reported to the Commission in the last five years that were determined to be similar to this event. The most recent event was reported under LER 91-014 and involved a lightning strike which impacted plant operation. The cause of this event was a lightning induced fault on one of the three 345kV lines servicing the plant's switchyard that ultimately resulted in a loss of the 345kV switchyard concurrent with a Generator Load Reject Scram. The other event, reported under LER

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90-009, involved an unexpected transfer of the Vital AC Bus to its "alternate" power source. The cause of this event was a short circuit on the Vital AC Bus which was the result of personnel error during installation of a design change.

In addition to the corrective actions described in this report, other corrective actions are already in progress as a result of a lightning event which occurred in July 1993. These actions include additional surge suppression on Control Room Annunciator circuits, and a preventative maintenance program for the existing lightning protection system.

The original due date of LER 94-009 was 08/19/94. A 14-day extension was granted by the Commission to allow for the results of the 10CFR50.59 safety evaluation to be included in the report.

LICENSEE EVENT REPORT (LER) FAILURE CONTINUATION

EXPIRES: 6/89

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

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