U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-456/88007(DRSS)

Docket No. 50-456 License No. NPF-70

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: Braidwood Station, Unit 1

Inspection At: Braidwood Site, Braidwood, Illinois

Inspection Conducted: March 1-17, 1988

Inspector: Charles F. Gill — Date: 3/25/88

Approved By: L. Robert Greger, Chief
Facilities Radiation Protection
Section — Date: 3-25-88

Inspection Summary

Inspection during the period March 1-17, 1988 (Report No. 50-456/88007(DRSS))
Areas Inspected: Special, announced inspection of licensee action following a startup test which indicated operability problems with the Control Room Ventilation Systems.
Results: The licensee's failure to have Control Room Ventilation Systems operable apparently violated regulatory requirements (Section 4). The appropriate enforcement action for this failure will be determined and communicated to the licensee by separate correspondence.

DETAILS

1. Persons Contacted

B. Andrews, Shielding Project Engineer, S&L
#*P. Barnes, Regulatory Assurance Supervisor
*E. Carroll, Regulatory Assurance Engineer
#D. Christinia, Project Field Engineer
*L. Davis, Assistant Superintendent Technical Services
#D. Elras, PWR Engineering Superintendent
#D. Galanis, Senior Electrical Project Engineer, S&L
#P. Holland, Regulatory Assurance Engineer
#S. Hunsader, Nuclear Licensing Administrator
*J. Jasnosz, AR/PR Coordinator
G. Lahti, Assistant NSLD Head, S&L
#F. Lentine, PWR Nuclear Licensing Supervisor
#M. Lohmann, Project Startup Construction Superintendent
#C. Moerke, Project Engineer
#P. Myrda, Project Field Engineer
#*D. O'Brien, Services Superintendent
#W. Paschal, Assistant HVACD Head, S&L
#J. Phelan, Lead Electrical Engineer
#*R. Richard, HVAC Group Leader
#B. Sheldon, PWR Engineering Manager
#*T. Simpkin, Regulatory Assurance Engineer
#S. Stimac, Staff Engineer

#L. Greger, NRC/RIII, Chief, Facilities Radiation Protection Section
#J. Hinds, NRC/RIII, Chief, Reactor Projects Section 1A
T. Tongue, NRC/RIII, Senior Resident Inspector

The inspector also contacted other licensee and contractor employees.

*Denotes those attending the interim exit meeting on March 4, 1988.

#Denotes those attending the telephone exit meeting on March 17, 1988.

2. General

This inspection which began on March 1, 1988, was conducted to review the circumstances surrounding a startup test which indicated inoperability of a Control Room Ventilation System while the plant was in operational Mode 1 (power operation).

3. Licensee Event Report (LER) Followup

Through direct observations, discussions with licensee personnel, and review of records, the following event report was reviewed to determine

that reportability requirements were fulfilled, immediate corrective action was accomplished, and corrective action to prevent recurrence had been accomplished in accordance with Technical Specifications.

LER No.	Description
456/87-058-00	Both Trains of Control Room Ventilation Inoperable Due to Incorrect Design Incorporation

The LER was reviewed as part of the inspection into the apparent inability of both independent Control Room Ventilation Systems to meet their design requirements; this matter is discussed in Section 4.

4. Inability of Independent Control Room Ventilation Systems to Perform Their Design Requirements

a. Event Summary

On November 6, 1987, during a review of the Control Room Ventilation Startup Test (BwSU VC-30) and Engineering Design Change DC-V041 by the licensee's Project Engineering Department (PED), it was identified that the train B heater for the emergency makeup filter unit did not energize during the startup test on October 2, 1987, although the fan was operating. After consulting with station technical staff engineers and the Architect Engineer (Sargent & Lundy), PED confirmed that an error in design existed in the heater interlock logic circuitry and the heaters on both trains (A and B) of the Control Room Ventilation (VC) Systems would not energize at the proper time.

At 1135 on November 6, 1987, both trains of VC were declared inoperable and Technical Specification 3.0.3 was entered. Upon declaring both trains of VC inoperable, the station's Electrical Maintenance Department was contacted to determine if the train B heater would energize with the emergency fan operating. The test of the train B heater revealed that the heater was energized as soon as the fan was started but de-energized shortly afterwards. After installation of temporary alterations on both trains of VC to correct the design error (miswiring), the train B heater was again tested; the heater was found to energize shortly after the emergency fan began operation and to remain energized. Based on the success of the test of the train B heater, Technical Specification 3 0.3 was exited at 1234. Since a test was not made at the time for correct operation of the train A heater, LCO Action Requirement 1.a of T/S 3.7.6 was entere on train A of the Control Room Ventilation Systems.

Upon reviewing setpoint data sheets for the fan dP heater interlock logic switch for the Control Room Ventilation Systems, station technical staff engineers noted on November 6, 1987, that the setpoints had not been reset, as required, after design change. On November 7, 1987, the as-found setpoint on train A was 16.5" wg; after setpoint readjustment the value was 5.75" wg, compared to the desired setpoint of 5.73" wg. The LCO action requirement on train A was exited at 0820 on November 9, 1987. Because train B was demonstrated operable with the existing fan dP heater interlock switch setpoint on November 6, 1987, LCO Action Requirement 1.a of T/S 3.7.6 was not entered for setpoint readjustment until 0858 on November 20, 1987. The as-found setpoint was 13.2" wg; the as-left setpoint was 5.70" wg on November 20, 1987, compared to the desired setpoint of 5.73" wg. The LCO action requirement on train B was exited at 1342 on November 21, 1987. The probable effect that the switch wiring and setpoint errors had on system operability are discussed further in Subsection 4.g.

Refer to Appendix A for the sequence of relevant events.

b. Event Causation

The following occurrences contributed to the failure of the Control Room Ventilation Systems to meet their design requirements:

(1) The incorrect heater operation was the result of a design error in the Architect Engineer's (A/E's) electrical schematic and wiring diagrams issued via Engineering Change Notice (ECN) No. 34446 on December 16, 1986.

(2) The cause of the design error was an incorrect interpretation by the A/E's Electrical Project Engineering Division of the "Normal/Abnormal" nomenclature shown on the Mechanical-Control and Instrumentation Logic Diagram (issued via ECN No. 34272 on December 16, 1986) to describe the interlock function.

(3) Adequate measures were not established for coordination among participating design organizations in that ECN No. 34272 generated by the A/E's Control and Instrumentation Division was improperly understood and incorrectly incorporated into ECN No. 34446 by the A/E's Electrical Project Engineering Division.

(4) Adequate measures were not provided for verifying or checking the adequacy of design in that a design review was not adequately performed to assure that the design change initiated by ECN No. 34446 was proper before the design change was complete.

(5) Failure to detect these design errors in the heater control circuits at the time of installation was due to a preservice testing deficiency in that the design change was not verified by component demonstration or retest, although a functional check of heater operation was performed.

(6) Contrary to standard preoperational testing practice, setpoint checks of the heater interlock logic switches were not made upon installation. The licensee's Instrument Maintenance Department (IMD) apparently was not aware of the need to adjust the setpoints after completion of ECNs Nos. 34272 and 34446. Due to the setpoint changes not being made, heater operation under certain conditions could appear normal, as it did during the functional test and subsequent surveillances (see Appendix A).

(7) When the startup test revealed that the heater was not operating on train B, test personnel apparently did not realize that heater operability is directly tied by the Technical Specifications to Control Room Ventilation System operability.

Refer to Appendix A for the sequence of relevant events.

c. Corrective Actions

(1) Initial actions were taken to correct the wiring and setpoint errors when they were discovered. A modification package for permanent alterations to the heater interlock logic circuits of both trains of the Control Room Ventilation System is being developed.

(2) The A/E's engineering and quality assurance personnel are investigating the design error to verify that it is an isolated error and to determine the appropriate corrective action to prevent recurrence.

(3) The licensee has identified no other preservice testing deficiencies involving a design change. The licensee therefore considers this incident to be an isolated event and proposes no other corrective actions regarding the preservice program.

d. Safety Significance

(1) The operability of both trains of VC was jeopardized by the incorrect design changes and failure to properly adjust the heater interlock logic switch setpoints from the time of system required operability at 2120 on May 29, 1987 (initial criticality), until 1342 on November 21, 1987, after both trains had the design errors and setpoints corrected. The

design error would result in heater operation whenever the fan was energized unless the high dP setpoint was reached. Had the correct setpoint changes been made initially, the fan dP setpoints would have been reached on both trains shortly after fan energization and the heaters would not have operated. Due to the licensee's failure to change the dP setpoints, it appears that the train A heater may have operated under normally expected ventilation conditions, but the train B heater would only sporadically operate because under existing ventilation conditions, the fan dP was about equal to the dP setpoint. Subsequent to the electrical modifications on November 6, 1987, it appears that the train B heater would continue to operate sporadically, but the train A heater now would not operate under normally expected ventilation conditions. Design operation of the heaters would be expected subsequent to the setpoint changes on November 7, 1987, and November 20, 1987, for Train A and Train B, respectively.

(2) Without the heaters operational to assure 70% relative humidity (T/S laboratory test RH for charcoal adsorber acceptance), the intake of makeup air of greater than 70% RH would lead to less adsorber efficiency than that for which the charcoal has been tested and would thus lead to higher Design Basis Accident (DBA) control room operator thyroid doses than anticipated. Under certain conditions (DBA conditions with high relative humidity), the control room potentially could have been uninhabitable per GDC-19 criteria. If the control room was uninhabitable, a condition would exist which could prevent the fulfillment of the safety function of systems needed to shutdown the reactor and maintain a safe shutdown condition.

The licensee's safety analysis of this event contends that only the main steamline break accident is postulated to significantly affect turbine building relative humidity (100% RH). A humidity sensor located in the turbine building emergency makeup air intake would reportedly annunciate in the Main Control Room to alert the operators. Makeup air from the minimum outside air intake can be established by opening the normally closed damper and closing the turbine building emergency makeup air intake damper. The licensee claims that the source of moisture in the air could thus be removed. It should be noted, however, that because the turbine building is not a Seismic Category I structure, no credit is given for that building's presence in accident analyses; nor did the NRC give credit for dual emergency air intakes. Also, as discussed above, inoperable heaters will allow atmospheric relative humidity to impinge on the charcoal adsorbers which will then have a lower iodine removal efficiency than if the heaters were operating; this is true for all relative

humidities and types of radioiodine release accidents. For these reasons, the licensee arguments appear to be invalid.

(3) Another potential problem resulted from the design and setpoint errors in that the heaters would operate at less than their design air flow. The heat removal by air flow would thus be less than designed, and the heater would tend to raise the temperature of the air impinging on the charcoal adsorbers. Although the probability of a charcoal fire may be only slightly increased, the licensee has committed to the heater design required of ANSI/ASME N509-1976. (ANSI/ASME N509-1976, Section 5.5 states that the sensible heat produced by the heater shall not result in increasing air temperatures to more than 225°F and a manual overtemperature control switch set at this value shall be provided.) Nevertheless, it appears that under some low flow conditions, charcoal combustion may have been possible. Until this matter is reviewed further, it is considered an Unresolved Item. (456/88007-01)

e. Quality Assurance Regulatory Requirements

Appendix B to 10 CFR 50 defines the required quality assurance criteria for nuclear power plants to assure safe operation, including quality assurance requirements for design, construction, and testing of systems that mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. As used in this appendix, quality assurance comprises all actions necessary to provide adequate confidence that systems and components will perform satisfactorily in service.

(1) Design Control

Commonwealth Edison Company Quality Procedure No. 3-1, Design Control, Section 4.2, states that design review and control is required to assure meeting design and regulatory requirements. Commonwealth Edison Company Quality Procedure No. 3-2, Design Change Control, Section 3.6, identifies an Engineering Change Notice (ECN) as a design change by the Architect Engineer (A/E) which documents and authorizes design changes engineered and issued by the A/E; Section 2.0, states that design reviews are conducted within the participating departments on each design change. The Braidwood Startup Manual is a procedure which provides requirements for the completion and initial testing of the plant in conformance with the requirements of the Commonwealth Edison Company Quality Procedures and Appendix B of 10 CFR 50.

Contrary to the above, the design control measures were inadequate to correctly implement Design Change No. VC-041 to the Control Room Ventilation Systems' heater interlock control systems:

- Adequate measures were not established for coordination among participating design organizations in that ECN No. 34272 generated by the A/E's Control and Instrumentation Division was improperly understood and incorrectly incorporated into ECN No. 34446 by the A/E's Electric Project Engineering Division.

- Adequate measures were not provided for verifying or checking the adequacy of design in that a design review was not adequately performed to assure that the design change initiated by ECN No. 34446 was proper by verifying or checking the adequacy of design, such as by the performance of adequate design reviews or by the performance of a suitable testing program.

Failure to meet the requirements of the Startup Manual and Quality Procedures Nos. 3-1 and 3-2 is an apparent violation of Criterion III, Design Control, Appendix B to 10 CFR 50. (456/88007-03)

(2) Test Control

Commonwealth Edison Company Quality Procedure No. 11-2, Development, Performance, Documentation and Evaluation of Preoperational and Startup Tests, Section 3.2, states that preoperational tests are tests made prior to initial criticality to demonstrate the satisfactory mechanical and electrical operation of the systems involved, including interlocks between systems. The Braidwood Startup Manual is a procedure which provides requirements for the completion and initial testing of the plant in conformance with the requirements of the Commonwealth Edison Company Quality Procedures and Appendix B to 10 CFR 50. This manual states in part, that a preoperational test will demonstrate the capability of systems and components to safety related performance requirements, a component demonstration is a test completed to reverify proper operation after a control circuitry change, and a retest is a test necessary to complete steps omitted during the execution or to repeat test sections.

Preoperational Test BwPT VC-10, Control Room Ventilation, was performed on March 4 and 11, 1987, on trains B and A, respectively. These tests, as well as retests on train A on March 30 and April 3, 1987, and on train B on April 4, 1987, indicate that the Control Room Ventilation Systems' heaters were operating. On April 15, 1987, Deficiencies (DEF) Nos. VC-10-520 and VC-10-521 were initiated to complete ECN No. 34446 for train B and A, respectively. On May 20,

1987, DEF Nos. VC-10-520 and 521 were closed. Initial criticality for Unit 1 occurred at 2120 on May 29, 1987; VC was declared operational by Technical Specifications. Because the licensee did not conduct a component demonstration or a retest after completion of ECN No. 34446, the licensee was apparently unaware until it was identified during a review of the VC startup test on November 6, 1987, that design change errors jeopardized the operability of the Control Room Ventilation Systems. The failure to meet the requirements of the Startup Manual and Quality Procedure No. 11-2 is an apparent violation of Criterion XI, Test Control, Appendix B to 10 CFR 50. (456/88007-04)

(3) Instructions, Procedures, and Drawings

On February 9, 1987, the setting of 5.73" wg was specified on design drawing instructions for differential pressure switches on train A (OPDS-VC059, Sheet No. PS631) and train B (OPDS-VC060, Sheet No. PS633) for the heater interlock logic circuitry of the Control Room Ventilation Systems. On November 7, 1987, the as-found setpoint on train A was 16.5" wg; on November 20, 1987, the as-found setpoint on train B was 13.2" wg. The failure to reset the setpoints on these switches after the completion of ECN No. 34446 and to verify the setpoints as part of the preoperational test program pursuant to the requirements of the Startup Manual is an apparent violation of Criterion V, Instructions, Procedures, and Drawings, Appendix B to 10 CFR 50. (456/88007-05)

f. Safety Review Regulatory Requirement

The Braidwood Final Safety Analysis Report (FSAR), Section 6.5.1 states that each control room HVAC makeup air filter unit utilizes heaters to assure optimum air conditions entering the charcoal absorbers. Appendix A of the FSAR indicates, in response to Regulatory Guide 1.52 Position 3.b, that the heater stage is sized to reduce the relative humidity of the entering air-steam mixture from 100% to approximately 70%. FSAR Subsection 7.3.1.1.9 states that the electric heating coils are interlocked with the corresponding standby makeup air fans; FSAR Subsection 9.4.1.4 states that the interlocks are cold checked, adjusted, and tested to ensure the proper sequence of operation. The calculated LOCA control room operator doses presented in Table 6.4-1 of the FSAR are based on iodine removal efficiency credits of 99% and 90% for the control room makeup air intake and recirculation charcoal absorber filters, respectively. Assuring these iodine removal efficiencies is dependent upon maintaining relative humidity at or below 70%, as specified in T/S 4.7.6.a.2 and T/S 4.7.6.h.2. The basis for T/S 3/4.7.6 states that the operability of the Control Room Ventilation System ensures that the control room will remain habitable for operations personnel during and following all credible accident conditions based on limiting the personnel radiation exposure consistent with the requirements of GDC-19.

The licensee made changes in the facility as described in the safety analysis report without prior Commission approval even though the change involved an unreviewed safety question, when on May 20, 1987, the licensee incorrectly implemented a design change to the Control Room Ventilation System heater interlock control system which shut the heater off when the fan dP setpoint was reached rather than the desired change which was to turn the heater on when the fan dP setpoint was reached.

This is an apparent violation of 10 CFR 50.59(a)(1) which prohibits a licensee from making changes in the facility as described in the safety analysis report, without prior Commission approval, if the proposed change involves an unreviewed safety question. 10 CFR 50.59(a)(2) states that a proposed change shall be deemed to involve an unreviewed safety question if, among others (i) the consequences the of an accident previously evaluated in the safety analysis report may be increased; or (ii) a possibility for a malfunction of a different type than any evaluated previously in the safety analysis report may be created; or (iii) the margin of safety as defined in the basis for any technical specification is reduced. (456/88007-02)

g. Technical Specification Limiting Conditions for Operation

Technical Specification 3.7.6 LCO, states that two independent Control Room Ventilation Systems shall be operable for all operational modes and that for modes 1, 2, 3 and 4, with one Control Room Ventilation System inoperable, restore the inoperable system to operable status within 7 days or be in at least hot standby within the next six hours and in cold shutdown within the following 30 hours. Technical Specification 3.0.3 LCO, states that when an LCO is not met, except as provided in the associated action requirements, within one hour action shall be initiated to place the unit in a mode in which the specification does not apply by placing it, as applicable, in at least hot standby within the next six hours, at least hot shutdown within the following six hours, and at least cold shutdown within the subsequent 24 hours.

The train B heater was apparently operable on October 1 and 19, 1987, during surveillance tests; yet the train B heater tested inoperable during the October 2, 1987 startup test and on November 6, 1987. The apparent contradictions in operability test results may be due to the nearness of the fan dP to the heater interlock logic switch setpoint. The fan dP measured 13.0" wg on October 2, 1987; the as-found setpoint on November 20, 1987 was 13.2" wg. Thus, it appears that at least between October 2, 1987 and November 6, 1987, train B operability was sufficiently in doubt and it should have been declared inoperable on October 2, 1987.

After the heater interlock logic switches were rewired on November 6, 1987, to correct the design errors, train B was declared operable at 1234. Later in the day it was discovered by station technical staff engineers that the setpoints on both trains were incorrect. This discrepancy combined with the rewired logic switches made it unlikely that train A was operable and put the operability of train B in significant doubt. It appears that both trains should have been declared inoperable and the action requirements of T/S 3.0.3 entered when the failure to reset the switch setpoint was identified. Instead, after setpoint readjustment the licensee exited the LCO action requirement (AR) of T/S 3.7.6 for train A at 0820 on November 9, 1987, entered T/S 3.7.6 LCO AR to reset setpoint on the train B heater interlock logic switch at 0853 on November 20, 1987, and exited train B T/S 3.7.6 LCO AR at 1342 on November 21, 1987.

The licensee appears to have been in violation of the T/S 3.7.6 LCO AR at least intermittently between October 2, 1987 (perhaps since initial criticality on May 29, 1987), and 1342 on November 21, 1987, and of the T/S 3.0.3 LCO AR between 1235 on November 6, 1987, and 0820 on November 9, 1987. (456/88007-06)

5. Exit Meeting

The inspector met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on March 4, 1988, and by telephone on March 17, 1988. The inspector summarized the scope and findings of the inspection, including the unresolved item and the apparent violations. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any such documents/processes as proprietary.

Appendix A

Sequence of Relevant Events

Date/Time	Event Description
October 14, 1986	Fan dP interlock switch (OPDS-VC059) on train A set at 16.1" wg with the switch in the normally closed position. (The switch was designed to open upon Hi-dP across fan OVC03CA, thus turning the fan off.)
tober 23, 1986	Design Change VC-041 was initiated to delete fan OVC03CA/CB high delta P trip and add low flow trip and heater interlock. (Based on Byron experience.)
December 16, 1986	Engineering Change Notice (ECN) No. 34272 approved by S&L's C&I Division in response to DC-VC041.
December 16, 1986	ECN No. 34446 approved by S&L's EPE Division in response to ECN No. 34272.

NOTE: ECN 34446 was based on a misunderstanding of ECN 34272 which resulted in switches OPDS-VC059 & 060 remaining in the normally closed (NC) position when used as heater interlock switches. Thus, when the fan started the heater would start and run until the fan dP setpoint was reached.

December 16, 1986	Fan dP interlock switch (OPDS-VC060) on Train B set at 16.0" wg with the switch in the normally closed position.
February 9, 1987	The setting of 5.73" wg was specified on differential pressure switches on Train A (OPDS-VC059, Sht. No. PS631) and Train B (OPDS-VC060, Sht. No. PS633).
March 4, 1987	Preoperational Test BwPT VC-10, "Control Room Ventilation," was performed on Train B. The heater generated about 30 amps.
March 11, 1987	VC-10 performed on Train A. The heater generated about 30 amps.
March 30, 1987	Retest No. 146 was performed on Train A; reason for retest was unrelated to heater performance. The heater generated about 30 amps.

April 3, 1987	Retest No. 147 was performed on Train A; reason for retest was unrelated to heater performance. Heater contacts reported closed.
April 4, 1987	Retest No. 147 was performed on Train B. Heater contacts reported closed.
April 15, 1987	Deficiencies Nos. VC-10-520 and VC-10-521 written to complete ECN No. 34446 for train B and A, respectively.
May 1, 1987	Retest No. 149 was performed on Train A; reason for retest was unrelated to heater performance. The dT across the filter unit was 11-12°F; criteria for indication of heater function is a minimum of 5°F dT.
May 12, 1987	Electric construction on train B regarding DEF No. VC-10-520 completed.
May 15, 1987	Rework reverification complete for DEF No. VC-10-520.
May 16, 1987	Electrical construction on train A regarding DEF No. VC-10-521 complete.
May 19, 1987	Rework reverification complete for DEF No. VC-10-521.
May 20, 1987	DEF Nos. VC-10-520 and 521 closed.

NOTE: At this point in time the design changes required by ECN No. 34446 were complete; however, the heater interlock logic switches were wired in the wrong position (NC rather than the correct NO setting) and the fan dP setpoints had not been revised to the correct value (5.73" wg). The root cause for incorrect wiring diagram in ECN No. 34446 is discussed above (December 16, 1986 ECN approval date).

In accordance with the startup manual, the modifications of the interlock logic switches appear to require either retests or, at least, component demonstrations to verify the adequacy of the design change; neither type of verification was performed.

The standard preoperational testing practice was to complete all setpoint changes after any required design changes on affected components were completed without a specific setpoint change request. However, reportedly contractor instrument maintenance personnel assumed this instruction only applied until fuel load. Because the VC system was not required to be operational until initial criticality the setpoints erroneously remain unchanged.

May 23, 1987	Preoperational Test Program for VC completed.
May 29, 1987 @ 2120	Initial Criticality for Unit 1; VC delcared operable.
September 30, 1987	Startup Test BwSu VC-30, "Heat Capacity Verification for Control Room HVAC System," was performed on Train A. Because heater amps/volts were not measured, Deficiency B-501 was written. The resolution of DEF B-501 was that heater operation would not affect overall test acceptability; therefore no retest was required for the heater.
September 30, 1987 thru October 1, 1987	Surveillance Procedure No. OBwOs 7.6.B-1 was performed on Train B. Filter Unit dT was 7°F; criterion for heater function is a minimum dT of 5°F.
October 2, 1987	Startup Test VC-30 was performed on Train B. Proper heater voltage was measured; however zero amps were measured.

NOTE: The response of the startup test personnel was inadequate in that personnel did not realize that heater operability is directly tied by the Technical Specifications to the Control Room Ventilation System operability. The startup test procedure was apparently inadequate in that heater operability, including setpoint verification, was not part of the overall test acceptability criteria.

October 3, 1987	Surveillance 7.6.B-1 was performed on train A; filter Unit dT was 8°F.
October 18-19, 1987	Surveillance 7.6.B-1 was performed on train B; filter unit dT was 16°F.
November 3, 1987	Surveillance 7.6.B-1 was performed on train A; filter unit dT was 10°F.

NOTE: The train B heater was apparently operable on October 1, 1987 and October 19, 1987; yet the train B heater tested inoperable on October 2, 1987 and November 6, 1987. The apparent contradictions in operability test results may be due to the nearness of the fan dP to the heater interlock logic switch setpoint. The fan dP measured 13.0" wg on October 1, 1987; and the as-found setpoint on November 20, 1987 was 13.2" wg.

November 6, 1987 @ approx. 1100

The licensee's Project Engineering Department (PED) notified the station that during a review of the startup test VC-30 and Engineering Design Change DC-VC041, it was noted that the train B heater did not energize.

After consulting with Sargent & Lundy, the licensee confirmed that an error in design existed in the heater interlock logic circuitry and the heaters on both trains (A&B) would not energize at the proper time.

November 6, 1987 @ 1135, 61% reactor power

Both trains of VC were declared inoperable and T/S 3.0.3 was entered (T/S 3.7.6 LCO Action requirement 1.a was entered for Train A). LCO AR-1.a states that in modes 1, 2, 3 and 4; with one control room ventilation system inoperable, restore the inoperable system to operable status within 7 days or be in at least hot standby with the next 6 hours and in cold shutdown within the following 30 days.

NOTE: Upon declaring both trains of VC inoperable, the licensee's Electrical Maintenance Department (EMD) was contacted to determine if the train B heater would energize with the emergency fan running.

The component check of the B train heater revealed that the heater was energized as soon as the fan was started but de-energized after the fan had been running for a few seconds. Train A was not tested. If train A had been tested, the heater may have energized. The fan dP for Train A measured on September 30, 1987, was 11.5" wg; the as found setpoint on November 7, 1987 was 16.5" wg.

After installation of temporary alterations (changing switches OPDS-VC059 and OPDS-VC060 from the NC to the NO positions) of both trains of VC by EMD, the train B heater was again tested; the heater was found to energize shortly after the emergency fan began operation and to remain energized. Train A was not tested; because of the still undiscovered setpoint error, it is likely that train A would have failed the component test.

November 6, 1987 @ 1234

T/S 3.0.3 is exited; Train A remained in T/S 3.7.6 LCO Action Requirement 1.a.

NOTE: The heaters are energized only if the fan energizing contacts and the fan dP contacts are both closed (an AND interlock logic gate). Thus it was expected that with the fan dP heater interlock switch in the incorrect NC position, the heater would come "on" when the

fan was started and turn "off" when the fan dP setpoint was reached. Likewise, when the fan dP heater interlock switch was in the correct NO position, it was expected that the heater would not turn "on" until the fan dP setpoint was reached. Although the train B heater behaved as expected, it did so at a later time after fan start than expected.

Station technical staff engineers reviewed setpoint data sheets to determine that the setpoint changes required by the design change specified by ECN No. 34446 had not been completed. Since train A was in T/S 3.7.6 LCO AR-1.a and train B had been demonstrated operable, no change in LCO AR's were deemed necessary by the licensee. Setpoint change request for train A was initiated on November 6, 1987.

November 7, 1987	Train A switch OPDS-VC059 as-found setpoint was 16.5" wg; the as-left setpoint was 5.75" wg. The setpoint had drifted up from the October 14, 1986 value of 16.1" wg.
November 9, 1987 @0820	Train A T/S 3.7.6 LCO-AR-1.a was exited.
November 9, 1987	Setpoint change request for train B was initiated.
November 20, 1987 @0853	Train B T/S 3.7.6 LCOAR-1.a was entered.
November 20, 1987	Train B switch OPDS-VC-060 as-found setpoint was 13.2" wg; the as-left setpoint was 5.70" wg. The setpoint had drifted down from the December 16, 1986 value of 16.0" wg.

NOTE: Switches OPDS-VC059 and 060 were initially high delta P fan trips both at Byron and Braidwood. The switch was converted to a heater interlock logic switch, in part, because setpoint drift at Byron resulted in spurious fan trips.

November 21, 1987 @1342	Train B T/S 3.7.6 LCO AR-1.a was exited.